

Innovation, Technology, and Knowledge Management

Marta Peris-Ortiz

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Entrepreneurial Universities

Exploring the Academic and Innovative
Dimensions of Entrepreneurship in
Higher Education



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Innovation, Technology, and Knowledge Management

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Series Foreword

The Springer book series *Innovation, Technology, and Knowledge Management* was launched in March 2008 as a forum and intellectual, scholarly “podium” for global/local, transdisciplinary, transsectoral, public–private, and leading/“bleeding”-edge ideas, theories, and perspectives on these topics.

The book series is accompanied by the Springer *Journal of the Knowledge Economy*, which was launched in 2009 with the same editorial leadership.

The series showcases provocative views that diverge from the current “conventional wisdom,” that are properly grounded in theory and practice, and that consider the concepts of *robust competitiveness*,¹ *sustainable entrepreneurship*,² and *democratic capitalism*,³ central to its philosophy and objectives. More specifically, the aim of this series is to highlight emerging research and practice at the dynamic intersection of these fields, where individuals, organizations, industries, regions, and nations are harnessing creativity and invention to achieve and sustain growth.

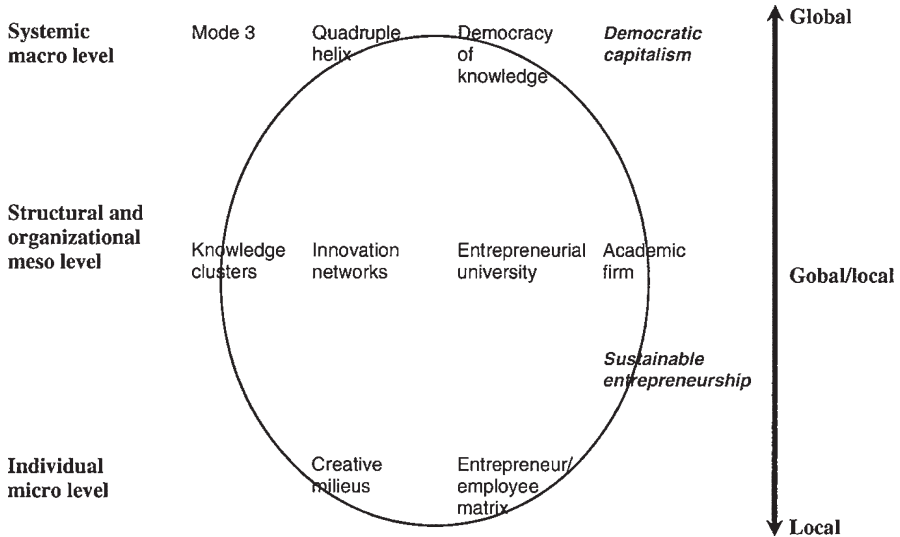
¹We define *sustainable entrepreneurship* as the creation of viable, profitable, and scalable firms. Such firms engender the formation of self-replicating and mutually enhancing innovation networks and knowledge clusters (innovation ecosystems), leading toward robust competitiveness (E.G. Carayannis, *International Journal of Innovation and Regional Development* 1(3), 235–254, 2009).

²We understand *robust competitiveness* to be a state of economic being and becoming that avails systematic and defensible “unfair advantages” to the entities that are pail of the economy. Such competitiveness is built on mutually complementary and reinforcing low-, medium-, and high-technology and public and private sector entities (government agencies, private firms, universities, and nongovernmental organizations) (E.G. Carayannis, *International Journal of Innovation and Regional Development* 1(3), 235–254, 2009).

³The concepts of *robust competitiveness* and *sustainable entrepreneurship* are pillars of a regime that we call *democratic capitalism* (as opposed to “popular or casino capitalism”), in which real opportunities for education and economic prosperity are available to all, especially—but not only—younger people. These are the direct derivative of a collection of top-down policies as well as bottom-up initiatives (including strong research and development policies and funding, but going beyond these to include the development of innovation networks and knowledge clusters across regions and sectors) (E.G. Carayannis and A. Kaloudis. *Japan Economic Currents*, p. 6–10 January 2009).

Books that are part of the series explore the impact of innovation at the “macro” (economies, markets), “meso” (industries, firms), and “micro” levels (teams, individuals), drawing from such related disciplines as finance, organizational psychology, research and development, science policy, information systems, and strategy, with the underlying theme that for innovation to be useful it must involve the sharing and application of knowledge.

Some of the key anchoring concepts of the series are outlined in the figure below and the definitions that follow (all definitions are from E.G. Carayannis and D.F.J. Campbell, *International Journal of Technology Management*, 46, 3–4, 2009).



Conceptual profile of the series *Innovation, Technology, and Knowledge Management*.

- The “Mode 3” Systems Approach for Knowledge Creation, Diffusion, and Use: “Mode 3” is a multilateral, multinodal, multimodal, and multilevel systems approach to the conceptualization, design, and management of real and virtual, “knowledge-stock” and “knowledge-flow,” modalities that catalyze, accelerate, and support the creation, diffusion, sharing, absorption, and use of cospecialized knowledge assets. “Mode 3” is based on a system-theoretic perspective of socio-economic, political, technological, and cultural trends and conditions that shape the coevolution of knowledge with the “knowledge-based and knowledge-driven, global/local economy and society.”
- Quadruple Helix: Quadruple helix, in this context, means to add to the triple helix of government, university, and industry a “fourth helix” that we identify as the “media-based and culture-based public.” This fourth helix associates with “media,” “creative industries,” “culture,” “values,” “lifestyles,” “art,” and perhaps also the notion of the “creative class.”

- **Innovation Networks:** Innovation networks are real and virtual infrastructures and infratechnologies that serve to nurture creativity, trigger invention, and catalyze innovation in a public and/or private domain context (for instance, government–university–industry public–private research and technology development cooperative partnerships).
- **Knowledge Clusters:** Knowledge clusters are agglomerations of cospecialized, mutually complementary, and reinforcing knowledge assets in the form of “knowledge stocks” and “knowledge flows” that exhibit self-organizing, learning-driven, dynamically adaptive competences and trends in the context of an open systems perspective.
- **Twenty-First Century Innovation Ecosystem:** A twenty-first century innovation ecosystem is a multilevel, multimodal, multinodal, and multiagent system of systems. The constituent systems consist of innovation metanetworks (networks of innovation networks and knowledge clusters) and knowledge metaclusters (clusters of innovation networks and knowledge clusters) as building blocks and organized in a self-referential or chaotic fractal knowledge and innovation architecture (Carayannis, 2001), which in turn constitute agglomerations of human, social, intellectual, and financial capital stocks and flows as well as cultural and technological artifacts and modalities, continually coevolving, cospecializing, and cooperating. These innovation networks and knowledge clusters also form, reform, and dissolve within diverse institutional, political, technological, and socioeconomic domains, including government, university, industry, and non-governmental organizations and involving information and communication technologies, biotechnologies, advanced materials, nanotechnologies, and next-generation energy technologies.

Who is this book series published for? The book series addresses a diversity of audiences in different settings:

1. *Academic communities:* Academic communities worldwide represent a core group of readers. This follows from the theoretical/conceptual interest of the book series to influence academic discourses in the fields of knowledge, also carried by the claim of a certain saturation of academia with the current concepts and the postulate of a window of opportunity for new or at least additional concepts. Thus, it represents a key challenge for the series to exercise a certain impact on discourses in academia. In principle, all academic communities that are interested in knowledge (knowledge and innovation) could be tackled by the book series. The interdisciplinary (transdisciplinary) nature of the book series underscores that the scope of the book series is not limited a priori to a specific basket of disciplines. From a radical viewpoint, one could create the hypothesis that there is no discipline where knowledge is of no importance.
2. *Decision makers—private/academic entrepreneurs and public (governmental, subgovernmental) actors:* Two different groups of decision makers are being addressed simultaneously: (1) private entrepreneurs (firms, commercial firms, academic firms) and academic entrepreneurs (universities) interested in optimizing knowledge management and in developing heterogeneously composed

knowledge-based research networks; and (2) public (governmental, subgovernmental) actors that are interested in optimizing and further developing their policies and policy strategies that target knowledge and innovation. One purpose of public *knowledge and innovation policy* is to enhance the performance and competitiveness of advanced economies.

3. *Decision makers in general*: Decision makers are systematically being supplied with crucial information, for how to optimize knowledge-referring and knowledge-enhancing decision-making. The nature of this “crucial information” is conceptual as well as empirical (case study-based). Empirical information highlights practical examples and points toward practical solutions (perhaps remedies); conceptual information offers the advantage of further-driving and further-carrying tools of understanding. Different groups of addressed decision makers could be decision makers in private firms and multinational corporations, responsible for the knowledge portfolio of companies; knowledge and knowledge management consultants; globalization experts, focusing on the internationalization of research and development, science and technology, and innovation; experts in university/business research networks; and political scientists, economists, and business professionals.
4. *Interested global readership*: Finally, the Springer book series addresses a whole global readership, composed of members who are generally interested in knowledge and innovation. The global readership could partially coincide with the communities as described above (“academic communities,” “decision makers”), but could also refer to other constituencies and groups.

Elias G. Carayannis

Preface

Entrepreneurship is an expression of the talent of human creation, and as such it manifests in different areas of individual life, the business world, society, and institutions: from different aspects of management thinking, as expressed by Schumpeter (1934, 1950), in reference to the skill for the discovery and exploitation of opportunities; Penrose (1959), when he refers to the executive's mind as one of the essential resources of the company; or Baumol (1968) when he emphasizes the importance of creativity as an essential element, which combines different factors and achieves economic growth.

Based on the individual consideration of entrepreneurship, the received education and the influence of society (Nga & Shamuganathan, 2010), or the existence of innate characteristics (Chell, 2008), they explain the features or characteristics of the entrepreneur which lead them to the discovery of opportunities (Shane & Venkataraman, 2000) or to create them by means of new combinations of factors (Schumpeter, 1934). In this sense, the field of entrepreneurship essentially corresponds to “the study of sources of opportunities; the processes of discovery, evaluation, and exploitation of opportunities; and the set of individuals who discover, evaluate, and exploit them” (Shane y Venkataraman, *Ibid*, 218); nothing can substitute ingenuity and individual intuition to discover new opportunities or create them by means of new factors or new combinations of factors.

However without neglecting the importance of the characteristics and individual initiatives of the entrepreneur, this book investigates the institutional dimension of entrepreneurship to establish *Entrepreneurial Universities* as an object of study. This institutional dimension of concept (Clark, 1998), in turn, has two aspects: one which enhances the individual aspect of future entrepreneurs, since these universities establish learning methods for their students which facilitate a greater inclination for innovation and entrepreneurship; and the aspect which involves the direct entrepreneurial action of the university, which by means of professional advice to companies or business incubators, and the creation of spin-offs, inaugurates a major path so that universities—their different professors and departments—fully intervene in the discovery of opportunities or in their creation as well as technology transfer. In this framework, they also increase the resources and the incentives for research and their subsequent application to innovation (Ross, 1976).

In the plurality of topics which characterize the examination of entrepreneurship in universities, the majority of the chapters in this book can be grouped into the following three main sections: the ones which deal with the entrepreneurial education of their students, with different variations; the sections which examine the entrepreneurial universities which are characterized by directly contributing to innovation and technology transfer; and those which deal with entrepreneurial research in universities such as the case study, in which they either focus on an aspect of entrepreneurial education or cover the study of educational aspects jointly with those of innovation and technology transfer.

Accordingly, Chaps. 2, 5, 12, 13, 14, and 20 deal with entrepreneurial education, with different variations. The heterogeneity of the approaches and topics which these six chapters feature permits the exploration of the wealth of contents required to carry out the academic training in entrepreneurship and experience its complexity. Chapter 2 studies the theoretical and practical consequences of entrepreneurial education, from the theoretical perspective of planned behavior. Chapter 5 examines the influence of formal and informal factors of the university institution on the entrepreneurial intention of the students. Chapters 12, 13, and 14 analyze different training contents which the students must include, ranging from collaboration and autonomous learning skills to their availability for motivation and commitment, as the basis which will facilitate the incorporation of specifically entrepreneurial skills. Finally, Chap. 20 examines the impact of entrepreneurship education programs on student entrepreneurial orientations, comparing data from Portugal, Spain, and Brazil.

Chapters 3, 4, 9, and 11 review the university's direct action as an entrepreneurial institution, contributing to innovation, technology transfer, and the development of society. Chapter 3, by means of a questionnaire to collect information from 206 department heads of Italian and Spanish universities, aims to measure the entrepreneurial orientation of these departments and how this will lead to the generation of patents and spin-offs which permit capitalizing their own researcher effort. Chapter 4 highlights that higher education institutions play a key role in the entrepreneurial field and this also consists in complying with the students' training and expectations, to maximize the potential for the commercialization of their ideas and their investigation and create value in society, without being a threat to academic values. The university, as an institution, forms part of a triple helix model and stimulates the development of society jointly with public administrations and companies. Chapter 9, in the same way as the two previous chapters, is based on the increasingly greater interest of universities to capitalize their own researcher effort. In the authors' own words, "Using a review of the literature, this paper identifies a number of variables that determine the characteristics of support programs for setting up academic spin-offs: the origin of the initiative; area of activity; objectives; funding for the program; type of spin-off to which support is provided; organization of the support activities; degree of integration and degree of autonomy." The results of the study provide a guide so that the academic authorities involved in the programs to create spin-offs can create or improve these programs. Finally, Chap. 11 conducts an exploratory study about the business incubators in Spain and the United Kingdom and, as the

authors explain, the chapter's contribution consists in confirming "that effectiveness assessment of incubators is so far un-systematic. (...) [T]he lack of rigorous assessment tools and methodologies feeds the uncertainty surrounding business incubator effectiveness and ultimately threatens their ability to make meaningful contributions to the success of the companies they nurture."

Chapters 6, 7, and 10 study three cases of entrepreneurial universities, which cover the educational aspects of entrepreneurship jointly with innovation and technology transfer. Chapter 6 illustrates, by means of the case of the University of Southern Santa Catarina in Brazil, the contribution of university institutions to innovation and entrepreneurship as well as economic development and sustainability. This chapter shows that the added value which the university contributes will depend on the knowledge transferred through the research, in addition to the contribution by means of the teaching work. In reference to Chap. 7, as perfectly summarized by its authors, "The objective of this paper (based on the entrepreneurial activity of the University of the Basque Country) is to show how educational innovation in entrepreneurship and technology transfer consolidates the third mission and transforms higher education institutions into entrepreneurial universities. The results obtained suggest that public investment to promote entrepreneurship in universities is efficient. To improve these results, it is necessary to determine standards in entrepreneurial education to introduce them into the academic curriculum and strengthen incubators focused on the creation of academic spin-offs from university R&D results." Chapter 10, concerning entrepreneurial initiatives in Colombian universities, in line with the previous two chapters, features the case of the Innovation, Entrepreneurship and Business Center of Sergio Arboleda University—Sergio i+E in Bogota, Colombia, which reveals the growing importance of the university in its contribution to creativity, innovation, and entrepreneurship, both in the students' training and the technology transfer.

Chapters 15, 16, and 17 correspond to different case studies and they respectively cover the entrepreneurship relation with the University of Valencia, the Polytechnical University of Valencia, and the CETIS University de Mexico. Both the analysis of the University of Valencia and the Polytechnical University of Valencia cover all the entrepreneurial aspects, from the training up to those related to innovation and technology transfer; and in reference to the study from CETYS University, the latter is especially focused on the preliminary training aspects, which the students must include in order to achieve good training in entrepreneurship.

In reference to Chaps. 1 and 8, Chap. 1 is about innovation and entrepreneurship in the academic setting and provides a general review of the literature about the universities' relation with entrepreneurship and innovation; and Chap. 8, "A Quest for the Research Centres about Entrepreneurship in Spanish Universities," pays special attention to the literature about entrepreneurship however with a different purpose: to verify, based on the literature, where the main research centers about entrepreneurship are in Spain.

Finally, Chaps. 18 and 19 have singular features which could not be included in any of the above groups. Chapter 18 deals with the introduction or improvement of

virtual business internships in higher education institutions and in the own words of the chapter's authors, "recent changes in the Spanish laws and in the regulations of universities, such as the Universitat Politècnica de València, which allow business internships to take place abroad. These conditions could provide an opportunity for innovation and growth, especially by combining internationalization with virtualization of traineeships." Finally, Chap. 19 compares the attitudes of Spanish and Portuguese students in Tourism Degree programs and how they perceive the assistance which these studies provide to improve their entrepreneur profile. The employed methodology consists of a descriptive analysis of the data obtained through a questionnaire, using statistical tests of comparison of means, T-Student and Contingency tables that allow checking the hypotheses and analyzing the differences between the two countries.

Thus as a whole, the chapters of the book which we present here shall contribute to communicate the main ideas about entrepreneurship in relation to the university institution. This relation is founded on three essential missions of the university: research, teaching, and the contribution to innovation and technology transfer. Readers may read this book based on the group of presented topics or according to the sequence of chapters organized in the book, depending on whether they are more interested in homogeneity or in the variety of the presented topics. We believe that the book as a whole makes a significant contribution to the important topic of Entrepreneurial Universities. Jointly with companies and public administrations, they depend on the presence of a triple incentive—a triple helix—towards improvement in the culture of innovation and entrepreneurship as well as innovation and economic development.

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References

- Baumol, W. J. (1968). Entrepreneurship in economic theory. *The American Economic Review*, 58(2), 64–71.
- Chell, E. (2008). The nascent entrepreneur, business development and the role of human resources. In R. Barret & S. Mayson (Eds.), *International handbook of entrepreneurship and HRM* (pp. 21–46). Cheltenham, UK: Edward Elgar.
- Clark, B. R. (1998). *Creating entrepreneurial universities: Organizational pathways of transformation*. Oxford: Pergamon-Elsevier Science.
- Nga, J. K. H., & Shamuganathan, G. (2010). The influence of personality traits and demographic factors on social entrepreneurship start up intentions. *Journal of Business Ethics*, 95, 259–282.
- Penrose, E. (1959). *The theory of the growth of the firm*. Oxford: Basil Blackwell and New York: Wiley.

- Ross, R. D. (1976). Institutionalization of academic innovations: 2 models. *Sociology of Education*, 49(2), 146–155.
- Schumpeter, J. A. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.
- Schumpeter, J. A. (1950). *Capitalism, socialism and democracy* (3rd ed.). New York: Harper & Row.
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25, 217–226.

Contents

1	Activities Related to Innovation and Entrepreneurship in the Academic Setting: A Literature Review	1
	Ademar Schmitz, David Urbano, Maribel Guerrero, and Gertrudes Aparecida Dandolini	
2	The Influence of Entrepreneurship Education on Entrepreneurial Intentions	19
	João J. Ferreira, Cristina I. Fernandes, and Vanessa Ratten	
3	Assessing the Entrepreneurial Orientation of University Departments. A Comparative Study Between Italy and Spain.....	35
	Angelo Riviezzo, Francisco Liñán, and Maria Rosaria Napolitano	
4	Entrepreneurship and University: How to Create Entrepreneurs from University Institutions.....	47
	Alberto Vaquero-García, Francisco Jesús Ferreiro-Seoane, and José Álvarez-García	
5	The Influence of University Context on Entrepreneurial Intentions	65
	Juan Carlos Díaz-Casero, Antonio Fernández-Portillo, Mari-Cruz Sánchez-Escobedo, and Ricardo Hernández-Mogollón	
6	Universities in the Context of the Knowledge-Based Society According to Systemism: Evidences from a Brazilian Community University	83
	Ademar Schmitz, David Urbano, Gertrudes Aparecida Dandolini, and João Artur de Souza	
7	Entrepreneurial University: Educational Innovation and Technology Transfer	105
	María Saiz-Santos, Andrés Araujo-De la Mata, and Jon Hoyos-Iruarrizaga	

8	A Quest for the Research Centres About Entrepreneurship in Spanish Universities	123
	Alicia Blanco-González, Camilo Prado-Roman, and Juan-Gabriel Martínez-Navalón	
9	Title Variables that Determine the Characteristics of University Spin-Off Support Programs	135
	José María Beraza-Garmendia and Arturo Rodríguez-Castellanos	
10	Entrepreneurial Initiatives in Colombian Universities: The Innovation, Entrepreneurship and Business Center of Sergio Arboleda University	151
	Antonio Alonso-Gonzalez, Diego Plata-Rugeles, Marta Peris-Ortiz and Carlos Rueda-Armengot	
11	University Incubators May Be Socially Valuable, but How Effective Are They? A Case Study on Business Incubators at Universities	165
	Dag Bennett, Diana Pérez-Bustamante Yábar, and José Ramón Saura	
12	Transversal Competences Acquisition by Assigning Collaborative Work Group Roles	179
	Eugenia Babiloni, Ester Guijarro, Lourdes Canós-Darós, and Cristina Santandreu-Mascarell	
13	Assessment of Autonomous Learning Skill Through Multi-criteria Analysis for Online ADE Students in Moodle	197
	Mónica de Castro, Concepción de la Fuente-Cabrero, and M ^a del Pilar Laguna Sánchez	
14	Development Motivation of Student Abilities and Skills Through a Business Activity	215
	Raúl Gómez Martínez, Alberto Prado Román, and Paola Plaza Casado	
15	A Study on Entrepreneurship at the University of Valencia	229
	Elisabeth Bustos-Contell, Gregorio Labatut-Serer, and Salvador Climent-Serrano	
16	Entrepreneurship at the Universitat Politècnica de València	239
	Carlos Rueda-Armengot, Sofía Estelles-Miguel, Marta Elena Palmer Gato, José Miguel Albarracín Guillem, and Jose M. Merigó Lindahl	
17	CETYS University: Teaching in a Proactive and Entrepreneurial University	249
	Marta Peris-Ortiz, Monica Acosta-Alvarado, and Mariella C. Remund	
18	Intrapreneuring Within a Higher Education Institution: Introducing Virtual Business Internships	259
	Gisela Sanahuja Vélez, Gabriela Ribes Giner, and Ismael Moya Clemente	

**19 Entrepreneurship by Students in Tourism Degree Program.
A Cross-Cultural Analysis** 267
María de la Cruz del Río Rama, José Álvarez García,
Carlos Rueda-Armengot, and Marta Peris-Ortiz

**20 The Impact of Entrepreneurship Education Programs
on Student Entrepreneurial Orientations: Three International
Experiences** 287
João J. Ferreira and Cristina I. Fernandes

Index 303

Chapter 1

Activities Related to Innovation and Entrepreneurship in the Academic Setting: A Literature Review

Ademar Schmitz, David Urbano, Maribel Guerrero,
and Gertrudes Aparecida Dandolini

Abstract In the knowledge-based society, universities have assumed new missions and relations in order to contribute to economic and social development, normally discussed under innovation and entrepreneurship concepts. This chapter aims to explore relevant scientific literature in what concerns the activities related to innovation and entrepreneurship in the academic setting. It reports early results of a systematic literature review considering articles published on Web of Science, in which both bibliometric and content analysis are being conducted. Content analysis of a set of articles aimed to identify characteristics of universities that endure into innovation and entrepreneurship, and the activities related to innovation and entrepreneurship in the academic setting. Turns out that characteristics are mainly associated to the concept of the entrepreneurial university, in with changes occurring within universities and on their relations within the knowledge-based society are discussed. Both the internal changes and relations are related to the need of universities to contribute to regional socioeconomic development through the creation, dissemination and application of knowledge, and to the need to support its own sustainability. More than 20 different activities related to innovation and entrepreneurship within universities were identified. They are related to regional socioeconomic development, and to the sustainability of universities; to individuals within universities, to the university itself, and to the relation of the university with its surroundings; to the process and results of knowledge creation, knowledge dissemination and knowledge application; to profit-gain of the university or its partners,

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and to social development of the communities surrounding the university; and to fulfilling the universities missions and to their relations within the knowledge based society. Empirical studies should be conducted in order to verify if all these activities in fact contribute to innovation and entrepreneurship in the academic setting, and if there are other activities eventually not listed by the analyzed literature.

Keywords Economic development • Entrepreneurship • Innovation • Research • Social development • Sustainability • Universities

1.1 Introduction

In the knowledge-based society, universities are increasingly challenged to become more socially and economically relevant organizations (Nelles & Vorley, 2011). To do so, universities have gone through academic revolutions. The first revolution added the mission of generating knowledge through research to the traditional mission of preserving and transmitting knowledge (teaching), with which universities were established. Then the second revolution made economic and social development a third mission of universities in addition to teaching and research (Etzkowitz, 2003a). This means that the university, as a medial institution, originated for the conservation and transmission of knowledge, but evolved over the centuries into an institution in which knowledge is also created and put to use (Etzkowitz, 2013).

In addition, in order to contribute to socioeconomic development, universities need to closely interact with industry and government, known as triple helix of innovation (Etzkowitz, 2003a, 2003b). The triple helix of innovation refers to the interweaving of university, industry and government with a spiral pattern of linkages to advance economic and social development through the strategy of innovation (Etzkowitz, Webster, Gebhardt, & Terra, 2000). It implies the breaking down of traditional organizational, cultural, and normative barriers that in the past have separated these spheres to the detriment of economic competitiveness and technological progress (Etzkowitz et al., 2000).

Concerning the universities missions, the incorporation of new ones does not mean the replacement of the old ones. On the contrary, universities need to incorporate new activities in order to fulfill the new missions, while continuing doing those activities fulfilling the original missions. The need to fulfill the three missions simultaneously and the need to closely interact with industry and government, implies and requires changes in the function and structure of universities (Etzkowitz et al., 2000; Goldstein, 2010). Realignments include new understandings and metrics for the traditional teaching and research missions, internal organizational changes that are more conducive to interdisciplinarity and collaborations with government and industry, new modes of governance and management, and new institutional capacities (Goldstein, 2010).

These changes in universities have gained substantial importance in recent literature and they are usually discussed from the perspectives of innovation (Clark, 1996;

Strier, 2011; van Vught, 1999) and entrepreneurship (Clark, 1998; Etzkowitz, 2003a, 2003b, 2013; Etzkowitz et al., 2000; Urbano & Guerrero, 2013). Studies claim that the changes taking place within universities somehow manifest themselves in the form of innovation and entrepreneurship activities. These activities include both traditional activities of innovation and entrepreneurship, more related to economic development, and those related to social development (Abreu & Grinevich, 2013). They also claim that these activities, beside contributing to economic and social development, should contribute to the sustainability of the university (Etzkowitz, 1998; Etzkowitz et al., 2000; Philpott, Dooley, O'Reilly, & Lupton, 2011).

Despite the extensive and increasing literature, and although the terms innovation and entrepreneurship are commonly used together within universities, not many studies have explicitly address them together at theoretical and practical levels. Furthermore, authors argue that literature is still fragmented and broadly conceptualized (Mars & Rios-Aguilar, 2010; Nelles & Vorley, 2011; Rothaermel, Agung, & Jiang, 2007; Urbano & Guerrero, 2013; Wood, 2011), requiring more systematic and holistic studies (Guenther & Wagner, 2008; Mazdeh, Razavi, Hesamamiri, Zahedi, & Elahi, 2013; Urbano & Guerrero, 2013; Wood, 2011), considering both the economic and the social aspects of innovation and entrepreneurship within universities (Abreu & Grinevich, 2013; Mars & Rios-Aguilar, 2010; Mazdeh et al., 2013; Wood, 2011).

This chapter aims to contribute to reduce this gap, by exploring relevant scientific literature in what concerns the innovation and entrepreneurship activities in the academic setting. To do so, it tries to answer, based on a literature review, the following questions: (a) what are the characteristics of universities that endure into innovation and entrepreneurship? and (b) what are the activities of innovation and entrepreneurship within universities? Characteristics were explicitly identified and analyzed because in some cases, they may indicate activities, and in other cases, they justify them. Characteristics also allow to analyze if the activities being considered by literature encompass the entire extension of innovation and entrepreneurship within universities.

This exploratory study was accomplished through a literature review. A systematic approach was used which uses a rigorous protocol and steps to execute the literature research and analysis (Crossan & Apaydin, 2010). The literature review is based on relevant scientific articles, published on Web of Science. Articles were identified using keywords, including but not restricted to academic innovation, university innovation, academic entrepreneurship, university entrepreneurship, innovative university, and entrepreneurial university. After the application of some restrictions on database, document type, and language, 372 articles were considered for literature review. These 372 articles were submitted to a bibliometric analysis (results to be reported in an oncoming article), and then a set of 36 articles, classified as best fitting the objective of the study, had their content analyzed. Both characteristics and activities were identified during the article's content analysis.

The article brings both theoretical and practical contributions. Theoretical contributions include an extensive and detailed literature review on the characteristics of universities that endure into innovation and entrepreneurship, on the activities related to innovation and entrepreneurship within universities, and a unique study considering

explicitly and systematically innovation and entrepreneurship together within universities. Practical contributions include the possibility of the use of the results by university managers, policy makers, and other researchers. As the article brings a unique list of activities related to innovation and entrepreneurship within universities, it subsidizes the development of more adequate internal and external policies to foster universities' contribution to regional socioeconomic development and the universities' sustainability.

This article is organized in five sections. Present section introduces the article, contextualizing the research problem, presenting the research objective and methodology, and its theoretical and practical contributions. In the second section, some early results of the overall systematic literature review being conducted on innovation and entrepreneurship within universities is presented. The third section brings the main characteristics identified for universities that endure into innovation and entrepreneurship activities. In the fourth section, the list of innovation and entrepreneurship activities of universities identified by this study are presented. Finally, the fifth section summarizes the most important findings and indicates potential further studies.

1.2 Innovation and Entrepreneurship Within Universities

Initial results of the overall systematic literature review show that innovation and entrepreneurship in the academic setting have been studied under concepts such as innovative universities (Clark, 1996; Strier, 2011; van Vught, 1999), university innovation (Chen et al., 2013; O'Shea, Chugh, & Allen, 2008), academic innovation (Chang, Chen, Hua, & Yang, 2006; Chen et al., 2013; Conklin, 1978; Lindquist, 1974; Ross, 1976; Schachter, 1986), entrepreneurial universities (Audretsch, 2014; Etzkowitz, 1984, 1998, 2003a, 2003b, 2013; Etzkowitz et al., 2000; Guenther & Wagner, 2008; Guerrero, Urbano, Cunningham, & Organ, 2014; Guerrero, Cunningham, & Urbano, 2015; Guerrero & Urbano, 2012; Jacob, Lundqvist, & Hellsmark, 2003; Kirby, Guerrero, & Urbano, 2011; Mainardes, Alves, & Raposo, 2011; Nelles & Vorley, 2011; Philpott et al., 2011; Sam & van der Sijde, 2014; Urbano & Guerrero, 2013; Yokoyama, 2006), university entrepreneurship (Nelles & Vorley, 2011; Rothaermel et al., 2007; Todorovic, McNaughton, & Guild, 2011), and academic entrepreneurship (Abreu & Grinevich, 2013; Doutriaux, 1987; Etzkowitz, 2003a, 2013; Goldstein, 2010; Guerrero et al., 2014, 2015; Guerrero & Urbano, 2012; Klofsten & Jones-Evans, 2000; Mars & Rios-Aguilar, 2010; Mazdeh et al., 2013; Tijssen, 2006; Urbano & Guerrero, 2013; Wood, 2011; Wright, 2014).

The term "academic innovation" is used by some of the earliest articles, but not explored further. Lindquist (1974) used the term as the need for change in the university. Ross (1976) considered academic innovation as the involvement of the university in innovative disciplines and programs. Conklin (1978) considered academic innovation as the creation of new teaching techniques. Schachter (1986) considered academic innovation as the creation of new curriculums. The term "university innovation", also termed as "academic innovation", is also used a few times, but no definition was given. Finally, the term "innovative university" is used a few times, but defined only once, as those universities that explore new ways of

organizing knowledge and/or more effectively exploiting the fields in which they are already engaged (Clark, 1996).

On the other hand, terms related to entrepreneurship are discussed more often. “Academic entrepreneurship”, also discussed as “university entrepreneurship” (Jacob et al., 2003; Mazdeh et al., 2013), is used and defined several times. Definitions vary from the creation of new business ventures by someone related to the university (Doutriaux, 1987; Mazdeh et al., 2013) to all activities outside of the normal university duties of basic research and teaching (Abreu & Grinevich, 2013; Klofsten & Jones-Evans, 2000), including the commercialization of knowledge produced within universities (Jacob et al., 2003; Klofsten & Jones-Evans, 2000; Mazdeh et al., 2013), and other activities such as custom-made educational courses, consultancy, training, and extension activities which bring rewards for the individual academic or his/her institution (Abreu & Grinevich, 2013; Jacob et al., 2003; Mazdeh et al., 2013).

The term “entrepreneurial university” is the most frequently defined one in literature. Its main definitions include partnerships with industry (Etzkowitz, 1984, 2003a; Kirby et al., 2011), creation of new ventures (Etzkowitz, 2003b, 2013; Guenther & Wagner, 2008; Jacob et al., 2003), knowledge capitalization through new services (Jacob et al., 2003) and knowledge commercialization (Etzkowitz, 2003a, 2013; Guenther & Wagner, 2008; Jacob et al., 2003), search for new sources of funds (Etzkowitz, 1984; Etzkowitz et al., 2000; Kirby et al., 2011; Mainardes et al., 2011), knowledge production and application (Etzkowitz, 2003a, 2003b, 2013; Guerrero et al., 2014), and contribution to regional social and economic development (Etzkowitz, 2003b; Etzkowitz et al., 2000; Guerrero et al., 2014; Kirby et al., 2011).

According to Audretsch (2014), universities need to become more entrepreneurial in order to facilitate knowledge spillovers and the commercialization of their knowledge. As a conduit of knowledge spillovers, entrepreneurial universities contribute to economic and social development through its multiple missions (Guerrero et al., 2014). It is seen as an important catalyst for regional economic and social development because it generates and exploits knowledge as entrepreneurial opportunities (Urbano & Guerrero, 2013). Therefore, the concept of the entrepreneurial university is seen as the most well-articulated in the evolution of the university towards the requirements of the knowledge-based society (Goldstein, 2010), in which the role of the university for socioeconomic development and the collaboration between university and external stakeholders is emphasized (Sam & van der Sijde, 2014).

While the studies on innovative universities and entrepreneurial universities have focused on characteristics and activities that make universities being more innovative and entrepreneurial as organizations, the studies related to the other terms have focused as well on activities inside or related to universities that increase innovation and entrepreneurship in the context of knowledge based society. This does not mean that there are crispy boundaries between or among the studies. On the contrary, literature is fuzzy in what concerns activities and more precisely definitions of innovation and entrepreneurship within universities.

In this sense, innovation and entrepreneurship in the academic setting can be seen as continuous and complementary processes that allow current production systems and social standards be improved or replaced in order to bring economic and social development of regions, states and countries. This idea widens (Schumpeter’s 1934)

concept of creative destruction (more related to economic development), in which science and creativity are used to develop new and novel knowledge (innovation), applicable to economic and social demands or opportunities, and the application of this knowledge to stimulate economic and social development (entrepreneurship).

From an economic perspective, this represents a process in which new products, processes, organizational and marketing methods are created and put to use in order to generate economic value (Mortensen & Bloch, 2005; Neves & Neves, 2011). From a social perspective, it represents a process in which knowledge is transformed in products, services, and models that attend social needs and create new social relationships and collaborations, increasing the ability of society to act (Murray, Caulier-Grice, & Mulgan, 2010), creating social value. In his creative destruction process, (Schumpeter 1934) stresses the importance of both innovation and entrepreneurship in economy and society, by precisely articulating the entrepreneurial activities, based on innovation, to the need to change. Under this perspective, academic entrepreneurship tries to create [social and] market value toward the generation and transfer of knowledge through innovation (Urbano & Guerrero, 2013).

Concerning the knowledge required in this creative destruction process, innovative knowledge provides the understanding of a particular subject or technology that serves as the basis of a commercial opportunity (Shah & Pahnke, 2014) or a social demand. Entrepreneurial knowledge, on the other hand, provides an understanding of the entrepreneurial process and networks from which to draw resources and expertise (Shah & Pahnke, 2014) in order to apply the innovative knowledge for regional socioeconomic development and for the sustainability of the universities.

1.3 Characteristics of Entrepreneurial Universities

According to The Free Dictionary, a characteristic is a feature that helps to identify, tell apart, or describe recognizably. According to the Longman Dictionary of American English, a characteristic is a special quality or feature that someone or something has. Therefore, characteristics of universities that endure into innovation and entrepreneurship activities might also be indicated as features or qualities. Furthermore, as the concept of the entrepreneurial university is seen as the most well articulated in the evolution of the university towards the requirements of the knowledge-based society (Goldstein, 2010), literature tends to indicate characteristics of such universities. Table 1.1 presents the characteristics indicated or cited in the analyzed articles.

The characteristics indicated in the literature confirm the changes occurring within universities and on their relation within the knowledge based society. In particular, the work developed by Clark (1998) and Etzkowitz (2003b, 2004, 2013) expands the idea of academic entrepreneurship to encompass both the individual with entrepreneurial inclinations and the academic organization with a requirement to demonstrate engagement with entrepreneurship (Brennan, McGovern, & McGowan, 2007). In this new format, the university tends to be

Table 1.1 Characteristics of entrepreneurial universities

Authors	Characteristics
Clark (1998)	<ul style="list-style-type: none"> • A strengthened steering core: universities cannot depend on traditional control or steering; they need to become quicker, more flexible, more focused in reacting to demands from their environments • An expanded developmental periphery: universities need to have mechanisms to relate to the outside world; they have to reach across their traditional boundaries; they need to set up special organizational units • A diversified funding base: universities need to have diversified resources of funds; they have to widen their financial base and become less dependent of government • A stimulated academic heartland: universities need academic units that act as entrepreneurial units; these units have to be stimulated to react positively to change • An integrated entrepreneurial culture: universities need a culture that embraces change; a set of beliefs that is university-wide and that become the very basis of the institution's identity
Neal (1998))	<ul style="list-style-type: none"> • A focus on environmental changes in technology, economy, social values, and regulations that would open windows of opportunity • An action orientation within narrow decision windows utilizing input from a limited number of constituencies, based on an acceptance of reasonable risks • A realization of the lack of predictable resources, combined with an emphasis on efficient and appropriate use of resources • A distinction between the use and the acquisition of required resources (capital and human) based on considerations of specialization, flexibility, potential for obsolescence, and resource life • An ability to organize and reorganize decision-making structures based on external and internal opportunities
Subotzky (1999))	<ul style="list-style-type: none"> • A closer university-business partnership • A greater faculty responsibility for accessing external sources of funding • A managerial ethos in governance, leadership and planning
Etzkowitz et al. (2000)	<ul style="list-style-type: none"> • Internal transformation • Trans-institutional impact • Interface processes • Recursive effects
Etzkowitz (2003b)	<ul style="list-style-type: none"> • The organization of group research • The creation of a research base with commercial potential • The development of organizational mechanisms to move research out of the university as protected intellectual property • The capacity to organize firms within the university • The integration of academic and business elements into new formats such as university–industry research centres;

(continued)

Table 1.1 (continued)

Authors	Characteristics
Etzkowitz (2004)	• The capitalization of knowledge becomes the basis for economic and social development and, thus, of an enhanced role for the university in society
	• The interaction with the government and industry
	• The university independence from other institutional spheres
	• The creation of hybrid organizational formats that incorporate business sector practices and those of traditional universities
	• The continuing renovation of the university's internal structure as its relationship to the industry and government changes
Goldstein (2010)	• The active involvement of universities in the development and commercialization of technology stemming from university-based research
	• The changing of internal regulations, rewards and incentives, norms of behavior, and governance of universities to remove barriers to individual faculty, other researchers
	• Research centers/institutes engaging in behavior that leads to the commercialization of university-generated knowledge
Kirby et al. (2011)	• They strive to be more entrepreneurial in transforming their organizational structures to better respond and adapt to the external environment
	• They seek to encourage collective entrepreneurial action at all levels by using various mechanisms to promote entrepreneurial culture
Mainardes et al. (2011)	• The capacity to adapt to demands from the surrounding environment
	• They are to develop and set out clear mission declarations and objectives
	• A business focused culture and an internal university structure that is differentiated by sub-units and by professional university management
	• Shared models of governance for implementing adaptive strategies
	• A committed leadership to represent an essential factor for successful adaptation
Etzkowitz (2013)	• Interaction: the entrepreneurial university interacts closely with industry and government
	• Independence: the entrepreneurial university is a relatively independent institution
	• Hybridization: the resolution of the tensions between the principles of interaction and independence are an impetus to the creation of hybrid organizational formats to realize both objectives simultaneously
	• Reciprocity: there is a continuing renovation of the internal structure of the university as its relation to industry and government changes, and of industry and government as their relationship to the university is revised

Source: Author's

increasingly independent of the government and at the same time more highly interactive with other social spheres. Entrepreneurial universities seek to be as free of state control as possible and seeking to interact closely with the market with the objective of acquiring resources as well as meeting the needs of society in terms of knowledge, both in terms of creation and dissemination thereby contributing to social development whether on the local, regional or national scale (Mainardes et al., 2011).

According to Ropke (1998), an entrepreneurial university can mean three things: the members of the university (faculty, students, and employees) are turning themselves somehow into entrepreneurs; the university itself, as an organization, becomes entrepreneurial; and, the interaction of the university with the environment follows an entrepreneurial pattern. This means that entrepreneurial university needs to become an entrepreneurial organization, its members need to become entrepreneurs, and its interaction with the environment needs to follow an entrepreneurial pattern (Guerrero & Urbano, 2012; Urbano & Guerrero, 2013).

1.4 Activities Related to Innovation and Entrepreneurship Within Universities

According to Audy (2006), institutional policies (related to technology transfer, conflicts of interest, research projects with companies, etc.) and the development of innovative environments (such as technology transfer offices, ethics in research offices, technology parks, incubators, innovation networks, etc.) are important to create the conditions for the development of an environment geared to innovation and entrepreneurship. This means that in order to become more innovative and entrepreneurial, universities need to incorporate several activities that were not always in their scope. Table 1.2 brings a synthesis of the identified activities according to the analyzed articles, together with respective authors and denomination, such as entrepreneurial university, academic entrepreneurship, and so on.

By considering the common indicated activities, it was possible to create a list of the different activities related to innovation and entrepreneurship within universities. Table 1.3 brings the identified activities with the respective meanings and authors. Meanings were extracted from original text and combined in order to represent the view of the different authors that indicated the activities.

Table 1.2 Indication of activities related to innovation and entrepreneurship within universities

Authors	Denomination	Activities
Etzkowitz (1984)	Entrepreneurial University	Commercial utilization of research results; creation of firms from research results; external funding; creation of research groups as quasi-firms; contracts and grants; joint ventures
Doutriaux (1987)	Academic Entrepreneurship	Spinoffs creation; startups creation; consulting firms; technical services firms; manufacturing firms
Louis, Blumenthal, Gluck, and Stoto (1989)	University Entrepreneurial Activities	Engaging in large-scale science, with externally funded research projects; earning supplemental income from outside the university, mainly through consulting; gaining industry support for university research; obtaining patents or generating trade secrets; forming companies based on the results of research

(continued)

Table 1.2 (continued)

Authors	Denomination	Activities
Klofsten and Jones-Evans (2000)	Academic Entrepreneurship	Consulting; contract research; large-scale science projects; external teaching; testing; patenting/licensing; spin-offs; sales.
Etzkowitz (2001)	Entrepreneurial University	Business incubator facilities; spin-off creation; start-up creation; industrial liason programmes; liason offices; technology transfer offices; publishing (after intellectual property preservation)
Chang et al. (2006)	Academic Innovation	Patenting; licensing; incubated startups; spin-offs; intellectual property offices; technology transfer offices; technology licensing offices
Yokoyama (2006)	Entrepreneurial University	Business corporations; overheads; consultancy; service to the community; scholarships
Rothaermel et al. (2007)	Academic Entrepreneurship	Patenting and licensing; creating incubators; science parks; university spinouts; investing equity in start-ups
Guenther and Wagner (2008)	Entrepreneurial University	Incubators; science parks; technology transfer offices; entrepreneurship education
Kirby et al. (2011)	Entrepreneurial University	Involvement in large-scale science projects; contracted research; consulting; patenting/licensing; generation of business spin-offs; external teaching; collaboration; new product development and distribution
Philpott et al. (2011)	Entrepreneurial University	Creation of a technology park; spinoff firm formation; patenting and licensing; contract research; industry training courses; consulting; grantsmanship; publishing academic results; producing high qualified graduates
Abreu and Grinevich (2013)	Academic Entrepreneurship	Formal commercial activities (licensing, spin-outs); informal commercial activities; consultancy business; contract research; non-commercial activities (informal advise, public lectures)
Mazdeh et al. (2013)	University Entrepreneurship	New companies exploiting intellectual property created in universities considering university spin-offs; companies started on the side of university employment; consulting, specialized research and training, science projects, patenting/licensing, sales, and testing

Source: Author's

According to the analyses literature, Etzkowitz (1984) was the first author explicitly stating the activities of an entrepreneurial university, which includes commercial utilization of research results, creation of firms from research results, external funding, creation of research groups as quasi-firms, contracts and grants,

Table 1.3 Activities related to innovation and entrepreneurship in the academic setting

Activity	Meaning	Authors
Teaching	Production of high quality students, establishing relationships with practice	Klofsten and Jones-Evans (2000), Kirby et al. (2011), Mazdeh et al. (2013), Philpott et al. (2011)
Training courses	Courses offered outside traditional programs, especially to industry and community members	Mazdeh et al. (2013), Philpott et al. (2011)
Entrepreneurship education	Training top-level workforce, producing entrepreneurs and not only workers	Abreu and Grinevich (2013), Guenther and Wagner (2008)
Publishing	Dissemination of knowledge through scientific articles, books, etc., after intellectual property preservation	Etzkowitz (2001), Philpott et al. (2011)
Patenting	Obtaining patents or generating trade secrets in order to preserve intellectual property university creations	Chang et al. (2006), Kirby et al. (2011), Klofsten and Jones-Evans (2000), Louis et al. (1989), Mazdeh et al. (2013), Philpott et al. (2011), Rothaermel et al. (2007)
Licensing	Transferring knowledge and technology to existing or new created companies	Abreu and Grinevich (2013), Chang et al. (2006), Kirby et al. (2011), Klofsten and Jones-Evans (2000), Mazdeh et al. (2013), Philpott et al. (2011), Rothaermel et al. (2007)
Consulting services	Consulting services to businesses in order to improve their operations, promoting existing businesses	Abreu and Grinevich (2013), Doutriaux (1987), Kirby et al. (2011), Klofsten and Jones-Evans (2000), Louis et al. (1989), Mazdeh et al. (2013), Philpott et al. (2011), Yokoyama (2006)
Technical services	Laboratory services to businesses such as testing, homologation, etc.	Doutriaux (1987), Klofsten and Jones-Evans (2000), Mazdeh et al. (2013)
Community services	Services to communities in order to improve their acting through appointments, informal advising, public lectures	Abreu and Grinevich (2013), Yokoyama (2006)
Businesses creation	Establishment of new companies such as spinoff and spinous through technology transfer and consulting; new companies exploiting intellectual property created in universities; companies started on the side of university employment; creation of firms from research results	Abreu and Grinevich (2013), Chang et al. (2006), Doutriaux (1987), Etzkowitz (1984, 2001), Kirby et al. (2011), Klofsten and Jones-Evans (2000), Louis et al. (1989), Mazdeh et al. (2013), Philpott et al. (2011), Rothaermel et al. (2007), Yokoyama (2006)

(continued)

Table 1.3 (continued)

Activity	Meaning	Authors
Venture funding	University based venture funds; investing equity in startups; joint ventures	Etzkowitz (1984), Rothaermel et al. (2007)
Contract research	Development of research under public and private contracts	Abreu and Grinevich (2013), Klofsten and Jones-Evans (2000), Kirby et al. (2011), Philpott et al. (2011)
Collaborative research	Development of research in partnership with industry and community	Kirby et al. (2011), Klofsten and Jones-Evans (2000)
Incubator facilities	Maintenance or participation in social and business incubator facilities in order to create new ventures	Chang et al. (2006), Etzkowitz (2001), Guenther and Wagner (2008), Rothaermel et al. (2007)
Science/Technology parks	Maintenance or participation in science and technology parks in order to do research and development and the creation of new ventures	Guenther and Wagner (2008), Philpott et al. (2011), Rothaermel et al. (2007)
Technology transfer offices	Maintenance of technology transfer offices, technology licensing offices, etc. in order to transfer knowledge and technology to new or existing companies	Chang et al. (2006), Etzkowitz (2001), Guenther and Wagner (2008)
External funding	Obtaining external funds for research development, scholarships, and special training courses	Etzkowitz (1984), Louis et al. (1989), Philpott et al. (2011), Yokoyama (2006)
Large scale science	Engaging in large-scale science, with externally funded research projects and specialized research	Kirby et al. (2011), Louis et al. (1989), Mazdeh et al. (2013)
Knowledge commercialization	Commercial utilization of research results	Etzkowitz (1984), Klofsten and Jones-Evans (2000), Mazdeh et al. (2013)
Research groups	Creation and maintenance of research groups as business units	Etzkowitz (1984)
Liason programs	Liason programmes and offices to increase partnerships with industry, government and communities	Etzkowitz (2001), Kirby et al. (2011)

Source: Author's

and joint ventures. This author further developed these activities by himself (see Etzkowitz, 2001) or with other authors (see Etzkowitz & Zhou, 2008).

The work of Louis et al. (1989) is many times cited in the literature. The authors distinguish several types of university entrepreneurial activities, including engaging in large-scale science, with externally funded research projects; earning supplemental income from outside the university, mainly through consulting; gaining industry support for university research; obtaining patents or generating trade secrets; and, forming companies based on the results of research.

For Guenther and Wagner (2008), the entrepreneurial universities facilitate entrepreneurial activity through various instruments such as infrastructure, consulting services and further support schemes: incubators, science parks and technology transfer offices have been established in order to facilitate technology diffusion to business related activities; and entrepreneurship education which calls for the responsibility of the universities to address the need for entrepreneurial competence recently has emerged as part of the academic curricula of such organizations (Guenther & Wagner, 2008).

In Philpott et al. (2011), a spectrum of entrepreneurial activities of universities are defined, from “soft” activities (closer to the traditional paradigm) to “hard” activities (closer to the entrepreneurial paradigm), including: producing highly qualified graduates, publishing academic results, grantsmanship, consulting, industry training courses, contract research, patenting and licensing, spin-off firm formation and creation of technology parks. This seems to be one of the most complete studies, and considers almost all activities cited by other authors.

By analyzing the indicated activities and the characteristics of entrepreneurial universities discussed in the previous section, it is possible to say that innovation and entrepreneurship activities:

- (a) Are related to regional socioeconomic development (Etzkowitz, 2003a, 2003b, 2004) and the universities’ sustainability (Etzkowitz, 1998; Etzkowitz et al., 2000; Philpott et al., 2011).
- (b) Are related to individuals within universities, to the university itself, and to the relation of the university with its surroundings (Guerrero & Urbano, 2012; Ropke, 1998; Urbano & Guerrero, 2013).
- (c) Are related to the process and results of knowledge creation, knowledge dissemination and knowledge application (Etzkowitz, 2003a, 2003b, 2004, 2013).
- (d) Are related to profit-gain of the university or its partners, and to social development of the communities surrounding the university (Abreu & Grinevich, 2013; Yokoyama, 2006).
- (e) Are related to the fulfilling the universities missions and to their relations within the knowledge based society (Goldstein, 2010; Mainardes et al., 2011).

1.5 Conclusions

The aim of this article was to explore scientific literature in what concerns activities related to innovation and entrepreneurship within universities. It tried to answer two main questions: the first is related to the how universities that endure into innovation and entrepreneurship are characterized, and the second is related to which activities within universities are related to innovation and entrepreneurship. To answer these questions, a systematic literature review was conducted considering articles published about innovation and entrepreneurship in the academic setting on Web of Science.

Concerning the characteristics of universities that endure into innovation and entrepreneurship, it was realized that the concept of the entrepreneurial university is seen as the most well articulated in the evolution of the university towards the requirements of the knowledge-based society (Goldstein, 2010). As such, relevant literature essentially tends to explore the characteristics of such universities. Among the identified characteristics, prevail those related to changes occurring within universities and on their relations within the context of the knowledge-based society. Both the internal changes and relations are related to the need of universities to contribute to regional socioeconomic development through the creation, dissemination and application of knowledge, and to the need to support its own sustainability.

Concerning the activities related to innovation and entrepreneurial in the academic setting, many authors have indicated several ones. After systematizing them in order to identify the common ones, more than 20 different activities were identified, related to regional socioeconomic development and the universities' sustainability; to individuals within universities, to the university itself, and to the relation of the university with its surroundings; to the process and results of knowledge creation, knowledge dissemination and knowledge application; to profit-gain of the university or its partners, and to social development of the communities surrounding the university; and to fulfilling the universities missions and to their relations within the knowledge based society. This means that innovation and entrepreneurship activities within universities are related to both organization growth and regional socioeconomic development, which is in consonance with the characteristics of entrepreneurial universities.

Even though the research originated the article had a sound methodological procedure, it presents three main limitations. The first is related to the fact that articles were originated from only on database, and therefore, there could be other relevant articles in other databases. The second is related to the fact that content analysis is based only on a set of 36 articles out of 372 the portfolio, manually selected as best fitting the objective of the study. Finally, but not less important, terms such as corporate university, market university, and enterprise university were not deeply discussed due the fact they were not considered in the original search that originated the overall portfolio.

In being so, and considering that activities originated only from literature, empirical studies should be conducted in order to verify if all these activities in fact contribute to innovation and entrepreneurship in the academic setting, and if there are other activities eventually not listed. To do so, it is suggested that further studies should consider a systemic view of innovation and entrepreneurship in the academic setting, considering all activities related knowledge creation, dissemination, and application. Furthermore, they should consider both the internal structure of the universities and their relations within the knowledge-based society.

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References

- Audy, J. L. N. (2006). Between tradition and renewal: Challenges of the entrepreneurial university. In J. L. N. Audy & M. C. Morosini (orgs) *Innovation and entrepreneurialism in the university* (pp. 58–78). Porto Alegre: EDIPUCRS.
- Abreu, M., & Grinevich, V. (2013). The nature of academic entrepreneurship in the UK: Widening the focus on entrepreneurial activities. *Research Policy*, 42(2), 408–422.
- Audretsch, D. B. (2014). From the entrepreneurial university to the university for the entrepreneurial society. *Journal of Technology Transfer*, 39(3), 313–321.
- Brennan, M., McGovern, P., & McGowan, P. (2007). Academic entrepreneurship on the island of Ireland: Re-orientating academia within the knowledge economy. *Irish Journal of Management*, 28(2), 51–77.
- Chang, Y. C., Chen, M. H., Hua, M., & Yang, P. Y. (2006). Managing academic innovation in Taiwan: Towards a “scientific-economic” framework. *Technological Forecasting and Social Change*, 73(2), 199–213.
- Chen, S. H., Huang, M. H., & Chen, D. Z. (2013). Driving factors of external funding and funding effects on academic innovation performance in university-industry-government linkages. *Scientometrics*, 94(3), 1077–1098.
- Clark, B. R. (1996). Substantive growth and innovative organization: New categories for higher education research. *Higher Education*, 32(4), 417–430.
- Clark, B. R. (1998). *Creating entrepreneurial universities: Organizational pathways of transformation*. Oxford: Pergamon-Elsevier Science.
- Conklin, G. H. (1978). Frustration of academic innovation: Can new teaching techniques survive in academic marketplace. *Teaching Sociology*, 5(2), 125–140.
- Crossan, M. M., & Apaydin, M. (2010). A multi-dimensional framework of organizational innovation: A systematic review of the literature. *Journal of Management Studies*, 47(6), 1154–1191.
- Doutriaux, J. (1987). Growth pattern of academic entrepreneurial firms. *Journal of Business Venturing*, 2(4), 285–297.
- Etzkowitz, H. (1984). Entrepreneurial scientists and entrepreneurial universities in American academic science. *Minerva*, 21(2–3), 198–233.
- Etzkowitz, H. (1998). The norms of entrepreneurial science: Cognitive effects of the new university-industry linkages. *Research Policy*, 27(8), 823–833.

- Etzkowitz, H. (2001). The second academic revolution and the rise of entrepreneurial science. *IEEE Technology and Society Magazine*, 20(2), 18–29.
- Etzkowitz, H. (2003a). Innovation in innovation: The triple helix of university-industry-government relations. *Social Science Information*, 42(3), 293–337.
- Etzkowitz, H. (2003b). Research groups as “quasi-firms”: The invention of the entrepreneurial university. *Research Policy*, 32(1), 109–121.
- Etzkowitz, H. (2004). The evolution of the entrepreneurial university. *International Journal Technology and Globalization*, 1(1), 64–77.
- Etzkowitz, H. (2013). Anatomy of the entrepreneurial university. *Social Science Information*, 52(3), 486–511.
- Etzkowitz, H., Webster, A., Gebhardt, C., & Terra, B. R. C. (2000). The future of the university and the university of the future: Evolution of ivory tower to entrepreneurial paradigm. *Research Policy*, 29(2), 313–330.
- Etzkowitz, H., & Zhou, C. (2008). Introduction to special issue building the entrepreneurial university: a global perspective. *Science and Public Policy*, 35(9), 627–635.
- Goldstein, H. A. (2010). The “entrepreneurial turn” and regional economic development mission of universities. *Annals of Regional Science*, 44(1), 83–109.
- Guenther, J., & Wagner, K. (2008). Getting out of the ivory tower: New perspectives on the entrepreneurial university. *European Journal of International Management*, 2(4), 400–417.
- Guerrero, M., Cunningham, J., & Urbano, D. (2015). Economic impact of entrepreneurial universities’ activities: An exploratory study of the United Kingdom. *Research Policy*, 44(3), 748–764.
- Guerrero, M., & Urbano, D. (2012). The development of an entrepreneurial university. *The Journal of Technology Transfer*, 37(1), 43–74.
- Guerrero, M., Urbano, D., Cunningham, J., & Organ, D. (2014). Entrepreneurial universities in two European regions: A case study comparison. *The Journal of Technology Transfer*, 39, 415–434.
- Jacob, M., Lundqvist, M., & Hellsmark, H. (2003). Entrepreneurial transformations in the Swedish university system: The case of Chalmers University of Technology. *Research Policy*, 32(9), 1555–1568.
- Kirby, D. A., Guerrero, M., & Urbano, D. (2011). Making universities more entrepreneurial: Development of a model. *Canadian Journal of Administrative Sciences*, 28(3), 302–316.
- Klofsten, M., & Jones-Evans, D. (2000). Comparing academic entrepreneurship in Europe: The case of Sweden and Ireland. *Small Business Economics*, 14(4), 299–309.
- Lindquist, J. (1974). Political linkage: Academic innovation process. *Journal of Higher Education*, 45(5), 323–343.
- Louis, K. S., Blumenthal, D., Gluck, M. E., & Stoto, M. A. (1989). Entrepreneurs in academe: An exploration of behaviors among life scientists. *Administrative Science Quarterly*, 34(1), 110–131.
- Mainardes, E. W., Alves, H., & Raposo, M. (2011). The process of change in university management: From the “ivory tower” to entrepreneurialism. *Transylvanian Review of Administrative Sciences*, 33, 124–149.
- Mars, M. M., & Rios-Aguilar, C. (2010). Academic entrepreneurship (re)defined: Significance and implications for the scholarship of higher education. *Higher Education*, 59(4), 441–460.
- Mazdeh, M. M., Razavi, S. M., Hesamamiri, R., Zahedi, M. R., & Elahi, B. (2013). An empirical investigation of entrepreneurship intensity in Iranian state universities. *Higher Education*, 65(2), 207–226.
- Mortensen, P. S., & Bloch, C. W. (2005). Oslo Manual-Guidelines for collecting and interpreting innovation data. Organization for Economic Cooperation and Development, OECD.
- Murray, R., Caulier-Grice, J., & Mulgan, G. (2010). *The open book of social innovation*. London: The Young Foundation.
- Neal, J. E. (1998). Quality Assurance in the Entrepreneurial University. *New Directions for Institutional Research*, 99, 69–85.

- Nelles, J., & Vorley, T. (2011). Entrepreneurial architecture: A blueprint for entrepreneurial universities. *Canadian Journal of Administrative Sciences*, 28(3), 341–353.
- Neves, C. E. B., & Neves, F. M. (2011). Research and innovation: New challenges for higher education in Brazil and in Germany. *Caderno CRH*, 24(63), 481–501.
- O’Shea, R. P., Chugh, H., & Allen, T. J. (2008). Determinants and consequences of university spinoff activity: A conceptual framework. *The Journal of Technology Transfer*, 33(6), 653–666.
- Philpott, K., Dooley, L., O’Reilly, C., & Lupton, G. (2011). The entrepreneurial university: Examining the underlying academic tensions. *Technovation*, 31(4), 161–170.
- Ropke, J. (1998). The entrepreneurial university, innovation, academic knowledge creation and regional development in a globalized economy. Working Paper, Department of Economics, Philipps-Universität Marburg, Germany.
- Ross, R. D. (1976). Institutionalization of academic innovations: 2 models. *Sociology of Education*, 49(2), 146–155.
- Rothaermel, F. T., Agung, S. D., & Jiang, L. (2007). University entrepreneurship: A taxonomy of the literature. *Industrial and Corporate Change*, 16(4), 691–791.
- Sam, C., & van der Sijde, P. (2014). Understanding the concept of the entrepreneurial university from the perspective of higher education models. *Higher Education*, 68(6), 891–908.
- Schachter, H. L. (1986). State coordinating agencies and academic innovation: A policy sector perspective. *Higher Education*, 15(3–4), 333–342.
- Schumpeter, J. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.
- Shah, S. K., & Pahnke, E. C. (2014). Parting the ivory curtain: understanding how universities support a diverse set of startups. *The Journal of Technology Transfer*, 39(5), 780–792.
- Strier, R. (2011). The construction of university-community partnerships: Entangled perspectives. *Higher Education*, 62(1), 81–97.
- Subotzky, G. (1999). Alternatives to the entrepreneurial university: New modes of knowledge production in community service programs. *Higher Education*, 38(4), 401–440.
- Tijssen, R. J. W. (2006). Universities and industrially relevant science: Towards measurement models and indicators of entrepreneurial orientation. *Research Policy*, 35(10), 1569–1585.
- Todorovic, Z. W., McNaughton, R. B., & Guild, P. (2011). ENTRE-U: An entrepreneurial orientation scale for universities. *Technovation*, 31(2–3), 128–137.
- Urbano, D., & Guerrero, M. (2013). Entrepreneurial universities: Socioeconomic impacts of academic entrepreneurship in a European region. *Economic Development Quarterly*, 27(1), 40–55.
- van Vught, F. (1999). Innovative universities. *Tertiary Education and Management*, 5(4), 347–354.
- Wood, M. S. (2011). A process model of academic entrepreneurship. *Business Horizons*, 54(2), 153–161.
- Wright, M. (2014). Academic entrepreneurship, technology transfer and society: Where next? *The Journal of Technology Transfer*, 39(3), 322–334.
- Yokoyama, K. (2006). Entrepreneurialism in Japanese and UK universities: Governance, management, leadership, and funding. *Higher Education*, 52(3), 523–555.

Chapter 2

The Influence of Entrepreneurship Education on Entrepreneurial Intentions

João J. Ferreira, Cristina I. Fernandes, and Vanessa Ratten

Abstract The purpose of this chapter is to analyze, from a theory of planned behavior perspective, the role of entrepreneurship education and entrepreneurial intention. A conceptual model is developed based on the literature discussing the importance of entrepreneurship education in global economic and social development. A number of hypothesis are developed based on demographic factors, risk taking propensity, proactiveness and self-efficacy to understand their relationship with entrepreneurial intention. The hypothesis are tested in a survey of Brazilian university students with the results suggesting that age, occupation of father and risk taking propensity do influence the intention of an individual to engage in entrepreneurial behavior. These results are then discussed in terms of practical and theoretical implications for entrepreneurship education. Future research suggestions are also stated highlighting the importance of fostering an entrepreneurial spirit in university students.

Keywords Ability • Aggressiveness • Business ventures • Decision making • Education • Employment occupation • Entrepreneurial behaviour • Entrepreneurship • Gender • Innovativeness • Learning • Motivational strategies • New business • Planned behaviour • Proactiveness • Researchers • Risk-taking propensity • Self-efficacy • Self-employment • Success

2.1 Introduction

There has been a growing interest in understanding how entrepreneurship education can enhance entrepreneurial initiatives by encouraging more creative thinking (Fayolle & Gailly, 2015). This is due entrepreneurship education encouraging a more enterprising society and this has been reinforced by public policy planners and

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government bodies around the world (Jones & Iredale, 2014). Most research about entrepreneurship education indicates that there seems to be a positive relationship between entrepreneurial education and actual entrepreneurship rates (e.g., Fayolle & Linan, 2014; Lima, Lopes, Nassif, & da Silva, 2015; Varela & Jimenez, 2001). This is due to the ability of having an entrepreneurial mindset being promoted through education as students who studied entrepreneurship have been found to have higher intentions to start business ventures (Noel, 2002).

The success of entrepreneurship education depends on the teaching and contents of the course (Volkman, 2004). In entrepreneurship courses, it is important to include information about how behavioural traits such as proactiveness and risk taking impact on decision making abilities (Heuer & Kolvereid, 2014). In this paper, we define entrepreneurial intentions as an individual's desire to start or own their own business (Bae, Qian, Miao, & Fiet, 2014). Many individuals want to have a business so they form a set of intentions that can help self predict their future behaviour (Crant, 1996). Entrepreneurial behaviour is often formed based on the intentions individuals have about their ability to start a business (Sheeran, 2002). This is due to intention being considered one of the best predictors of actual behaviour (Bagozzi, Baumgartner, & Yi, 1989).

There are a variety of learning activities in entrepreneurship courses designed to encourage formation of business ventures such as business plans and action programs (Schaper & Casimir, 2007). This enables students in entrepreneurship courses to learn through creating business plans that incorporate case studies. In this research we draw on Byabashaija and Katono's (2011) study who found that individual attitudes towards venture creation can change over a 4 month entrepreneurship course. Another study by Athayde (2009) found similar results over a 1 year academic period, which indicated that there is a positive affect towards venture creation from entrepreneurship courses. Other research by Kolvereid and Amo (2007) has also found that the way to measure whether entrepreneurship education has been successful is to evaluate start up rates.

Despite the increasing use of entrepreneurship education sometimes it is hard to assess actual behaviour because of the delay so intentions are often used as a proxy (Heuer & Kolvereid, 2014). This has meant that researchers such as McMullan and Gillin (1998) have used the likelihood of venture creation as a proxy to study entrepreneurial intentions and this allows it to be measured in order to understand future entrepreneurial behaviour. In the current line of research, the objective of the present study is to develop an integrative psychological model about the formation of entrepreneurial intentions, including in it the variables self-efficacy, risk-taking propensity and proactiveness as the main preceding factors to entrepreneurial initiative because of their influence on intentions for self-employment.

This paper contributes to the growth of literature discussing entrepreneurship education by analysing the key determinants affecting enterprise development. This aids the body of knowledge about entrepreneurship education in better understanding the ability to teach entrepreneurial practices that lead to better social and economic outcomes. In addition, there is a need to evaluate entrepreneurship by focusing on behavioural intentions of individuals that can be integrated into entrepreneurship curriculum. This paper seeks to address

the gap in the literature by focusing on entrepreneurial intentions and behavioural characteristics by proposing research hypotheses that test these relationships. The paper can then be used to better inform educational practices about entrepreneurship and encourage more research about the role of environmental factors in influencing entrepreneurial behaviour.

This paper is structured as follows. First, the literature on entrepreneurship education is reviewed with the theory of planned behaviour being stated as the theoretical framework. The research hypothesis based on the theory of planned behaviour are then explained and their relationship to entrepreneurial intentions. This is followed by a description of the data analysis and results. Finally, the implications of the study are discussed in the conclusion section by focusing on theoretical and practical implications. Limitations of the study leading to future research suggestions are then stated.

2.2 Theoretical Background

2.2.1 *Theory of Planned Behavior*

The theory of planned behaviour is the theoretical framework of this paper as it is useful to understand entrepreneurial intentions (Heuer & Kolvereid, 2014). It was originally developed by Ajzen (1991) to understand intentions that can help measure actual individual behaviour. In the context of entrepreneurship education, it helps to analyse the processes leading to entrepreneurial behaviour. The theory of planned behaviour comes from psychology studies as it focuses on attitudes, subjective norms and perceived behavioural control (Ajzen, 1991).

The premise of the theory of planned behaviour is to use intention as a proxy for behaviour. Ajzen (2005) proposed that when the likelihood of success is high then individuals will focus more on their intentions. This means that venture creation will result when intentions can be used to measure actual behaviour (Kolvereid & Isaksen, 2006). Based on the theory of planned behaviour, there are factors influencing entrepreneurial intention including demographics, self-efficacy, risk taking and proactiveness. These factors impact entrepreneurial intention, which in turn affects the start up rate of business ventures.

The theory of planned behaviour implies that cognitive structures including intention need to be changed for learning to occur (Heuer & Kolvereid, 2014). Cognitive structures can include an individual's underlying behaviour that can be influenced through information content (Krueger, 2009). As the acquisition of knowledge can change behaviour, entrepreneurial intentions are impacted by learning outcomes. As individuals learn different behaviour and change their attitudes this will affect their intentions to be entrepreneurial. The theory of planned behaviour focuses on attitudes, norms and behaviour, which are key interactions that an individual has that determines their intentions (Beadnell et al., 2007). The next section will further discuss the proposed model and how it relates to entrepreneurial intention.

2.2.2 *Entrepreneurial Intention from a Theory of Planned Behaviour Perspective: Proposed Model*

More educational courses now emphasise an entrepreneurial approach to learning, which is different to the traditional approach to teaching in a classroom setting (Jones & Iredale, 2014). This increased emphasis on the benefits of entrepreneurship has been in conjunction with more researchers wanting to know more about how an entrepreneurial mindset can be developed (McLarty, Highley, & Anderson, 2010; Ratten, 2014). A way to evaluate entrepreneurship education is to focus on entrepreneurial intention and the factors that influence this behaviour. Figure 2.1 depicts the proposed model, which relates demographic variables, self-efficacy, proactiveness and risk taking to entrepreneurial intention.

One of the most important factors influencing entrepreneurial intention of individuals is demographic as they help to understand how a person might behave in the future. This is due to demographics such as age, gender, graduation rate and employment occupation affecting the ability of individuals to be entrepreneurial. The employment occupation of a person's parents helps to decide whether they will engage in entrepreneurial behaviour. Heuer and Kolvereid (2014) highlight how the children of self-employed parents are more likely to have higher entrepreneurial intentions. Duchesneau and Gartner (1990) also supports this view that having one or both parent self-employed leads their children having more business ventures. The reason for this may be that individuals learn by experience and the development of entrepreneurial behaviour can be influenced by family background.

Another demographic variable influencing entrepreneurial intention is gender. The stereotype of entrepreneurs is that males are more entrepreneurial due to their behavioural traits being more orientated towards risk taking activity (Bae et al., 2014). Previous research by Weber (2011) suggests that there is a gender difference

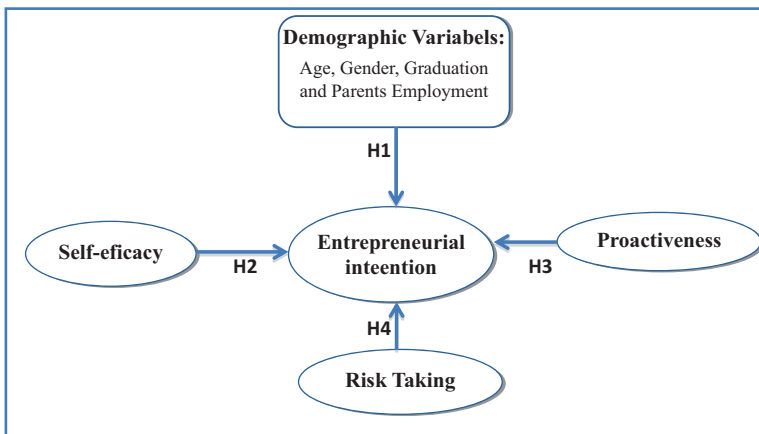


Fig. 2.1 Conceptual research model

in career aspirations because of skills. This has led to a stream of research suggesting that men have higher entrepreneurial intentions than women (e.g., BarNir, Watson, & Hutchins, 2011; Haus, Steinmetz, Isidor, & Kabst, 2013). As a result gender seems to have an influence on entrepreneurial intention as it can teach females to be more entrepreneurial (Williams & Subich, 2006). This may mean that entrepreneurship education might be needed more for females in order to increase their entrepreneurial intentions (Bae et al., 2014).

Age is another demographic factor influencing entrepreneurial intention. This is because the entrepreneurial process of learning can help promote more independence in the classroom as people learn in different ways. Governments around the world are interested in how they can influence entrepreneurial activity (Raposo, Ferreira, do Paço, & Rodrigues, 2008). This means that by focusing on age of entrepreneurs it can help create jobs and foster economic development (Heuer & Kolvereid, 2014).

Educational levels such as graduation from high school can also affect entrepreneurial intentions. This is due to the importance of learning by association that incorporates experimentation in an entrepreneurship context (Minniti & Bygrave, 2001). Graduating from high school can help build an individual's confidence and improve their entrepreneurial intention. Thus, we suggest the following hypothesis:

Hypothesis 1: Demographic variables positively influence entrepreneurial intention

Self-efficacy is defined as an individual's belief in their ability to perform certain tasks and abilities (Bae et al., 2014). In an entrepreneurship context, self-efficacy relates to roles associated with risk taking, innovativeness, proactiveness and competitive aggressiveness (McGee, Peterson, Mueller, & Sequeira, 2009). This means that entrepreneurial capabilities are determined by self-efficacy (Chen, Greene, & Crick, 1998). Entrepreneurial self-efficacy helps to mediate the relationship between education and intentions to start a new business (Chen, 2010). This is due to education about behaviors needed to be entrepreneurial being taught including coping and motivational strategies (Segal, Schoenfeld, & Borgia, 2007). Entrepreneurship education also enables business planning to be taught that builds skills needed to obtain finance and funding (Wang, Wong, & Lu, 2002). Krueger, Reilly, and Carsrud (2000) found that entrepreneurship education encourages better interaction with successful business owners and fosters the development of self-efficacy. Stumpf, Brief, and Hartman (1987) also found that greater expectations of success are associated with educational training. Therefore, based on the literature, we suggest the following hypothesis:

Hypothesis 2: Self-efficacy positively influences entrepreneurial intention

Proactiveness is the ability of an individual to focus on future behaviour. This behaviour is helpful to individuals wanting to increase their entrepreneurial capabilities by focusing on firm creation (Liñán, 2008). Individuals with attitudes that are forward thinking and progressive are likely to be ahead of their competitors. This behavioural trait is important for emphasising knowledge acquisition and dissemination about

entrepreneurial business endeavours (Bae et al., 2014). Charney and Libecap (2000) found that individuals who have studied entrepreneurship are more likely to start a new business venture. This may lead to a self-selection bias in that more proactive individuals are studying entrepreneurship as they are comfortable with this behaviour (Noel, 2002). Focusing on being proactive helps to understand the relationship between behaviour and intention (von Graevenitz, Harhoff, & Weber, 2010). The belief an individual has prior to deciding to be entrepreneurial is an important indicator of behaviour (Oosterbeek, Van Praag, & Ijsselstein, 2010). These beliefs can correlate being proactive with actual intentions and lead to the following hypothesis:

Hypothesis 3: Proactiveness positively influences entrepreneurial intention

The risk taking propensity of an individual is important in deciding their entrepreneurial intentions. Part of this involves uncertainty avoidance, which is the lack of tolerance for unknown outcomes (Bae et al., 2014). Uncertainty can impact on the way individuals perceive risk as they tend to follow social norms and practices (House, Hanges, Javidan, Dorfman, & Gupta, 2004). Risk taking involves behaviour that is uncertain and may lead to better performance outcomes. The willingness to take tasks incorporates ambiguity as a result of unknown results.

Entrepreneurship education can promote a person's propensity for risk taking activity (Bae et al., 2014) This is due to the knowledge learnt through entrepreneurship education enhancing an individual's knowledge of self employment or creativity as a career path (Slavtchev, Laspita, & Patzelt, 2012). This means that risk taking propensity of an individual is more related to entrepreneurial intentions because of the incorporation of business planning skills. Based on this literature, we therefore propose the following hypothesis:

Hypothesis 4: Risk taking positively influences entrepreneurial intention

2.3 Methodology

This chapter is based on a cross-sectional survey that allows the research hypothesis developed from the literature review to be tested. The survey contained a number of survey items that were developed from previous research to measure self-efficacy, risk taking propensity, proactiveness and demographic factors influencing entrepreneurial intention. The methodology enables a series of hypothesis to be tested to understand the intention of an individual to start a business venture. This permits a confirmatory approach in which each hypothesis is either supported or not supported by the data analysis.

2.3.1 Sample Characterization

In Table 2.1 we present the technical record of research: the population, the collection of information and statistical methods.

Table 2.1 Imprint research

Population	Students in higher education
Sample size	125 surveys
Respondents	Students in higher education
Questionnaire model	The questionnaire consists of closed questions, using a Likert scale
Information collection method	Personally administered surveys
Statistical models used	Frequency analysis; Descriptive measures, Graphical methods; Cronbach's alpha; Multiple linear regression
Data analysis	IBM SPSS 22.0, Microsoft Excel 2010

Table 2.2 Variables used in research and statistical techniques used

	Dimension	Variables	Frequency
Variáveis independentes	Demographic characteristics	Age	Descriptive measures (mean, standard deviation, minimum and maximum)
		Gender	Bar chart
		Graduation	Bar chart
		Employment father	Bar chart
		Employment mother	Bar chart
	Psychological factors	Self-efficacy	Descriptive measures, Pearson correlation coefficient and Cronbach's Alpha
		Proativeness	
Risk taking			
Dependent variables	Laboral intention	Entrepreneurial intention	Multiple linear regression

In this subsection we present the results of our sample of the 125 students from a Brazilian university, with an average age of students was 27.8 ± 7.3 years, ranging between this 15 to 44 years. In the following Tables 2.1, 2.2, and 2.3 the characteristics of the 125 respondents are presented, it appears that 57.6% were female, 77.6% had attended high school in public school, 40.0% of parents of respondents worked in organizations/private companies and 37.6% of the mothers had an autonomous profession.

Table 2.2 shows the independent and dependent variables and the respective statistical techniques that were used to analyse the conceptual model. The dimension, variable and frequency of the statistics are stated that were included in the survey questionnaire given to students in the sample. Table 2.3 states each of the hypotheses used to test the conceptual model and the statistical techniques used in the data analysis.

Table 2.3 Hypotheses and statistical techniques

Hypotheses	Technique
H1. Demographic variables positively influence entrepreneurial intention	Multiple linear regression
H2. Self-efficacy positively influence entrepreneurial intention	
H3. Proactiveness positively influence entrepreneurial intention	
H4. Risk taking positively influence entrepreneurial intention	

2.3.2 Presentation and Analysis of Results

Statistical Tool Validation

This section will discuss the empirical validation of the factors used for the validation of hypotheses. Table 2.4 below shows the descriptive statistics of the factors and the correlation between them and the Cronbach's alpha. The reliability of the variables included in the conceptual model varies from acceptable ($\alpha=0.664$) and good ($\alpha=0.843$).

Hypotheses Analysis

This data analysis section presents the results for the assessment of the hypotheses under study. Three models were used in the data analysis to understand the relationships between the variables and entrepreneurial intentions. The first model evaluates the effect of sociodemographic variables and entrepreneurial intention. The second model estimates the effect of the various factors that influence entrepreneurial intention. The last model simultaneously evaluates all variables from the conceptual model.

Table 2.5 shows the three linear regression models that predict entrepreneurial intention. In terms of sociodemographic variables included in model I, that respondents whose father works in organizations/private company ($B=-0.33$; $p<0.01$) have significantly less entrepreneurial intention than respondents whose father is an autonomous worker. Model III indicates that the greater the age of respondents the less entrepreneurial intention they will have ($B=-0.02$, $p<0.05$). For the different personal dimensions in the analysis, it is observed in Models II and III that higher risk taking propensity is associated with entrepreneurial intention (Model III: $B=0.46$; $p<0.05$). There was no statistically significant result from the data analysis for self-efficacy and proactiveness.

Table 2.6 shows the results for all the tested hypotheses as developed from the conceptual model. The data analysis found support for hypothesis 1 in that the younger the respondents in the survey were the higher their entrepreneurial intention indicating support for demographic variables being important. In addition, the data analysis showed support for respondents whose father works in a private company having less entrepreneurial orientation than those whose father is self employed. Hypothesis 2 was not supported by the data analysis, which indicates that self-efficacy does not affect entrepreneurial intentions.

Table 2.4 Descriptive statistics and correlations between factors (diagonally is presented with the Cronbach’s alpha)

	Dimensions	Items	Mean	Standard Deviation	1	2	3	4
1	Entrepreneurial intention	9	5.58	0.72	0.792			
2	Self-efficacy	9	5.70	0.36	0.431**	0.706		
3	Proactiveness	10	5.42	0.44	0.452**	0.413**	0.664	
4	Risk taking	6	3.19	0.90	0.372**	0.287**	0.443**	0.843

Table 2.5 Multiple linear regression; Dependent variable: entrepreneurial intention

	Model I		Model II		Model III	
	B (EP)	p	B (EP)	p	B (EP)	p
Gender–Female	–0.04 (0,12)	0.725			0.11 (0.08)	0.155
Age	–0.02 (0,01)	0.195			–0.02 (0.01)	0.049*
High School in Public School	–0.04 (0.15)	0.783			0.09 (0.11)	0.405
Father does not work	–0.14 (0.17)	0.407			–0.02 (0.12)	0.882
Father works in Organization/ Public Company	0.54 (0.45)	0.235			0.33 (0.20)	0.105
Father works in Organisation/ Company Private	–0.33 (0.13)	0.008**			–0.03 (0.08)	0.697
Mother does not work	0.04 (0.18)	0.845			0.02 (0.09)	0.866
Mother works in Organization/ Public Company	0.37 (0.48)	0.437			0.09 (0.32)	0.789
Mother works in Organisation/ Company Private	0.13 (0.18)	0.455			0.06 (0.11)	0.595
Self-efficacy			0.28 (0.16)	0.084	0.20 (0.16)	0.201
Proactiveness			0.17 (0.16)	0.294	0.16 (0.15)	0.302
Risk taking			0.15 (0.09)	0.084	0.19 (0.09)	0.041*
R ² adjusted	3.5%		51.8%		50.5%	
F	3.071**		9.318**		6.746**	

*p<0,05; **p<0,01; B—Coefficient of nonstandard regression; EP—B Standard Errors; F—F Statistic Coefficient of nonstandard regression

In addition, hypothesis 3 was not supported thereby meaning that proactiveness might not matter when intending to become an entrepreneur. Hypothesis 4 was supported by the data analysis indicating that risk taking propensity does influence entrepreneurial intention.

Table 2.6 Summary of results of the hypotheses

Hypotheses	Validation	Results
H1: Demographic variables have a positive influence on entrepreneurial intention	Validated	Younger respondents have a higher entrepreneurial intention
H2: Self-efficacy influences entrepreneurial intention	Not validated	–
H3: Proactiveness influences entrepreneurial intention	Not validated	–
H4: Risk taking influence entrepreneurial intention	Validated	More risk taking propensity is related to a higher level of entrepreneurial intention

2.4 Findings and Discussion

Entrepreneurial intentions are one of the most important factors affecting individual action (Bae et al., 2014). The results of the data analysis shows support for demographic variables and risk taking propensity affecting entrepreneurial intentions but no support for self-efficacy or proactiveness. This means that teaching these behavioural traits can be included in entrepreneurship courses by using experimental learning tools (Solomon, 2007). The support for age and occupation of father impacting entrepreneurial intentions means that entrepreneurship education can act as an equalizer to encourage entrepreneurial intentions based on gender (Wilson, Kickul, & Marlino, 2007). Previous research has found that gender of parents influences the extent an individual might participate in the workforce (Emrich, Denmark, & Den Hartog, 2004). This means that gender roles play a part in a society, which are further differentiated depending on the parents occupation.

The increase in entrepreneurship education programs have been driven by the recognition of it in shaping a regions development. The result for risk taking propensity influencing entrepreneurial intentions means that individuals with a developable set of skills are often attracted to entrepreneurship education (Johannisson, 1991). This is due to entrepreneurs being associated with personality traits such as self-efficacy, proactiveness and risk taking orientation (Heuer & Kolvereid, 2014).

Entrepreneurship education helps individuals improve their self-efficacy, which in turn affects their entrepreneurial intentions (Bae et al., 2014). This is important as education helps encourage individuals to increase their vicarious experience and emotional behaviour (Bandura, 1982). In addition, education in an entrepreneurial context refers to mastery of business practices and verbal persuasion needed to sell and market business ventures (Wilson et al., 2007).

Previous research has supported the link between entrepreneurship education and entrepreneurial intentions (e.g., Douglas, 2013; Fitzsimmons & Douglas, 2011). This is because entrepreneurship education involves the pedagogy to study entrepreneurial skills (Kuratko, 2005). Most importantly, the process of teaching entrepreneurial attitudes is important to individuals wanting to start or

manage a business venture (Fayolle, Gailly, & Lassas-Clerc, 2006). Depending on the audience, entrepreneurship education can make individuals aware about the issues facing business owners (Liñán, 2004). Entrepreneurship education makes people aware about the tools they will need in a business setting (McMullan & Long, 1987). These tools increase visibility about business ventures and help prepare aspiring entrepreneurs (Katz, 2003). The next section will further discuss the conclusions from the study including practical and theoretical implications for entrepreneurship education.

2.5 Conclusions

This paper has discussed the role of entrepreneurship education in facilitating entrepreneurial intentions. The role of self-efficacy, risk taking, proactiveness and demographic variables was examined in terms of how these factors affect entrepreneurial intentions. The evidence gathered from the survey and results highlight the importance of entrepreneurship education. The next section will further discuss theoretical implications followed by practical implications.

2.5.1 *Theoretical Implications*

There are still theoretical differences about the most important factors driving entrepreneurial intentions (Bae et al., 2014). This is partly due to the abundant literature discussing education from an entrepreneurship perspective. The advantage of this paper for understanding theoretical roles affecting entrepreneurial education is that there are positive relationships between demographic variables and risks taking with entrepreneurial intentions. This paper utilised the theory of planned behaviour to understand the drivers of entrepreneurial intention. This leads to the assertion that theories describing ways to educate individuals about entrepreneurship are crucial in linking the relationship between entrepreneurship theory and practice (Martin, McNally, & Kay, 2013).

As pointed out by previous research it is helpful to challenge current studies about the strength of the relationship between entrepreneurship education and entrepreneurial intentions (e.g., Bae et al., 2014; Honig, 2004). The study reported in this paper extends current theoretical underpinnings about entrepreneurship education by stressing how it is a good pedagogical resource. This is supported by the results of this study finding that some demographic factors can influence entrepreneurial intentions.

The main findings of the study are that individuals whose father works in a private company have less entrepreneurial intention. In addition, the results of this study indicated that age does impact entrepreneurial intention, which can influence educational programs. As there is debate in the literature about whether age does

influence entrepreneurial intention this study adds to the theoretical understanding about entrepreneurship education. The results also show that there can be a relationship between risk taking propensity and entrepreneurial intention. This leads to entrepreneurship education being an important component of building an ecosystem supporting future business venture activity.

The findings of the study discussed in this paper demonstrate that individual behavioural characteristics such as risk taking proclivity affect entrepreneurial intention. This correlation between risk taking and entrepreneurial intention is likely to help improve educational outcomes and training programs. Business schools can focus their entrepreneurship education classes around understanding how demographic variables are important but students can still learn to be entrepreneurial despite their age or risk taking ability.

2.5.2 Practical Implications

The results of this study have important practical implications both for business schools offering entrepreneurship programs but also for entrepreneurial organizations and small business owners. The positive effects of demographic variables and risk taking on entrepreneurial intentions found in this study mean that entrepreneurship educators and program developers should focus on these aspects more in designing and implementing courses.

Policy makers from a local, regional and country perspective can also utilise the results of this study to show how individual behaviour can affect entrepreneurial intention. As more governments focus on entrepreneurship as a way to increase global competitiveness, it is important to control for the influence of age, parent occupation and risk taking orientation. Regional differences within a country may also influence the effectiveness of entrepreneurship education programs. As there was support for demographic factors and risk taking influencing entrepreneurial intention, entrepreneurship educators can design pre-education and post-education surveys to evaluate the learning that takes place when individuals study entrepreneurship. Bae et al. (2014) found that the pre- and post-education entrepreneurial intentions do not differ with the additional of entrepreneurship education. However, other research has found that pre-education entrepreneurial intentions might account for some differences in post-education entrepreneurial intentions (e.g., Lima et al., 2015; Sánchez, 2011).

Globally entrepreneurship education should be improved to take into account demographic and individual personality traits in order to improve the success rates of new business ventures. This can be done by targeting learning goals in entrepreneurship courses around learning to change individual behaviour in order to be more creative and risk taking. The significant growth in entrepreneurship courses around the world means that there is more ways for students to learn about entrepreneurship. This can be evaluated in entrepreneurship courses by focusing on the linkage between environmental variables and entrepreneurial orientation. Internationally entrepreneurship educators can identify specific factors in an individual's internal and external environment for promoting better entrepreneurial skills.

2.5.3 *Limitations and Future Research Suggestions*

Despite the theoretical and practical relevance of this paper there are some limitations that give rise to future research suggestions. The primary limitation is that the survey respondents are students, which may limit generalizability of the findings to the general population. However, as the focus of the paper is on entrepreneurship education, studying student's entrepreneurial orientation is key to designing and implementing better programs for aspiring entrepreneurs. It would have been preferable to study pre and post entrepreneurial intentions of students to see how entrepreneurship education can enhance ability to start new business ventures. Future research could study in more detail how entrepreneurial intention of students changes over time and whether entrepreneurship education increases or decreases entrepreneurial intention. This would increase the research scope of this study but would require more time and financial resources to implement especially if conducted on a global scale.

This study focused on entrepreneurial intention, which as suggested by the literature is the key factor affecting actual number of businesses started by individuals. Despite the advantage of focusing on entrepreneurial intention there may be other factors affecting new business start up rates (Bae et al., 2014). This may lead to another interesting avenue for future research is whether there is a bias towards the type of individuals choosing entrepreneurship education (Elfenbein, Hamilton, & Zenger, 2010). As a result of this the results of this paper should also be compared to future studies that investigate the motivators for students studying entrepreneurship courses.

Entrepreneurship education can extend our knowledge about whether demographic variables as tested in this paper including family background affect entrepreneurial intention. We suggest that future research look more into how demographics such as employment occupation of mother and father change over time based on societal expectations. The present study found that students whose fathers worked in private companies had a lesser entrepreneurial intention. Future research could identify the types of parental occupations that affect entrepreneurial intention to see if there is a difference in industry or geographic location.

Lastly, future research could identify new types of factors that affect entrepreneurial intention that have not been previously addressed in the literature. This could include looking at individual attributes such as enthusiasm and perseverance are inherited based on parent's prior experience and moderate the way entrepreneurship education has evolved. As more scholars, entrepreneurs and policy makers become interested in the relationships between entrepreneurship education and entrepreneurial intention, there are many interesting research avenues that can be taken.

References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
- Ajzen, I. (2005). *Attitudes, personality and behaviour*. Maidenhead: Open University Press.

- Athayde, R. (2009). Measuring enterprise potential in young people. *Entrepreneurship Theory and Practice*, 33(2), 481–500.
- Bae, T. J., Qian, S., Miao, C., & Fiet, J. O. (2014). The relationship between entrepreneurship education and entrepreneurial intentions: A meta-analytic review. *Entrepreneurship Theory and Practice*, 38(2), 217–254.
- Bagozzi, R. P., Baumgartner, J., & Yi, Y. (1989). An investigation into the role of intentions as mediators of the attitude-behavior relationship. *Journal of Economic Psychology*, 10(1), 35–62.
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, 37(2), 122–147.
- BarNir, A., Watson, W. E., & Hutchins, H. M. (2011). Mediation and moderated mediation in the relationship among role models, self-efficacy, entrepreneurial career intention, and gender. *Journal of Applied Social Psychology*, 41(2), 270–297.
- Beadnell, B., Wilson, A., Wells, E., Morison, D., Rogers, M., & Hoppe, M. (2007). Intrapersonal and interpersonal factors influencing adolescents decisions about having sex: A test of sufficiency of the theory of planned behaviour. *Journal of Applied Social Psychology*, 37(12), 2840–2876.
- Byabashaija, W., & Katono, I. (2011). The impact of college entrepreneurial education on entrepreneurial attitudes and intention to start a business in Uganda. *Journal of Developmental Entrepreneurship*, 16(1), 127–144.
- Charney, A., & Libecap, G. (2000). *Impact of entrepreneurship education*. Kansas City, MO: Kauffman Center for Entrepreneurial Leadership.
- Chen, Y. (2010). *Does entrepreneurship education matter to students' entrepreneurial intention? A Chinese perspective*. Paper presented at second International Conference on Information Science and Engineering. China, December 4–6.
- Chen, C. C., Greene, P. G., & Crick, A. (1998). Does entrepreneurial self-efficacy distinguish entrepreneurs from managers? *Journal of Business Venturing*, 13(4), 295–316.
- Crant, J. M. (1996). The proactive personality scale as a predictor of entrepreneurial intentions. *Journal of Small Business Management*, 34(3), 42–49.
- Douglas, E. J. (2013). Reconstructing entrepreneurial intentions to identify predisposition for growth. *Journal of Business Venturing*, 28(5), 633–651.
- Duchesneau, D., & Gartner, W. (1990). A profile of new venture success and failure in an emerging industry. *Journal of Business Venturing*, 5(5), 297–312.
- Elfenbein, D. W., Hamilton, B. H., & Zenger, T. R. (2010). The small firm effect and the entrepreneurial spawning of scientists and engineers. *Management Science*, 56(4), 659–681.
- Emrich, C., Denmark, F., & Den Hartog, D. (2004). Cross-cultural differences in gender egalitarianism. In R. House, P. Hanges, P. Dorfman, M. Javidan, & V. Gupta (Eds.), *Culture, leadership, and organizations: The GLOBE study of 62 societies* (pp. 343–394). Thousand Oaks, CA: Sage.
- Fayolle, A., & Gailly, B. (2015). The impact of entrepreneurship education on entrepreneurial attitudes and intention: Hysteresis and persistence. *Journal of Small Business Management*, 53(1), 75–93.
- Fayolle, A., & Linan, F. (2014). The future of research on entrepreneurial intentions. *Journal of Business Research*, 67, 663–666.
- Fayolle, A., Gailly, B., & Lassas-Clerc, N. (2006). Assessing the impact of entrepreneurship education programmes: A new methodology. *Journal of European Industrial Training*, 30(9), 701–720.
- Fitzsimmons, J. R., & Douglas, E. J. (2011). Interaction between feasibility and desirability in the formation of entrepreneurial intentions. *Journal of Business Venturing*, 26(4), 431–440.
- Haus, I., Steinmetz, H., Isidor, R., & Kabst, R. (2013). Gender effects on entrepreneurial intention: A meta-analytical structural equation model. *International Journal of Gender and Entrepreneurship*, 5(2), 130–156.
- Heuer, A., & Kolvereid, L. (2014). Education in entrepreneurship and the theory of planned behavior. *European Journal of Training and Development*, 38(6), 506–523.

- Honig, B. (2004). Entrepreneurship education: Toward a model of contingency-based business planning. *Academy of Management Learning and Education*, 3(3), 258–273.
- House, R. J., Hanges, P. J., Javidan, M., Dorfman, P. W., & Gupta, V. (2004). *Leadership, culture, and organizations: The GLOBE study of 62 societies*. Beverly Hills, CA: Sage.
- Johannisson, B. (1991). University training for entrepreneurship: A Swedish approach. *Entrepreneurship and Regional Development*, 3(1), 67–82.
- Jones, B., & Iredale, B. (2014). Enterprise and entrepreneurship education: Towards a comparative analysis. *Journal of Enterprising Communities: People and Places in the Global Economy*, 8(10), 34–50.
- Katz, J. A. (2003). The chronology and intellectual trajectory of American entrepreneurship education: 1876–1999. *Journal of Business Venturing*, 18(2), 283–300.
- Kolvreid, L., & Amo, B. W. (2007). Entrepreneurship among graduates from business schools: A Norwegian case. In A. Fayolle (Ed.), *Handbook of research in entrepreneurship education* (Vol. 2). Cheltenham: Edward Elgar.
- Kolvreid, L., & Isaksen, E. (2006). New business start-up and subsequent entry into self-employment. *Journal of Business Venturing*, 21(6), 866–885.
- Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, 15(5), 411–432.
- Krueger, N. F. (2009). The micro foundations of entrepreneurial learning and ... education: The experiential essence of entrepreneurial cognition. In G. P. West, E. J. Gatewood, & K. G. Shaver (Eds.), *Handbook of University-wide entrepreneurship education*. Cheltenham: Edward Elgar.
- Kuratko, D. F. (2005). The emergence of entrepreneurship education: Development, trends, and challenges. *Entrepreneurship Theory and Practice*, 29(5), 577–598.
- Lima, E., Lopes, R., Nassif, V., & da Silva, D. (2015). Opportunities to improve entrepreneurship education: Contributions considering Brazilian challenges. *Journal of Small Business Management*, 53(4), 1033–1051.
- Liñán, F. (2004). Intention-based models of entrepreneurship education. *Piccola Impresa/Small Business*, 3, 11–35.
- Liñán, F. (2008). Skill and value perceptions: How do they affect entrepreneurial intentions? *International Entrepreneurship and Management Journal*, 4(3), 257–272.
- Martin, B. C., McNally, J. J., & Kay, M. J. (2013). Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes. *Journal of Business Venturing*, 28, 211–224.
- McGee, J. E., Peterson, M., Mueller, S. L., & Sequeira, J. M. (2009). Entrepreneurial self-efficacy: Refining the measure. *Entrepreneurship Theory and Practice*, 33(4), 965–988.
- McLarty, L., Highley, H., & Anderson, S. (2010) *Evolution of enterprise education in England*. Research Report, DFE-RR015. The Department for Education, London. Retrieved May 1, 2015, from www.education.gov.uk/publications/eOrderingDownload/DFE-RR015.pdf.
- McMullan, W. E., & Gillin, L. M. (1998). Developing technological start-up entrepreneurs: A case study of a graduate entrepreneurship programme at Swinburne University. *Technovation*, 18(4), 275–286.
- McMullan, W., & Long, W. A. (1987). Entrepreneurship education in the nineties. *Journal of Business Venturing*, 2(3), 261–275.
- Minniti, M., & Bygrave, W. (2001). A dynamic model of entrepreneurial learning. *Entrepreneurship Theory and Practice*, 25(3), 5–16.
- Noel, T. W. (2002). Effects of entrepreneurial education on intent to open a business: An exploratory study. *The Journal of Entrepreneurship Education*, 5, 3–13.
- Oosterbeek, H., Van Praag, M., & Ijsselstein, A. (2010). The impact of entrepreneurship education on entrepreneurship skills and motivation. *European Economic Review*, 54(3), 442–454.
- Raposo, M. L. B., Ferreira, J. J. M., do Paço, A. M. F., & Rodrigues, R. J. G. (2008). Propensity to firm creation: Empirical research using structural equations. *International Entrepreneurship and Management Journal*, 4(4), 485–504.

- Ratten, V. (2014). Encouraging collaborative entrepreneurship in developing countries: The current challenges and a research agenda. *Journal of Entrepreneurship in Emerging Economics*, 6(3), 298–308.
- Sánchez, J. C. (2011). University training for entrepreneurial competencies: Its impact on intention of venture creation. *International Entrepreneurship and Management Journal*, 7(2), 239–254.
- Schaper, M. T., & Casimir, G. (2007). The impact of tertiary education courses on entrepreneurial goals and intentions. In A. Fayolle (Ed.), *Handbook of research on entrepreneurship education: Contextual perspectives* (Vol. 2). Cheltenham: Edward Elgar.
- Segal, G., Schoenfeld, J., & Borgia, D. (2007). Using social cognitive career theory to enhance students' entrepreneurial interests and goals. *Academy of Entrepreneurship Journal*, 13, 69–73.
- Sheeran, P. (2002). Intention–behavior relations: A conceptual and empirical review. *European Review of Social Psychology*, 12(1), 1–36.
- Slavtchev, V., Laspita, S., & Patzelt, H. (2012). Effects of entrepreneurship education at universities. *Jena Economic Research Papers*, 25, 1–33.
- Solomon, G. T. (2007). An examination of entrepreneurship education in the United States. *Journal of Small Business and Enterprise Development*, 14(2), 168–182.
- Stumpf, S. A., Brief, A. P., & Hartman, K. (1987). Self-efficacy expectations and coping with career-related events. *Journal of Vocational Behavior*, 31(1), 91–108.
- Varela, R. V., & Jimenez, J. E. (2001). *The effect of entrepreneurship education in the universities of Cali*. Paper presented at the Babson conference, Babson.
- Volkman, C. (2004). Entrepreneurial studies in higher education. *Higher Education in Europe*, 29(2), 177–185.
- von Graevenitz, G., Harhoff, D., & Weber, R. (2010). The effects of entrepreneurship education. *Journal of Economic Behavior & Organization*, 76(1), 90–112.
- Wang, C. K., Wong, P. K., & Lu, Q. (2002). Tertiary education and entrepreneurial intentions. In P. Phan (Ed.), *Technological entrepreneurship* (pp. 55–82). Greenwich, CT: Information Age Publishing.
- Weber, R. (2011). *Evaluating entrepreneurship education*. Munich: Springer.
- Williams, C. M., & Subich, L. M. (2006). The gendered nature of career related learning experiences: A social cognitive career theory perspective. *Journal of Vocational Behavior*, 69(2), 262–275.
- Wilson, F., Kickul, J., & Marlino, D. (2007). Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: Implications for entrepreneurship education. *Entrepreneurship Theory and Practice*, 31(3), 387–406.

Chapter 3

Assessing the Entrepreneurial Orientation of University Departments. A Comparative Study Between Italy and Spain

Angelo Riviezzo, Francisco Liñán, and Maria Rosaria Napolitano

Abstract This paper aims at empirically measuring the entrepreneurial orientation (EO) of university departments and the impact it has on their ability to generate patents and spin-offs from research. Moving from a recent operationalization of universities' EO developed by a group of scholars in Canada, we used a web-based questionnaire to collect information from 206 heads of department of Italian and Spanish universities. Through a multiple regression analysis we assessed the relationship between departments' EO and performance, expressed in terms of patents and spin-offs. Our findings show that the EO significantly affects the ability of university departments to generate patents and spin-offs. However, not all the dimensions we used to operationalize the EO play the same role. In this sense, our study shows that much more attention should be paid to the context-specific conditions, that can definitively affect the results and the relationships between the investigated variables. Implications, limitations and future improvements of the research are discussed.

Keywords Academic entrepreneurship • Context conditions • Entrepreneurial orientation • Entrepreneurial university • Entre-U scale • Exploratory factor analysis • Industry collaboration • Italy • Patents • Questionnaire • Regression analysis • Research mobilization • Spain • Spin-offs • Survey • Unconventional fundraising • Unconventional networking • University departments • University mission • University policies

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3.1 Introduction

Universities are nowadays supposed to act as entrepreneurs, contributing directly to social and economic development (Clark, 1998; Etzkowitz, 1983, 2004; Gibb, 2005). In accomplishing this mission “they are unafraid to maximise the potential for commercialisation of their ideas and create value in society and do not see this as a significant threat to academic values” (Clark, 2004). The “entrepreneurial university” (Etzkowitz, 1983) compared to the traditional teaching and research university is, therefore, characterized by many changes, in terms of organization, culture and strategy (Riviezzo, 2014).

A relevant body of literature describes the organizational innovations promoted by entrepreneurial universities—such as the creation of industrial liaison offices, technology transfer offices, and incubators (Etzkowitz, 2004)—and the evolution, over time, in the nature of relationships between university and industry—from single transactions to longer-term relationships (Bercovitz & Feldman, 2006). Several scholars proposed a detailed analysis of the external variables, related to the characteristics of the local system of innovation, and the internal variables, related to the university environment, affecting and enhancing such evolution of knowledge-producing organizations towards initiators of economic growth (Bercovitz & Feldman, 2006; Cesaroni, Conti, Piccaluga, & Mascara, 2005; Etzkowitz, 1998; Feldman, Feller, Bercovitz, & Burton, 2001; Geuna, 1998; Gras, Lapera, Solves, Jover, & Azuar, 2008; Lerner, 2005; Powers & Mcdougall, 2005; Riviezzo & Napolitano, 2010).

Numerous scholars discussed the cultural differences between universities and the business world, investigating the effects on technology transfer process (Liyanage & Mitchell, 1994; Samsom & Gurdon, 1993; Van Geenhuizen & Soetanto, 2009). Following this cultural perspective, literature proposed also an analysis of academic inventors’ personal traits, such as intentions (Prodan & Drnovsek, 2010) or propensity to engage in commercial activities (Hoye & Pries, 2009). Furthermore, the need of creating and promoting entrepreneurial culture among students and faculty members, by integrating entrepreneurship education into the curricula and pursuing interdisciplinary research, has been widely discussed (Clark, 1998; Napolitano & Riviezzo, 2008; Riviezzo, DeNisco, & Napolitano, 2012; Van Burg, Romme, Gilsing, & Reymen, 2008). Finally, the new social and discursive practices imported into the academic domain from the commercial environment, as a consequence of the intensified exchange process between universities and business partners, have been analyzed (Fairclough, 1993; Mautner, 2005; Riviezzo, Napolitano, & Garofano, 2015).

Less attention was paid to changes in the universities’ strategic orientation, in terms of objectives and identity. Differently from the above-cited contributions, the strategic perspective is precisely the one we privileged in this paper. Borrowing an approach typically used in studies focused on firms, we aim at investigating the role of entrepreneurial orientation (EO, Covin & Slevin, 1991; Lumpkin & Dess, 1996; Miller, 1983) in determining the ability of universities to enhance the commercial

results of their research. In particular, we move from an operationalization of the EO construct specific to the university departments (Todorovic, Mcnaughton, & Guild, 2011), to investigate the impact it has on performance measured in terms of patents and spin-offs. The study is based on survey data from 206 department heads of Italian and Spanish universities.

In the following sections a review of the literature on the concept of EO and its application within universities is presented. Thereafter, the methodology and results are discussed. Finally, the implications and limitations of the study are illustrated.

3.2 Theoretical Background

The EO is a multidimensional construct used to operationalize entrepreneurship in its essence. According to many authors (e.g., Covin & Slevin, 1986; Miller, 1983) it consists of three components: innovativeness, risk-taking and proactiveness. Lumpkin and Dess (1996) propose to integrate these three dimensions with two more: competitive aggressiveness and autonomy.

Beside the different operationalizations, some conceptual differences about what the theoretical construct represents emerged among scholars (Basso, Fayolle, & Bouchard, 2009; Cogliser, Brigham, & Lumpkin, 2008; Zahra, Jennings, & Kuratko, 1999). Both Miller (1983) and Covin and Slevin (1991) use the EO concept to assess a firm's strategic posture. Entrepreneurship is therefore directly defined in relation to a combination of the three above-mentioned dimensions. On the other hand, Lumpkin and Dess (1996) propose a distinction between the concepts of EO and entrepreneurship, drawing on the distinction between the process ('how') and the results ('what'). In their view, the five dimensions of EO represent the processes that lead to entrepreneurship.

The ambiguity on the EO construct is enhanced by its application in the context of non-profit organizations. In theory, also organizations that are not profit-oriented, such as public organizations, may pursue the strategic aim of creating value and opportunity through the continuous search of innovative activities. However, empirical evidence are still limited and the potential application of the construct in the context of non-profit organizations has been explored just to a certain extent (e.g., Bhuian, Menguc, & Bell, 2005; Caruana, Ewing, & Ramaseshan, 2002; Morris, Coombes, Schindehutte, & Allen, 2007; Morris & Jones, 1999; O'Shea, Allen, Chevalier, & Roche, 2005). Most of the problems are related to the scarce adaptation of the measures and assessment tools to the peculiarities of the reality under observation.

In the specific case of universities, taking into account the differences with firms in terms of objectives, organization and systems of governance, an innovative scale to assess the EO was recently proposed (Todorovic et al., 2011). The items included in this scale—that the authors labeled “Entre-U”—are the result of in-depth interviews carried out with faculty members from four Canadian universities. Respondents were heads of departments and were asked to identify the most significant elements that in their perception were related to the EO of university

departments. At the end of the process 23 items were developed, traced back to four dimensions: research mobilization; unconventionality; industry collaboration; university policies.

The first dimension relates to research undertaken in the department in terms of focus and orientation towards external stakeholders. The term used is aimed precisely to seize the capacity to “engage external stakeholders at all stages of research process, especially in making sure that research outcomes are communicated to multiple audiences in ways that are easily understood, so the results are more readily transferred and applied” (Todorovic et al., 2011). The second dimension refers to the department’s ability to identify new opportunities outside the traditional academic environment, focusing on unconventional approaches in research funding, problem solving, relationships with external organizations and so on. The third dimension assesses the degree of cooperation with industry at individual and organizational levels. The fourth and last dimension refers to the perception that the department head has about the central university policies and the extent to which they hinder or facilitate the departments in their innovative and unconventional action.

Through an exploratory survey among Canadian universities, the reliability of the “Entre-U” scale in measuring the entrepreneurial performance of university departments, expressed in terms of patents and spin-offs, was validated. The proposed dimensions are effectively able to explain the ability of departments in exploiting the results of their research.

But, as noted above, the context-specific conditions (i.e., legal, economic and policy conditions; characteristics of the local firms, such as dimensions, organizational structure, R&D investments; public and private funding of R&D activities; presence of formal and informal investors; and so on) play a relevant role in explaining the entrepreneurial posture of universities. In this perspective, the present study aims at investigating to what extent the proposed items of the “Entre-U” scale fit in measuring the EO of universities operating in a completely different context.

In fact, unlike Canada, where universities have deep-rooted traditions of commercial exploitation of their research, in Italy and Spain only in recent years universities have been moving towards the valorisation of their scientific knowledge, by patenting the results of their research activities and promoting the creation of spin-off companies. It seems therefore interesting to assess the EO and its relationship with entrepreneurial performance within the Italian and Spanish university departments.

3.3 Method

We carried out a survey among department heads of Italian and Spanish universities, by using a structured, on-line questionnaire. The target population of the survey was identified through progressive steps. First, we used secondary data to select the universities with the best entrepreneurial performance, in terms of spin-offs and patents. We used secondary data (i.e., previous studies, national reports and so on)

to identify the universities most involved with the third mission both in Italy and Spain. Namely, we considered those universities with a number of patents and spin-offs above the national average. In this way, we tried to involve in the survey those universities characterized by stronger EO.

Since the focus of this study is on single departments, we contacted the industrial liaison offices and/or the technology transfer offices of the selected universities to identify the departments most involved in commercial activities. Then, we proceeded to contact the department heads, by telephone and/or by e-mail. When we acquired a willingness to take part in the survey, we sent via e-mail the link to the online questionnaire. As an incentive to participate, anonymity to respondents and the opportunity to have access to the final results of the survey were granted.

We contacted first about 250 departments in Italy and then about 400 in Spain over 2 years of fieldwork. At the end, we obtained a final sample made up of 206 departments: 101 departments (49 %) from 32 different Italian universities; 105 departments (51 %) from 23 different Spanish universities.

3.3.1 Descriptive Statistics of the Sample

Approximately 34 % of departments in the sample are from the disciplines of physical, chemical, biological and geological science; 23 % are from engineering; 16 % are from ICT; 12 % are from economics/business; 8 % are from medicine; and 7 % are from different disciplines (e.g., agriculture, architecture, law etc.).

The majority of departments in the sample (47 %) presents a number of faculty members falling in the 31–60 range; 19 % in the 61–90 range; 18 % in the 16–30 range; 9 % in the 91–120 range; 5 % have more than 120 members (being 300 members the highest number in the sample); and 2 % have less than 15 members (being 12 the lowest figure).

Finally, considering the number of years of experience of the surveyed departments, most (31 %) are in the 21–30 years range; 22 % in the 11–20 years range; 14 % in the 31–40 years range; 9 % in the 6–10 years range; 6 % were established from more than 40 years (being 85 years the highest figure); and 18 % from less than 5 years (being 1 the lowest figure).

3.3.2 Measures

A structured questionnaire was used to get information about: the different dimensions of the departments' EO, which are the independent variables of the survey; the number of patents and spin-offs generated by departments' research activities, which are the dependent variables; and several characteristics of the departments, representing the control variables.

To measure the EO, we used the 23 items proposed by Todorovic et al. (2011), translating them into Italian and Spanish. Respondents were asked to rate the extent to which the EO items described their own department on a seven-point Likert scale.

Furthermore, the department heads were asked to indicate: the total number of patents held by faculty members and the total number of spin-offs created.

We considered some descriptive characteristics of the department as control variables: scientific area; size, measured as the total number of faculty members; experience, measured as the number of years that the department had operated.

3.4 Results

We performed an exploratory factor analysis to validate the “Entre-U” scale. Bartlett’s Test of Sphericity was significant (1995.057, $df=190$, $p<0.000$) and the Kaiser-Meyer-Olkin measure of sampling adequacy (0.893) was “meritorious” (Kaiser, 1974). Five factors with Eigenvalues higher than 1, accounting on the whole for 56.89% of the variance, emerged from the analysis.

Based on this analysis, the items loading on the five factors are slightly different from the original scale proposed by Todorovic et al. (2011). The first factor is the most important (37.2% of the variance) and is related to cooperation with external partners. The associated items coincide perfectly with those of the “industry collaboration” dimension in the original scale. The second factor (9.57% of the variance) is related to the central university policies. Also in this case the associated items are the same of the “university policy” dimension in the original scale. The third factor (4.73% of the variance) is related to research activities and, again, the associated items are the same of the “research mobilization” dimension in the original scale. The fourth factor (4.09% of the variance) and the fifth factor (3.20% of the variance) are both related to unconventional exploration of new opportunities. Therefore, the items associated in the “unconventionality” dimension in the original scale are here splitted in two different factors: “unconventional networking” and “unconventional fundraising”.

Three items of the original “Entre-U” scale did not load of any of the five factors and were dropped off from the analysis. Therefore the final scale considered in this study is made up of 20 items. Table 3.1 shows the factor loadings and the complete list of retained items.

We performed a multiple regression analysis to investigate the relationship between EO of the departments and the two measures of entrepreneurial performance we considered. The scientific area of the department was also included in the analysis. Table 3.2 shows the results for both regressions. The table shows also the variance inflation factor (VIF) for the individual predictors calculated to check for multicollinearity problems in the regression analysis. The VIF values are always just over 1, 2 or 3, far below critical values, thus not revealing any problems of multicollinearity.

Table 3.1 Pattern matrix

Item	Factor				
	1	2	3	4	5
We encourage industry involvement in the research activities of our faculty members	.790				.302
Our department is highly regarded by industry	.763				.276
We are recognized by industry or society for our flexibility and innovativeness	.672		.216		
We believe that our department should build relationships with private or public sector organizations	.493			-.334	
Our graduate students often secure high quality industry positions	.290		.233		
We feel that university-wide policies at this university contribute substantially towards our department achieving its goals and objectives		.871			
Our university policies are best described as developed bottom-up using feedback from all levels of the university		.838			
Compared to most other universities, our university is very responsive to new ideas and innovative approaches		.785			
Our department is given significant latitude when evaluating faculty members performance		.375			
We encourage our graduate and PhD students to engage in research with significant implications for industry or society			.844		
We encourage students to seek practical applications for their research			.632		
Faculty members in our department emphasize applied research	.273		.359		.219
Our faculty members are expected to make substantial contributions to industry or society			.281		
Our faculty members often seek research opportunities outside the traditional university environment				.480	
We support our faculty members collaborating with non-academic professionals	.242		.303	.449	.291
When we come upon an unconventional new idea, we usually let someone else try it and see what happens (<i>Reverse coded</i>)	.221		.285	.306	
We seek significant funding from sources other than the National Minister					.743
Compared to other similar departments in our region, our faculty members are known as very efficient and productive researchers		.231			.656
We try to generate off-campus benefits from research projects				.293	.521
Compared to other similar departments in this region, we are good at identifying new opportunities			.329	.317	.509

Extraction Method: Generalized Least Squares. Rotation Method: Oblimin with Kaiser Normalization

Table 3.2 Relationship between entrepreneurial orientation and performance

	Spin-offs		Patents	
	Beta	VIF	Beta	VIF
Country	-.274*	1.463	.034	1.485
Size	.174**	1.079	.075	1.081
Experience	.049	1.348	.018	1.348
ICT	.474*	2.784	.133	2.733
Science	.080	3.678	.153	3.681
Engineering	.120	3.297	.167	3.292
Medicine	-.107	1.831	.027	1.831
Economics	.019	2.595	-.195	2.651
Entrepreneurial Orientation	.201*	1.168	.329*	1.169
R ²	.345		.261	
ADJUSTED R ²	.310*		.221*	

*p<0.05; **p<0.001

Standardized regression coefficients are displayed in the table

If considered in its totality, as a single construct, the EO of the departments is significantly related to performance. In particular, the EO plays a more significant role in determining the number of patents ($\beta = .329$) compared to spin-offs ($\beta = .201$).

As it is known from the literature on EO, however, the single dimensions that make up the construct may have a different role in determining the performance (Lumpkin & Dess, 1996). Even in this study, therefore, it seems appropriate to empirically test the role of single dimensions. Table 3.3 shows the regression results by considering each dimension of the EO as independent variables and the number of spin-offs and patents as dependent variables.

As the table shows, the number of spin-off and patents are not significantly related to any of the five dimensions constituting the EO construct. The multiple regression model, in fact, shows a lack of significance for all the dimensions. As may be seen, adjusted R² is lower than in the previous regressions. Therefore, there is no evidence in our results that any specific dimension of the Entre-U scale is especially relevant in explaining the entrepreneurial outcomes of university departments.

3.5 Discussion

This paper focuses on the university departments' strategic orientation, borrowing an approach typically used in studies on profit-oriented firms, with the specific aim of investigating its relationship with departments' ability to generate patents and spin-offs from research activities. We moved from the definition of university departments' EO developed by a group of scholars in Canada (Todorovic et al., 2011). The main reasoning behind the study is that context conditions significantly

Table 3.3 Relationship between each dimension of entrepreneurial orientation and performance

	Spin-offs		Patents	
	Beta	VIF	Beta	VIF
Country	-.243**	1.665	.061	1.692
Size	.179**	1.091	.083	1.090
Experience	.043	1.373	.004	1.385
ICT	.498*	2.908	.142	2.856
Science	.101	3.726	.179	3.731
Engineering	.148	3.460	.172	3.459
Medicine	-.095	1.879	.051	1.881
Economics	.028	2.631	-.188	2.693
Industry Collaboration	.031	2.702	.192	2.667
University Policy	-.011	1.337	-.041	1.333
Research Mobilization	-.068	1.881	-.074	1.856
Unconven. Networking	.083	2.333	.140	2.312
Unconven. Fundraising	.168	3.014	.134	2.938
R ²	.352		.278	
ADJUSTED R ²	.300*		.220*	

*p<0.05; **p<0.001

Standardized regression coefficients are displayed in the table

affect the universities proclivity to behave entrepreneurially (Bercovitz & Feldman, 2006; Cesaroni et al., 2005; Etzkowitz, 1998, 2004; Feldman et al., 2001; Gras et al., 2008; Lerner, 2005; Mcmillan, Zemann, & Subbanarasimha, 1987; Powers & Mcdougall, 2005; Riviezzo, 2014; Riviezzo & Napolitano, 2010; Roberts & Malone, 1996). Therefore, not necessarily the dimensions and items used to operationalize the EO of universities in Canada may result to be effective in a completely different context like Italy and Spain.

As stated before, in fact, while in countries like Canada universities have deeply rooted traditions of commercial exploitation of their research, in Italy and Spain only in recent years universities developed a more positive attitude towards entrepreneurship, mainly as a consequence of changes in policy conditions. More in general, there are significant differences between Latin and Anglo-Saxon countries at cultural level. Thus, both the external environment and the academic internal environment are completely different and may affect differently the universities' EO.

Indeed, our findings show that the operationalization of the EO is slightly different in the Italian and Spanish context, and not all the dimensions considered affect evenly the university departments' entrepreneurial posture. In particular, when considered as a whole measure, the EO scale is significant in explaining patents and spin-offs. Otherwise, considering the single dimensions, none of them plays a significant role in explaining departments' ability to commercially exploit their knowledge. Therefore, based on these findings, we argue that there is no full transferability of the original "Entre-U" scale to different research contexts, such as Mediterranean countries. On the other hand, we can also conclude that, at least in

our study, being an “entrepreneurial university” is a holistic phenomenon. That is, either the university is entrepreneurial or it is not entrepreneurial, and there are no particular dimensions that are more relevant than others.

It follows that more work is needed to refine the measure and better understand what elements of being an “entrepreneurial university” are more significant in explaining performance. In this regard, it is possible that the scale items we adopted—developed and validated in a much more mature context like Canada—needed some adjustments, because they aim at measuring activities that not always the Italian and Spanish departments carry on or that are less likely to be considered as “entrepreneurial”. And, in turn, this is probably a consequence of the developmental stage in which the universities involved in the survey are, compared to the “ideal” entrepreneurial university model. In the Mediterranean countries universities are still in the evolutionary process towards the entrepreneurial model. In this sense, the main features of the EO may differ for such university departments from those of universities operating in much more mature contexts, such as Anglo-Saxon countries.

Finally, the role of entrepreneurial universities in contributing to innovation processes has been stressed in the literature (Guerrero, Liñán, Toledano, & Urbano, 2009). In turn, innovation is pointed out as one of the key drivers of regional economic development (Bercovitz & Feldman, 2006). In our opinion, therefore, there is an urgent need to contribute to the transformation of universities into more entrepreneurial entities, which may play a more active role in the transfer of knowledge to new and existing businesses. In this sense, policy-makers should be aware of this relationship. In the case of Italy and Spain, it seems that holistic approaches are needed in order to achieve such transformation.

3.6 Limitations and Directions for Future Research

This paper is not without limitations. For instance, considering the variables measurement validity, we followed a widely accepted approach in entrepreneurship research by using a structured questionnaire to collect only perceived data from key informants. Even if this method has been proved to be effective, it would be interesting to use also factual and secondary data. This is an interesting point for future evolution of the present study. Similarly, the use of longitudinal data would add more value to the proposed framework.

Furthermore, in order to verify to what extent the context conditions can affect the results and the relationships between the investigated variables—as it would appear from the results of this study—it would be particularly interesting to perform a comparative analysis among more countries, especially comparing Latin and Anglo-Saxon countries. And this is one more direction for future research developments.

References

- Basso, O., Fayolle, A., & Bouchard, V. (2009). Entrepreneurial orientation: The making of a concept. *Entrepreneurship and Innovation, 10*(4), 313–321.
- Bercovitz, J., & Feldman, M. (2006). Entrepreneurial universities and technology transfer: A conceptual framework for understanding knowledge-based economic development. *Journal of Technology Transfer, 31*, 175–188.
- Bhuiyan, S. N., Menguc, B., & Bell, S. J. (2005). Just entrepreneurial enough: The moderating effect of entrepreneurship on the relationship between market orientation and performance. *Journal of Business Research, 58*, 9–17.
- Caruana, A., Ewing, M. T., & Ramaseshan, B. (2002). Effects of some environment challenges and centralization on the entrepreneurial orientation and performance of public sector entities. *Service Industries Journal, 22*(2), 43–58.
- Cesaroni, F., Conti, G., Piccaluga, G., & Mascara, P. C. (2005). Technology transfer offices (TTO) in Italian Universities: What they do and how they do it. *Working Paper, 5, IN-SAT Laboratory, Scuola Superiore S. Anna di Pisa*.
- Clark, B. R. (1998). *Creating Entrepreneurial Universities. Organisational pathways of transformation*. New York: Pergamon Press.
- Clark, B. R. (2004). *Sustaining change in Universities, Society for research into higher education*. London: Open University Press.
- Cogliser, C. C., Brigham, K. A., & Lumpkin, G. T. (2008). Entrepreneurial orientation (EO) research: A comprehensive review and analyses of theory, measurement, and data-analytic practices. In *Entrepreneurship Research Conference*, Babson College, Wellesley, MA.
- Covin, J. G., & Slevin, D. P. (1986). The development and testing of an organizational-level entrepreneurship scale. In R. Ronstadt et al. (Eds.), *Frontiers of entrepreneurship research*. Wellesley, MA: Babson College.
- Covin, J. G., & Slevin, D. P. (1991). A conceptual model of entrepreneurship as firm behavior. *Entrepreneurship Theory and Practice, 16*(1), 7–25.
- Etzkowitz, H. (1983). Entrepreneurial scientists and entrepreneurial Universities in American academic science. *Minerva, 21*, 198–233.
- Etzkowitz, H. (1998). The norms of entrepreneurial science: Cognitive effects of the new university–industry linkages. *Research Policy, 27*, 36–50.
- Etzkowitz, H. (2004). The evolution of the entrepreneurial university. *International Journal of Technology and Globalisation, 1*(1), 64–77.
- Fairclough, N. L. (1993). Critical discourse analysis and the marketization of public discourse: The Universities. *Discourse & Society, 4*(2), 133–168.
- Feldman, M. P., Feller, I., Bercowitz, J. E. L., & Burton, R. M. (2001). Understanding evolving University-Industry relationships. In M. P. Feldman & A. N. Link (Eds.), *Innovation policy in the knowledge based economy* (pp. 171–188). Boston, MA: Kluwer Academic.
- Geuna, A. (1998). The internationalisation of the European university: A return to medieval roots. *Minerva, 36*, 253–270.
- Gibb, A. A. (2005). Towards the entrepreneurial university. Entrepreneurship education as a lever for change. *NCGE Policy paper series, 15*.
- Gras, J. M. G., Lapera, D. R. G., Solves, I. M., Jover, A. J. V., & Azuar, J. S. (2008). An empirical approach to the organisational determinants of spin-off creation in European universities. *International Entrepreneurship and Management Journal, 4*, 187–198.
- Guerrero, M., Liñán, F., Toledano, N., & Urbano, D. (2009). Entrepreneurial universities and regional development: A Spanish case study. In T. P. Nolin (Ed.), *Handbook of regional economics* (pp. 589–606). New York, NY: Nova.
- Hoye, K., & Pries, F. (2009). ‘Repeat commercializers’, the ‘habitual entrepreneurs’ of university–industry technology transfer. *Technovation, 29*(10), 682–689.
- Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39*(1), 31–36.

- Lerner, J. (2005). The university and the start-up: Lessons from the past two decades. *Journal of Technology Transfer*, 30(1/2), 49–56.
- Liyanage, S., & Mitchell, H. (1994). Strategic management of interactions at the academic-industry interface. *Technovation*, 14(10), 641–655.
- Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the entrepreneurial orientation construct and linking it to performance. *The Academy of Management Review*, 21(1), 135–172.
- Mautner, G. (2005). The entrepreneurial university: A discursive profile of a higher education Buzzword. *Critical Discourse Studies*, 2(2), 1–26.
- Mcmillan, I. C., Zemann, L., & Subbanarasimha, P. N. (1987). Criteria distinguishing successful from unsuccessful ventures in the venture screening process. *Journal of Business Venturing*, 2, 123–137.
- Miller, D. (1983). The correlates of entrepreneurship in three types of firms. *Management Science*, 29, 770–791.
- Morris, M. H., Coombes, S., Schindehutte, M., & Allen, J. (2007). Antecedents and outcomes of entrepreneurial and market orientations in a non-profit context: Theoretical and empirical insights. *Journal of Leadership and Organizational Studies*, 13, 12–39.
- Morris, M. H., & Jones, F. F. (1999). Entrepreneurship in established organizations: The case of the public sector. *Entrepreneurship Theory and Practice*, 24(1), 71–91.
- Napolitano, M. R., & Riviezzo, A. (2008). The institutional education and training for entrepreneurship development in the Italian Universities. *International Journal of Entrepreneurship and Innovation Management*, 8(6), 665–685.
- O’Shea, R. P., Allen, T. J., Chevalier, A., & Roche, F. (2005). Entrepreneurial orientation, technology transfer and spinoff performance of U.S. Universities. *Research Policy*, 34(7), 994–1009.
- Powers, J. B., & Mcdougall, P. P. (2005). University start-up formation and technology licensing with firms that go public: A resource-based view of academic entrepreneurship. *Journal of Business Venturing*, 20, 291–311.
- Prodan, I., & Drnovsek, M. (2010). Conceptualizing academic–entrepreneurial intentions: An empirical test. *Technovation*, 30(5/6), 332–347.
- Riviezzo, A. (2014). Detecting the determinant attributes of entrepreneurial orientation within the Italian university departments. *Journal of Enterprising Culture*, 22(2), 133–159.
- Riviezzo, A., DeNisco, A., & Napolitano, M. R. (2012). Attractiveness of European higher education in entrepreneurship: A strategic marketing framework. In T. Burger-Helmchen (Ed.), *Entrepreneurship. Creativity and innovative business models* (pp. 139–154). Rijeka: InTech Web Org.
- Riviezzo, A., Napolitano, M. R., & Garofano, A. (2015). From words to deeds: Are Italian universities changing their discursive practices to promote entrepreneurship? In A. Fayolle, P. Kyro, & F. Liñán (Eds.), *Developing, shaping and growing entrepreneurship* (pp. 126–153). Cheltenham: Edgar Elgar Publishing.
- Riviezzo, A., & Napolitano, M. R. (2010). Italian universities and their third mission: A longitudinal analysis of the organization and education renewal towards the ‘entrepreneurial university’ model. *Industry & Higher Education*, 3, 227–236.
- Roberts, E. B., & Malone, D. E. (1996). Policies and structures for spinning off new companies from research and development organizations. *R&D Management*, 26, 17–48.
- Samsom, K. J., & Gurdon, M. A. (1993). University scientists as entrepreneurs: A special case of technology transfer and high-tech venturing. *Technovation*, 13(2), 63–71.
- Todorovic, W. Z., Mcnaughton, R. B., & Guild, P. D. (2011). ENTRE-U: An entrepreneurial orientation scale for universities. *Technovation*, 31, 128–137.
- Van Burg, E., Romme, A. G. L., Gilsing, V. A., & Reymen, I. M. M. J. (2008). Creating university spin-offs: A science-based design perspective. *The Journal of Product Innovation Management*, 25(2), 114–129.
- Van Geenhuizen, M., & Soetanto, D. P. (2009). Academic spin-offs at different ages: A case study in search of key obstacles to growth. *Technovation*, 29(10), 671–681.
- Zahra, S. A., Jennings, D. F., & Kuratko, D. F. (1999). The antecedents and consequences of firm-level entrepreneurship: The state of the field. *Entrepreneurship Theory and Practice*, 24, 45–65.

Chapter 4

Entrepreneurship and University: How to Create Entrepreneurs from University Institutions

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Abstract At a time of economic uncertainty, it is necessary to find new alternatives to improve the employment situation. One of the solutions is to foster entrepreneurship from the institutions of higher education (IHE). The IHE do not only have the function of training students. Their work goes beyond, insofar as they have a very important role in the transfer of knowledge to society. While entrepreneurship is something not too extended in the University classroom, past experiences promoted by the IHE, highlight an important interest in such initiatives. The main objective of this chapter is to point out the essential role of the IHE in the field of entrepreneurship, based on different actions that can be applied. Among other elements, the results of initiatives such as university business incubators, university spin-offs, mentoring (expert advice), business angels (agents that bring money or experience to future entrepreneurs), etc., will be discussed. This study will be done both from a national perspective, and compared with the perspective at European level, to determine the main results of the different alternatives. Together with the above, a set of best practices for university entrepreneurship (networks of entrepreneurship, studies focused on the creation of new enterprises, updating and recycling business courses, university aids to entrepreneurship, etc.), will also be dealt with. The methodology applied, based on case studies, will allow us to know the development of university entrepreneurial activities, in order to extrapolate the experiences to the Spanish reality.

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Keywords Applied research • Basic research • Basic Technology Company • Business Angels • Coaching • Economic and social integration • Entrepreneurial culture • Entrepreneurial university • Entrepreneurship program • Knowledge transfer • Learning by doing • Networks of entrepreneurship • Office transfer and research • Pre-incubator of business • Spin-off • Start-ups • Technologies of information and knowledge • Third mission • Units of support and self-employment • University entrepreneurship

4.1 Introduction

The institutions of higher education (IHE) of the twenty-first century are immersed in a process of profound changes. Their traditional responsibilities revolved around teaching and research (first and second mission, respectively of the IHE). However, it is necessary to add the transfer of knowledge and innovation for the promotion of entrepreneurship. These new activities are necessary to develop the social sustainability or third mission (Casani, Pérez Esparrells, & Rodríguez-Pomeda, 2010). This change is known as the “second academic revolution” (Martin & Etzkowitz, 2000).

To ensure this objective, it is essential to improve the transfer of knowledge from the IHE to society. However, this is not only accomplished by the transmission of concepts to students, but also, and this is something really new, through the work developed by University research teams that will be useful for the economic and social environment.

At least two effects of this activity can be mentioned: basic research and applied research, which will enable advances in the scientific and transfer field. In this sense, Ortín, Salas, Trujillo and Vendrell (2007); Ortín and Salas (2008) point out that an additional element to consider in the transmission of knowledge from IHE to society is its commercialisation, through new business initiatives. However, the promotion of entrepreneurship from the IHE should have another purpose, which is to contribute to adequate job placement of the students. The high figures of unemployment, underemployment and labour over-qualifications shown in the Spanish economy, to which must be added important current emigration of graduates who seek employment outside Spain, must make us consider the matter.

Thus, at present, many students and graduates, given their reduced job opportunities, as a result of the general unemployment rate (in 2014) of 24.1 %, amounting to 53.8 % for people under the age of 25, increasingly consider self-employment as an alternative to wage employment. Precisely for this reason, students and university graduates should receive adequate training, which promotes entrepreneurship in order to launch their business initiatives and the IHE have an obligation to provide these capabilities (Ministry of Education, 2010). If the IHE promote entrepreneurship, they enable young people to have adequate training and motivation in order to face the business challenge creation.

The European Union (EU) is no stranger to this phenomenon. In the “Action Plan on Entrepreneurship 2020”, the strategy indicated to be followed by European countries is to offer practical opportunities to those who are willing to take the risk of creating a company. Precisely, following the experiences of the Erasmus mobility program for

teachers and students, the EU created “Erasmus for Young Entrepreneurs”, whose objective is to promote transnational exchanges for new entrepreneurs, so they can learn from entrepreneurs in the same sector and from other countries.

The EU is aware that knowledge is the basic component for economic and social development. This is only viable in a joint work scenario, between the IHE and the company, being necessary to reinforce education and research, encourage the transfer of research results and promote relations between the IHE and the productive fabric (Comisión Europea, 2013). For this reason, the initiatives that are being carried out from the IHE, aimed at improving the levels of entrepreneurship should be noted, and precisely this is the main objective of the chapter.

To achieve this, the following work outline is presented. After this introduction, the second chapter is a study, from a general perspective, of the role of IHE in the field of entrepreneurship. The third chapter describes some of the initiatives of European IHE in the field of entrepreneurship. The fourth chapter identifies some of the actions in the field of entrepreneurship of IHE in Spain. Some recommendations for the promotion of entrepreneurship in the IHE are given in Chap. 5. This chapter ends with a series of conclusions from those stated in the preceding paragraphs.

4.2 An Overview of the IHE and Entrepreneurship

The IHE should have a key role in the field of entrepreneurship. In order for the higher education system to be of quality, it is necessary to respond to society demands, so as to meet students’ expectations, including their future employment situation, and it should be consistent with the needs of the business sector.

The IHE should encourage students in the learning and practice of entrepreneurship, in order to create new innovative business initiatives, and at the same time they should convey the need for business success by taking risks. In addition, the IHE should ensure adequate training, to give solution to the problems to which the students will be faced by in the market. By achieving all the above, the creation of employment and wealth will be made possible.

The study of entrepreneurship in the IHE at international level is not something new (Clark, 1998, 2004; Etzkowitz, 2004; Gibb, 2005; Maskell & Robinson, 2002; Röpke, 1998). Thus, for the IHE to be entrepreneurial, they should maximize the potential for commercialization of their ideas and create value in society, without being a threat to academic values (Clark, 2004). These investigations are based on the study by Etzkowitz and Leydesdorff (1997), where a triple helix model was used, in which public administrations, companies and universities or research entities work together on initiatives of interest for these three agents. In this way, business projects closely linked to technology are carried out, contributing to the economic and social development of the economy. Salas, Aguilar, and Susunaga (2000) point out that the agents that form part of innovation systems (universities, entrepreneurs, local government and funding entities), in addition to those elements of the economic environment (productive structure, labour market, infrastructure and community features), can influence entrepreneurs’ capacity for innovation.

Bailetti (2011) states that those companies created by university students are vital for the future of IHE, especially those that opt for research and teaching programs in entrepreneurial initiatives. Etzkowitz (1998, 2004) points out that the entrepreneurial IHE must have a proactive approach to knowledge and implementation of results. Clark (2004) indicates that the entrepreneurial IHE must have an administration that is capable of responding flexibly and strategically to the needs and opportunities of the environment. According to this same author, university educational programs must contain the entrepreneurial spirit. Thus, it is possible to mention that among the obligations of the IHE, besides transmitting knowledge, is also to boost the commitment and capacity of students and researchers to develop entrepreneurial initiatives (Fernández, 2004; Rodeiro, 2008).

The promotion of the entrepreneurial spirit is a key factor for universities that deeply commit themselves to economic and social development (Gibb, 2005). It is also mentioned that the IHE should promote the lifelong learning process; boost recruitment of entrepreneurial personnel, the promotion of entrepreneurial leaders. For Röpke (1998), an entrepreneurial IHE requires a self-transformation process to entrepreneurship. There is no point in an institution that seeks the promotion of entrepreneurship, if then the management is bureaucratic. To do this, it is essential for all the university community to strengthen its links with the business sector.

To achieve this, it is necessary for the IHE to create jobs for Teaching and Research Faculty and Administrative and Service Staff, especially as close to the field where the IHE carries out its activity (Gibb, 2012). This would involve applying a financial compensation and teaching allowance system that goes beyond the usual criteria of research, publications and teaching. The IHE must commit themselves much more to society, through initiatives such as the creation of business incubators, Offices of Technology Transfer (OTT), patents, which are useful for the business fabric. An entrepreneurial IHE is one that is capable of developing mechanisms of technology transfer which enable the transmission of all their knowledge to society (Huanca-Lopez, 2004). That is why it is necessary for an IHE to have a number of key areas, with the objective of adding value and innovation (Gibb, 2012). Figure 4.1 summarizes the key areas for the creation of an entrepreneurial University.

Consequently, the entrepreneurial spirit and the creation of enterprises are configured as key elements for growth and competitiveness. The IHE may improve the aspirations of students in the creation of companies. Thus, it is possible for the IHE

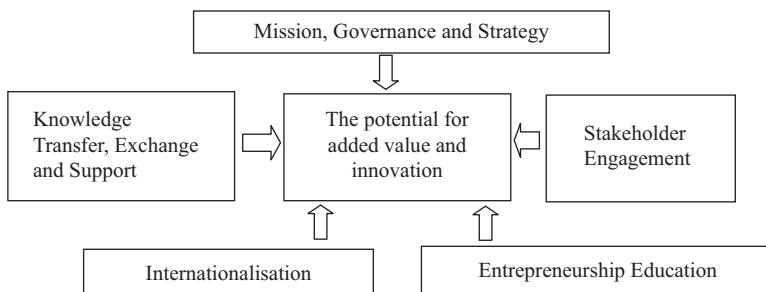


Fig. 4.1 Key areas of university entrepreneurial potential. **Source:** Gibb (2012)



Fig. 4.2 The potential contribution of an entrepreneurial university review to key strategic goals. **Source:** Gibb (2012)

to design policies and programs to improve the entrepreneurial capacity of students and graduates (Clark, 2004; Gibb, 2005; Napolitano & Riviezzo, 2008). Bailetti (2011) indicates that companies generated in the University environment are a tangible proof that students have acquired training which is correct and tailored to business demands. The IHE entrepreneurs become a social and economic engine of the environment where they operate (Etzkowitz & Klofsten, 2005). The benefits that an entrepreneurial orientation have for IHE are summarized in Fig. 4.2.

However, there are also objections to IHE strongly supporting entrepreneurship (Banja, 2000; Hayes & Wynyard, 2002; Roberts, 2002; Slaughter & Leslie, 1997). Among the ideas that are mentioned are that fostering entrepreneurship may decapitalize the IHE, as the Teaching and Research Faculty is engaged in the creation of companies, as well as there being a loss of income due to research contracts, as less effort is devoted to this objective and even possible management conflicts in the transfer of technology to spin-offs. However, it is expected that the same that happened with research at the time, which was integrated into teaching, the third function of the IHE will also be part of the IHE (Etzkowitz, 2004). Evidence shows how IHE are increasingly integrating economic development to University tasks (Hoskinsson, Covin, Volverda, & Johnson, 2011; Rothaermel, Shanti, & Lin, 2007). For this purpose, it is necessary for public managers to include the promotion of entrepreneurship in university governance programs.

4.3 Entrepreneurial Initiatives of the IHE at European Level

At international level there are a significant number of initiatives in the field of entrepreneurship. From the monograph “Educación emprendedora: Buenas prácticas internacionales” of the Fundación Universidad-Empresa (2012) for the European case, the following can be mentioned.

The Centre for Entrepreneurial Learning of the University of Cambridge (United Kingdom) has created a training program that seeks the promotion and improvement of the entrepreneurial capacity of students, responding to the needs of the University community in the field of entrepreneurship, and which makes it possible to share the best practices of entrepreneurship through networks and partnerships.

Among other activities, the following are established: (1) a postgraduate degree in entrepreneurship, with a duration of 12 months, compatible with another activity, where students are trained in entrepreneurial perception and skills, opportunity detection and evaluation of ideas for new business activities, as well as facilitating the creation of a business plan and the management of business initiatives; (2) *Enterprise Tuesday*, which is one of the most successful training programmes in entrepreneurship at the University of Cambridge, being reference for other IHE of the United Kingdom; (3) *Ignite*, an intensive 1-week program for potential entrepreneurs and established entrepreneurs, with the aim of establishing business ideas for the commercial world; (4) *Enterprisers: what are you waiting for?*, where business tasks are simulated, interaction with entrepreneurs and practical training in the field of entrepreneurship is ensured and (5) *EnterpriseWISE*, which is a course aimed at master and doctorate students in the field of science and technology, to develop skills in the field of entrepreneurship.

An entrepreneurship program was created at the *Team Academy* of the Polytechnic University of Jamk (Finland). From the start of the training stage, working groups are established to share ideas, thoughts, tasks and proposals. Students manage their own company cooperatively, receiving training in production of goods and services, marketing, finance, planning, leadership, international projects, etc. What really differentiates this training program from the rest is that the students work on real projects, which at the same time work as educational environments and practical business experiences. The education system is also innovative, because it is based on *coaching*, *learning by doing* and collaborative team learning.

The results of this program are very positive. Since 1993 a turnover of 1.5 million euros has been achieved by the enterprises generated. 91% of graduates have a job at the end of their training, 37% of graduates have created their own company in the 6-month period after finishing their studies, and 47% of graduates continue to be entrepreneurs after 2 years of completing their training.¹

The *Finpin* is a network consisting of 14 Finnish universities of applied sciences, which makes up one of the most important European IHE entrepreneurship networks. Through this initiative, the aim is to promote technologically-based entrepreneurship, by working together with the main Finnish Polytechnic Universities. Through the “Innocentre” network, the aim is to innovate in regional development through university entrepreneurship. The main objectives include: (1) to highlight good practices of entrepreneurship at regional level, to share them and see how they work; (2) to exchange good practices for further development in the network of partners and (3) to cooperate, at regional level, in strategic actions for the development of University entrepreneurship.

¹ See <http://www.cfel.jbs.cam.ac.uk/programmes/enterprisewise/>.

At the *International Center for Entrepreneurial Studies* of the University of Osijek (Croatia) research, training and documentation in the field of entrepreneurship are promoted. Among the main objectives of this initiative, which concludes with obtaining a 3-year degree in entrepreneurship, is the creation of an international reference in this matter, to ensure instruments for the development of best entrepreneurial practices for small and medium-sized enterprises (SMEs) and to improve the image of entrepreneurs. In addition to the mentioned degree, there is a master's degree in economics and entrepreneurship and an international and inter-university doctoral program in entrepreneurship and innovation. To complete the training programs, there are a large number of seminars and workshops aimed at managers of SMEs in the field of entrepreneurship.

With the *Kaospilots* initiative, which is applied in Denmark, a 3-year University degree is offered, with an integrative and innovative approach, consisting of training students in the creative design of business, leadership, processes and projects. The method of learning is very innovative, as the students must each create their own training plan based on their curriculum, and must take responsibility for their learning. All this is done with the support of specialized tutors, who will guide students, both individually and in group. During their training period, the students will have to work on a set of projects and initiatives, some of their own creation, developing a portfolio of entrepreneurial initiatives.

The *Tut Innovation and Business Center* of the technological University of Tallinn (Croatia) develops initiatives to promote entrepreneurship, among which are two: (1) empowerment of *spin-offs* and (2) *mektory*. The first one focuses on offering support for the creation of companies founded in the university world, counting on the Technological Park of Tallinn-Tehnopol and the University of Tartu. The second one is to help companies and students in innovative creation, the development of prototypes and start-ups and the creation of interdisciplinary work teams and collaboration networks at a global scale. In both cases, the aim is to give scientific and physical support to new Technology-Based Companies (TBCs).

The *Tumentrepreneurship*, of the University of Munich (Germany) offers complete and extensive counselling, as well as research and training for entrepreneurship, with the possibility of using the vast network of contacts of the institution. The support focuses on four fields of science with great potential for future growth: information, technology and communications (ITC), medical technologies, clean technologies and life sciences. Thus, it focuses on the creation of efficient spin-off enterprises, networks of entrepreneurs, determination of best practices for the development and promotion of entrepreneurial culture.

With the *Yes! Delft* of the technological University of Delft (the Netherlands), professionals and researchers who wish to create a technology-based start-up and/or develop an already existing one are educated, advised and supported. There are other activities: (1) a development center, where students are given lectures, visits to business incubators for students, scientists, and professionals interested in entrepreneurship; (2) specific training in entrepreneurship both for graduates and post-graduates; (3) a university business incubator and (4) a business growth center, which supports companies after entering the market.

The *Zentrum Für Entrepreneurship* of the Technological University of Berlin (Germany) offers in the field of entrepreneurship: (1) training (seminars, series of conferences, workshops, etc.) to improve the entrepreneurial capacity of new entrepreneurs; (2) specific support for entrepreneurs in business pre-incubators, use of rooms and equipment, etc.; and (3) provides funding to carry out new activities, at the same time as being a meeting point for investors interested in new business ideas.

Finally, with the *Phd in Technological Change and Entrepreneurship, of the Center for Innovation, Technology and Policy Research IN+*, which is a joint program between the Heinz School of Business, Carnegie Mellon University and the Tepper School of Pittsburgh (USA), with three partners in Portugal: the Higher Technical Institute, the Technical University (both in Lisbon) and the Portuguese Catholic University (in Lisbon, Beiras, Braga and Porto). It is a multidisciplinary programme, focusing on policies and entrepreneurial strategies and marketing of new products, especially in the field of ITC. Table 4.1 summarizes these initiatives.

Table 4.1 Initiatives that foster entrepreneurship from the IHE in EU

<i>Centre for Entrepreneurial Learning</i> of the University of Cambridge (United Kingdom). It is a programme for the development of educational activities designed to encourage and enhance the entrepreneurial skills of the students
<i>Team Academy</i> of the Polytechnic University of Jamk (Finland). In this entrepreneurship programme, working groups are formed to share ideas, thoughts, tasks and proposals among all members of the team, facilitating learning among all of them
<i>Finpin</i> . It is a network composed of 14 Finnish Politechnic Universities, which aims to promote technology-based entrepreneurship
<i>International Center for Entrepreneurial Studies</i> of the University of Osijek (Croatia). It promotes research, training and documentation in the field of entrepreneurial education
<i>Kaospilots</i> (Denmark). A University degree with an integrative and innovative approach is offered, which consists of training students in the creative design of business, leadership, processes and projects
<i>Tut Innovation and Business Center</i> of the Technological University of Tallinn (Croatia). Several initiatives are developed to foster entrepreneurship, among which are the empowerment of spin-offs and to help companies and students in the creation of new business initiatives
<i>Tum entrepreneurship</i> of the Technological University of Munich (Germany). It offers complete and extensive counselling, as well as research and training for entrepreneurship
<i>Yes! Delft</i> , of the Technological University of Delft (the Netherlands). Professionals and researchers who wish to create a technology-based start-up and/or develop an already existing one are trained and supported
<i>Zentrum für Entrepreneurship</i> of the Technological University of Berlin (Germany). Training aimed at improving entrepreneurial capacity, specific support to entrepreneurs by means of business pre-incubators and financing of new activities is offered
<i>Phd in Technological Change and Entrepreneurship</i> of the Center for Innovation, Technology and Policy Research IN+ (with partners in Portugal). It is a multidisciplinary programme, focusing on policies and entrepreneurial strategies, marketing of new products, especially in the ITC field

Source: Fundación Fundación Universidad-Empresa (2012)

4.4 Entrepreneurship and IHE in Spain

Despite being a topic which has hardly been analysed, the economic literature on the field of University entrepreneurship in Spain already has some references that are worth noting. In Cano, García, and Gea (2003), entrepreneurial attitudes and predisposition towards the creation of enterprises by university students are identified. Bretones (2009) examines the entrepreneurial behaviour at University level. In Ortín and Salas (2008) and Rodeiro, Fernández, Otero, and Rodríguez (2009), the determinant factors of the creation of spin-offs in the Spanish University are mentioned.

Although we cannot consider that entrepreneurship is limited to IHE, there is no doubt that this framework is one of the most favourable. 67 % of scientific production in Spain takes place in IHE, which reaches 97 % if we consider public IHE (CRUE, 2010a, b; CRUE, 2011).

In the BBVA-IVIE report “Universidad, Universitarios y productividad en España”, it is noted that among the proposals for the promotion of entrepreneurial culture in the IHE, is the need to promote entrepreneurship from the very beginning in the University classroom (Pérez García & Serrano Martínez, 2012). This same conclusion was noted in the annual GEM reports. (Global Entrepreneurship Monitor, Several Years)

So, and as consequence of the adaptation of our higher education system to the guidelines of the EHEA (European Higher Education Area), we have changed from informative teaching (know), to teaching based on know how (acquisition of skills and abilities), which involves the development of the capacity to perform, being essential for entrepreneurship.

When studying the situation in Spain in the field of University entrepreneurship, we can see a multiplicity of initiatives.

The University Entrepreneur Program is taught by the Escuela de Organización Industrial (EOI) to postgraduate students of 47 Spanish universities. Its objective is to stimulate entrepreneurship and enhance self-employment, enabling students to know about business performance and helping them to create a business plan. In addition, this program also pursues knowledge transfer from the IHE to enterprises, while the creation of technology-based enterprises (TBCs) is encouraged. The University Miguel Hernández (Elche) through the University entrepreneurship program counsels and guides students on entrepreneurship. Thus, students who wish to carry out their business ideas are advised and trained. The University of Las Palmas de Gran Canaria, through the Centre for University Entrepreneurs,² offers support programs for the creation and development of innovative enterprises. The program puts students, researchers and teachers interested in entrepreneurship together.

University enterprise networks are configured as another instrument, where several universities are co-ordinated to organize entrepreneurial promotion activities, seeking entrepreneurial talent and developing ideas with growth potential. The aim is to get sufficient motivation for the promotion of entrepreneurship, the creation and the promotion of new projects from the University classroom, consolidation of new business initiatives and generation of knowledge transfer from the IHE to the socio-economic fabric.

² See http://www.planempleo.ulpgc.es/index_paginas.php?pagina=emprededuria.

From the [Redemprendia](#) network, formed by several universities, with the support of the Foundation of Banco Santander, innovation and entrepreneurship is promoted. This program is integrated by more than twenty Ibero-American universities, and also two public Spanish universities: the University of Valencia and The Polytechnic University of Valencia.

Professorships of entrepreneurs. Among others, the University of Sevilla,³ La Rioja,⁴ Salamanca and Zaragoza are committed to teaching, research and the analysis of the entrepreneurial activity. In these professorships, students can develop their creative and innovative spirit and can collaborate with institutions and companies.

The IHE in collaboration with business entities organize entrepreneurship programs so that students contribute their ideas towards the creation of projects and promote their business development: stimulation workshops and business advice, clubs of entrepreneurs, research projects, training courses or contests for ideas. In such forums, seminars for the development of a business plan are given, specialized counselling is provided, conferences and seminars with entrepreneurs are organised, where their experience is transmitted to young entrepreneurs, enabling access to finance and risk capital, ensuring a space for the development of their activity, etc. This is what happens, for example, at the Polytechnic University of Madrid with the Business Creation Contest UPM, *Actuaupm*.⁵

Other IHEs, like for example, the Universities of Valencia, Córdoba, Valladolid and La Laguna have been focusing for some years on summer schools for their Faculty of Teaching and Research in the field of entrepreneurship.⁶ In this case, it is the RE4 project, which comprises the Spanish Network of Motivation for students with an entrepreneurial spirit. In these activities, University entrepreneurship experiences are analysed and teachers and researchers are trained on this subject.

Another possibility is the creation of multidisciplinary teams in the field of entrepreneurship. This is the case of the “Innogestiona” programme of the University of Cádiz,⁷ which pursues the strengthening and growth of University enterprises, in order to promote entrepreneurial culture, to focus group activities and research institutes towards the economic and social environment and at the same time, enhance the generation of companies by research groups.

There is also official training in the field of entrepreneurship. The University of Mondragón (Guipúzcoa) offers a specific degree in the field of entrepreneurship,⁸ which is the degree in Entrepreneurial Leadership and Innovation. This program is based on teamwork, where the professor acts as a coach, rather than a traditional instructor.

³ See <http://institucional.us.es/ceyne/>.

⁴ See http://fundacion.unirioja.es/Catedras_subsecciones/view/6/catedra-de-emprendedores.

⁵ See <http://www.upm.es/portal/site/institucional/menuitem.e29ff8272ddf41943a75910dff46a8/?vgnnextoid=24a0f3032e93f110VgnVCM10000009c7648aRCRD>.

⁶ See http://www.fg.ull.es/es/noticia/la_red_espanola_para_la_motivacion_de_los_estudiantes_universitarios_en_espiritu_emprendedor_re4_se_reunio_el_lunes_en_la_universidad_de_la_laguna/837/.

⁷ See http://www.uca.es/recursos/doc/Unidades/Catedra_Emprendedores/7305284_2032012123321.pdf.

⁸ See <http://www.mondragon.edu/es/estudios/grados/grado-en-liderazgo-emprendedor-e-innovacion/>.

This educational model is based on the Finnish model, which is very successful worldwide, based on four aspects: dialogue, reading, action and self-management. In this degree, the students must create their own businesses, either individually or in group, in order to achieve real interaction with the business world. Moreover, all the students must carry out 2-month training at the Academy Team of Finland, in addition to training periods in the United States, China, India, Brazil or Mexico. There are also postgraduate courses in the field of entrepreneurship at the Rovira i Virgili University.⁹

Another option is University *mentoring*, which consists of successful entrepreneurs with recognised experience guiding and inspiring young university students who have just started their entrepreneurial activity. One of these examples is the *mentoring* program of the University of Valencia.¹⁰ Closely linked with the previous case are the University *business angels*, which focus on funding innovative projects, but with a high risk level, especially in the technological field. An example of this initiative is the Forum of investment R+D+i network of the Network of Universities of Valencia (RUVID).

In recent years, the IHE have supported initiatives for entrepreneurship, such as business incubators,¹¹ units in support of entrepreneurship and self-employment, professorships and permissions for the promotion of entrepreneurship, incorporation of specialists into staff, recruitment of employment and local development agents, etc. These initiatives are integrated in the Offices for Transfer of Research Results (OTRIs) of Universities, which have become the main aspects for the promotion and exploitation of the innovative capabilities of research personnel of the IHE.

University spin-offs are another alternative to university entrepreneurship, which are a recent phenomenon (Rodeiro et al., 2009). As they are enterprises which are created based on University knowledge and in geographical areas close to the campus, they provide not only the transmission of knowledge, but also the growth of local economies. The incorporation of graduates and doctors to the enterprises promotes the university-company link in both directions. Ortín and Salas (2008) point out how technological parks, business incubators and business centers try to create an enabling environment for the development of technology-based companies. In addition, it can be seen how the number of spin-offs in Spain has continued growing in the years of crisis, which is a counter-cyclical behaviour, as expected in the case of these companies, since they are alternatives to the traditional labour market for researchers whose job placement gets complicated in these phases of the cycle.¹²

Finally, it should be noted that IHE back start-ups. Such businesses are those that, despite their youth and lack of economic capacity, can easily get good results in the market as they are stimulated by other investors. Table 4.2 summarizes the basic entrepreneurship initiatives in the IHE in Spain

⁹ See http://www.urv.cat/masters_oficials/socials_juridiques/innovacio/es_master_emprenedoria_innovacio.html.

¹⁰ See <http://www.adeituv.es/noticia-mentoring-emprendedores-universitarios/>.

¹¹ In Vaquero and Ferreira (2011, 2014), it was pointed out that the European model of enterprise incubators was born out of the interest of the business sector, public sector and University, with an activity focused on business activity and advanced research.

¹² From the OTRI (1996–2009) network survey and survey ITC (2011) the evolution of the number of spin-offs has been the following: 90 (2004), 88 (2005), 143 (2006), 120 (2007), 100 (2008), 118 (2009) and 131 (2010).

Table 4.2 Initiatives that foster entrepreneurship from the IHE in Spain

Entrepreneurs program. The University entrepreneur program is taught by the Escuela de Organización Industrial (EOI) to graduate students of 47 Spanish universities. Its objective is to stimulate entrepreneurship and enhance self-employment, enabling students to meet business performance and help them to create a business plan
Entrepreneurial networks. Through the University entrepreneurship network of Catalan public universities, the aim is for IHE to promote and give support to students' entrepreneurial initiatives. This activity is coordinated by the University of Barcelona
The network Redemprendia, formed by several universities, with the support of the Foundation of Banco Santander, promotes innovation and entrepreneurship
Professorships of entrepreneurs. In these professorships, students can develop their creative and innovative spirit and can collaborate with institutions and companies
Clubs of entrepreneurs. The University of Navarra has set up an ongoing training platform, which offers students tools for their future career. The students are put in contact with the business world, providing them professional experience. Thus, among other activities organised are business lunches, contests for entrepreneurs, etc.
Workshops for entrepreneurs. They are activities held regularly in the IHE, which give information on the basics of entrepreneurship
Contests of university student entrepreneurs. The aim is for students and Faculty of Teaching and Research to promote their business projects, promoting the spirit and the culture of entrepreneurship, enhancing the implementation of business ideas and strengthening the relationship between entrepreneurs and business support agencies. The objective is to promote the entrepreneurial spirit and boost innovative capacity, by even awarding prizes to the best business plans
Summer schools for lecturers and researchers in entrepreneurship. It aims at training lecturers and researchers in entrepreneurship, with the aim of getting them to encourage entrepreneurship among students in the university classrooms and laboratories
Creation of multidisciplinary teams in entrepreneurship. It promotes the entrepreneurial culture through multidisciplinary teams from different areas of knowledge
Degree and postgraduate programs in entrepreneurship. The University of Mondragón offers degrees in entrepreneurial leadership and innovation. The University Rovira i Virgil offers a Master in entrepreneurship and innovation
<i>Mentoring.</i> Program for university entrepreneurs, where successful company representatives tell the students their own experiences. It involves entrepreneurs with a long career and experience helping young entrepreneurs with their ideas and tips
<i>Business Angels.</i> It aims at closer links between University entrepreneurs and entities or people who want to invest in new initiatives, despite the risk involved. It is an innovative initiative. This is the case of the RUVID
<i>Business incubators.</i> These are places where the installation of a company is possible during the first years
<i>Spin-offs.</i> They are business initiatives promoted by the University community, based on the knowledge gained and work results achieved in the University. This alternative allows the transfer of knowledge from the IHE to the business fabric, while providing an additional income to the university institution with spin-offs
<i>Start-ups.</i> They are business projects associated with technologically-based initiatives and an intensive use of business innovation

Source: Red Emprendia and compiled by authors

4.5 Recommendations

On the basis of the above throughout this chapter, it is clear that the IHE have the responsibility of focusing their training capacity towards the needs of the economic and social fabric. This must always be the main goal, with a greater need in situations with a serious problem of adjustment between labour supply and demand. If today's companies are not able to absorb university graduates, it is time to support new business initiatives linked to the academic world. Failure to do so would mean the assumption of public and private costs of our students' which does not generate any return.

Therefore, the IHE should offer quality training that meets the market needs and reorient their lines and research projects in order for companies to use part of their funds for university activities. Therefore, the aim is for the IHE to achieve useful knowledge which is demanded by the market, and in addition generate entrepreneurs.

In Spain, some steps have already been taken in this regard, but we are at a level of development far below the experiences that are observed at European level. The transfer of technology from the Spanish IHE is a fact, but it is on a small scale and some mistakes have been made. Thus, entrepreneurial activities only focus on technical and business degrees and post-degrees, as if the graduates and students that do them, are the only ones who can be entrepreneurs. Nothing could be further from the truth. Entrepreneurship must be present, to a greater or lesser extent, in all degrees, in the most technical degrees as in the humanistic ones.

In Spain, entrepreneurial culture is unsuccessful. Our country is an example of clear examples of people who after completing their university education have opted for entrepreneurship and have been successful, but there are just a few examples. Certainly, lack of entrepreneurial training is, at least in part, to blame for this situation.

Much has been said about the importance of entrepreneurship, of the need for young people to be entrepreneurial (European Union, 2014), but the truth is that many times these good wishes do not come true. Six years have had to pass for there to be a law that promotes entrepreneurship, [Law 14/2013](#), of 27 September, supporting entrepreneurs and their internationalization, but the results to date, must be qualified, in the best of cases, as very discrete. Continuous cutbacks in higher education, both by the Central Executive, and regional Governments, which have an impact on the budgets of the IHE in Spain, do not help to promote entrepreneurship. From 2008 to 2012 (which is the latest data released by the Ministry of Education, Culture and Sport), public expenditure on higher education in Spain has been reduced by 1.169 million Euros. In terms of GDP, Spain has gone from spending 0.93 % of public expenditure on higher education in 2008 to 0.87 % in 2012. If you really want to support entrepreneurship in the IHE, this cannot be achieved, by cutting public funds in education, research and transfer.

A change in the learning model regarding entrepreneurship in Spain is required. Thus, there is still a sharp polarization of these activities using traditional teaching. It is difficult to foster innovation and entrepreneurship by examining students using the traditional model of learning and assessment. If you want to teach how to be entrepreneurial, it is necessary for the student, with appropriate guidelines, to establish his/her own "route sheet" in the entrepreneurial field. Therefore, it is

essential to use in greater profusion, techniques such as coaching, learning by doing and collaborative team learning, which work very well. Only then will it be possible to make true entrepreneurs. Greater collaboration of the IHE with the business fabric is essential. Of course, University researchers must continue seeking excellence in their scientific production, by achieving publications of high impact at international level, getting funds through public tenders, increasing their number of 6-year periods. However, the above is perfectly compatible with a research and transfer strategy more focused on reality. There is an increasing need to opt for passing on knowledge to the socio-economic fabric. It is not a question of supporting a scientific or entrepreneurial University, as both performances are perfectly compatible and necessary.

Not only will more resources be achieved this way, but also the citizens will realize that public funds given to the IHE are well used. The IHE must be capable of generating many and good entrepreneurs, and this is the responsibility of all those that are part of the University community.

It is advisable for the IHE to take advantage of the synergies derived from multiple instruments for the promotion of entrepreneurship. There are already public and private institutions that offer business incubators, *business angels*, advice, international entrepreneurship programs, being necessary for the IHE to be integrated into these regional, national and international networks, which even though they are not yet exclusive to university graduates, can help them to be entrepreneurial.

4.6 Conclusions

As noted in this chapter, the economic and social progress is a consequence of innovation boosted by entrepreneurs, being the IHE one of the appropriate frameworks for the development of this activity.

The process of change in the IHE of promotion of entrepreneurship is increasingly more present, especially in some European countries, though to a lesser extent in Spain.

All those involved in the University community have responsibility in the change of model, based on entrepreneurship and focused on innovation and applied research, the so-called third function of the IHE.

Within this new framework the IHE should keep in mind that the creation of employment and wealth is necessary if you want to emerge from the economic crisis the best way. This should not mean a breakage of the traditional role of the IHE, but a complement to its multiple activities. Therefore, knowledge transfer is increasingly more important, which requires a joint effort of all those involved in the IHE, in collaboration with the business sector.

It should not be ignored that the IHE are a key element for the economic recovery. The IHE have the human and material resources to innovate, improve productivity, and promote entrepreneurship. The fact that over 40 % of entrepreneurship is carried out by graduates of the IHE, is sufficient for educational managers support this activity. The enterprise should be a tool for the development of innovation, which enables its practical application to the business fabric, making a change in the

exhausted Spanish production model possible, which results in increased competitiveness and internationalisation.

Although there is still a long way to go, we have to admit that fortunately, something is changing. Far are those years when entrepreneurship and innovation were out of the actions of the IHE. Proof of this is that in Spain there are increasingly more actions for the promotion of entrepreneurship: training programs, networks, Professorships, clubs, *mentoring*, business incubators, *spin-offs*, etc.

The Spanish position on entrepreneurship is far from the achievements already consolidated in most European countries. However, entrepreneurship is increasingly something more natural day by day in the IHE. It is true that university entrepreneurship is a relatively new field in Spain, but the reality shows us the need to further deepen its study. It should take the example of other countries and apply these experiences properly in Spain. It is not necessary to invent anything, we must learn to adapt to what has worked in other countries, especially in the EU.

For all of the above, the IHE should understand that entrepreneurship is part of their mission and that their contribution is necessary for the change of the economic model and the generation of wealth and employment. To achieve this, it is necessary for university governance programs to include this third feature of IHE, so demanded by society.

References

- Bailetti, T. (2011). Fostering student entrepreneurship and university Spinoff companies. *Technology Innovation Management Review*, October, 7–12. Retrieved from <http://timreview.ca/article/485>.
- Banja, J. (2000). *No conflict, no interest. Ethical considerations in technology transfer*. Retrieved December 22, from http://www.emory.edu/acad_exchange/2000/febmar/banja.html.
- Bretones, F. (2009). *Comportamiento emprendedor en el ámbito universitario*. Granada: Service of publications of the University of Granada.
- Cano, C. J., García, J., & Gea, A. B. (2003). *Actitudes emprendedoras y creación de empresas en los estudiantes universitarios*. Almería: Service of publications of the University of Almería.
- Casani, F., Pérez Esparrells, C., & Rodríguez-Pomeda, J. (2010). Nuevas estrategias económicas en la universidad desde la responsabilidad social, *Revista Calidad en la Educación*, 33, 255–273. Santiago de Chile: National Council of education. Retrieved from http://www.cned.cl/public/Secciones/SeccionRevistaCalidad/doc/68/cse_articulo964.pdf.
- Clark, B. R. (1998). *Creating Entrepreneurial Universities. Organisational pathways of transformation*. Oxford: Elsevier.
- Clark, B. R. (2004). *Sustaining Change in Universities: Continuities in case studies and concepts*. Maidenhead: Open University Press.
- Comisión Europea. (2013). Comunicación de la Comisión al Parlamento Europeo, al Consejo, al Comité Económico y Social Europeo y al Comité de las Regiones Plan de acción sobre emprendimiento 2020. *Relanzar el espíritu emprendedor en Europa*, Brussels. Retrieved from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0795:FIN:ES:PDF>.
- CRUE. (2010a). *La Universidad Española en cifras 2010*, Madrid. Retrieved from <http://www.crue.org/Publicaciones/Paginas/UEC.aspx?Mobile=0>.
- CRUE. (2010b). *Encuesta red OTRI (1996–2009)*, Madrid. Retrieved from http://www.crue.org/Publicaciones/Documents/Informe%20Redotri/INFORME_ENCUESTA_2011%20RedOTRI.PDF.

- CRUE. (2011). *Encuesta Informe de la Encuesta de Investigación y Transferencia de Conocimiento 2011 de las Universidades Españolas*, Madrid. Retrieved from http://www.crue.org/Publicaciones/Documents/Informe%20Redotri/Informe_Encuesta_2010.pdf.
- Etzkowitz, H. (1998). The norms of entrepreneurial science: Cognitive effects of the new university–industry linkages. *Research Policy*, 27(8), 823–833.
- Etzkowitz, H. (2004). The evolution of the entrepreneurial university. *International Journal of Technology and Globalisation*, 1(1), 64–77.
- Etzkowitz, H., & Klofsten, M. (2005). The innovation region: Toward a theory of knowledge-based regional development. *R & D Management*, 35(3), 243–255.
- Etzkowitz, H., & Leydesdorff, L. (1997). *Universities and the global knowledge economy: A triple helix of university-industry-government relations*. London: Pinter.
- European Commission. (2002). *Final Report of the Expert Group Best Procedure Project on Education and Training for Entrepreneurship*. Brussels: Directorate-General for Enterprise. Retrieved from http://ec.europa.eu/enterprise/policies/sme/files/support_measures/training_education/education_final_en.pdf.
- European Union. (2014). *Erasmus for Young Entrepreneurs*. Brussels: European Union. Retrieved from <http://www.erasmus-entrepreneurs.eu/index.php?lan=es#.VK-3M9KG914>.
- Fernández, S. (2004). Vínculos entre financiación y organización: Análisis comparado de la Universidad española. *Education Policy Analysis Archives*, 12(63). Retrieved from <http://epaa.asu.edu/epaa/v12n63>.
- Fundación Universidad-Empresa. (2012). *Educación emprendedora: Buenas prácticas internacionales*, Madrid. Retrieved from <http://www.fue.es/50545212/50707644224.pdf>.
- Gibb, A. (2005). Towards the Entrepreneurial University. Entrepreneurship Education as a lever for change. *NCGE Policy paper series*, 15. Retrieved from http://ncee.org.uk/wp-content/uploads/2014/06/towards_the_entrepreneurial_university.pdf.
- Gibb, A. (2012). Exploring the synergistic potential in entrepreneurial university development: Towards the building of a strategic framework. *Annals of Innovation Entrepreneurship*, 3, 1–21. Retrieved from <http://journals.co-action.net/index.php/aie/article/view/16742>.
- Global Entrepreneurship Monitor. (Several years). *Informes GEM España*, Madrid. Retrieved from <http://www.gem-spain.com/?q=Informes%20GEM%20Nacionales>.
- Hayes, D., & Wynyard, R. (Eds.). (2002). *The McDonaldisation of higher education*. Westport, CT: Bergin and Garvey.
- Hoskinson, R., Covin, J., Volverda, H., & Johnson, R. (2011). Revitalizing entrepreneurship: The search for new research opportunities. *Journal of Management Studies, Special Issue: Revitalizing Entrepreneurship*, 48(6), 1141–1168. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-6486.2010.00997.x/abstract>.
- Huanca-Lopez, R. (2004). La investigación universitaria de países de desarrollo y la visión de los académicos sobre la relación Universidad-Empresa. *Doctoral thesis*, Polytechnic University of Valencia.
- Law 14/2013, of 27 September, support for entrepreneurs and its internationalization*. Retrieved from https://www.boe.es/diario_boe/txt.php?id=BOE-A-2013-10074.
- Law 39/2010 of 22 December, the State budget for the year 2011*. Retrieved from https://www.boe.es/diario_boe/txt.php?id=BOE-A-2010-19703.
- Martin, B., & Etzkowitz, H. (2000). The origin and evolution of the university species. *VEST*, 3–4(13), 7–32. Retrieved from <https://www.sussex.ac.uk/webteam/gateway/file.php?name=Fac-BRM-VEST-Uni&site=25>.
- Maskell, D., & Robinson, A. (2002). *The new idea of a university*. Thorverton: Imprint Academic.
- Ministry of Education. (2010). *Estrategia Universidad 2015*. Contribución de las universidades al progreso socioeconómico español, Madrid. Retrieved from http://www.uab.cat/doc/DOC_cei_estrategia2015_edicio2011.
- Napolitano, M. R., & Riviezzo, A. (2008). The institutional education and training for entrepreneurship development in the Italian universities. *International Journal of Entrepreneurship and Innovation Management*, 8, 665–685.

- Ortín, P., & Salas, V. (2008). La creación de Spin-off universitarios en España: Características, determinantes y Resultados. *Revista de Economía Industrial*, 368, 79–95. Retrieved from <http://www.minetur.gob.es/Publicaciones/Publicacionesperiodicas/EconomiaIndustrial/RevistaEconomiaIndustrial/368/79.pdf>.
- Ortín, P., Salas, V., Trujillo, M., & Vendrell, F. (2007). El spin-off universitario en España como modelo de creación de empresas intensivas en tecnología. *Internal report, Ministry of Industry, Trade and Tourism*, Madrid. Retrieved from <http://www.ipyme.org/Publicaciones/Informe%20spinnoff.pdf>.
- Pérez García, F., & Serrano Martínez, L. (2012). *Universidad, Universitarios y productividad en España*. Madrid: Fundación BBVA. Retrieved from http://www.fbbva.es/TLFU/dat/Monografia_Universidades_2012_web_cerrado.pdf.
- REDEMPRENDIA. (2012). *100 buenas prácticas de emprendimiento universitario*, Madrid. Retrieved from http://www.redemprendia.org/sites/default/files/descargas/100_buenas_practicas_en_emprendimiento_universitario.pdf.
- Roberts, P. (2002). The virtual university and ethical problems in downsizing. *Ethicomp 2002*, Lisbon, Portugal. Retrieved from <http://www.ccsr.cse.dmu.ac.uk/conferences/ethicomp2002/abstracts/49.html>.
- Rodeiro, D. (2008). La creación de empresas en el entorno universitario español. *Doctoral Thesis*, University of Santiago de Compostela. Retrieved from https://dspace.usc.es/bitstream/eam/10347/2413/1/9788497509954_content.pdf.
- Rodeiro, D., Fernández, S., Otero, L., & Rodríguez, A. (2009). Factores determinantes de la creación de spin-offs universitarias. *Revista Europea de Dirección y Economía de la Empresa*, 19(1), 47–68.
- Röpke, J. (1998). The Entrepreneurial University. Innovation, academic knowledge creation and regional development in a globalized economy, *Working Paper*, no. 3, Department of Economics, Philipps-Universität Marburg. Retrieved from <http://etc.online.uni-marburg.de/etc1/010.pdf>.
- Rothaermel, F., Shanti, D., & Lin, J. (2007). University entrepreneurship: A taxonomy of the literature. *Industrial and Corporate Change*, 16(4), 691–791. Retrieved from <http://scheller.gatech.edu/directory/faculty/rothaermel/pubs/07ICC.pdf>.
- Salas, C., Aguilar, I., & Susunaga, G. (2000). El papel de la innovación en el desarrollo económico regional: Algunas lecciones y experiencias del contexto internacional. *Transferencia*, 13(49), Enero.
- Slaughter, S., & Leslie, L. (1997). *Academic capitalism: Politics, policies, and the entrepreneurial university*. Baltimore: Johns Hopkins University Press.
- Vaquero, A., & Ferreiro, J. (2011). Los viveros gallegos como instrumento de desarrollo local: Situación actual y líneas futuras de mejora. *Revista Galega de Economía*, 20(1), 1–23. Retrieved from https://www.usc.es/econo/RGE/Vol20_1/castelan/art8c.pdf.
- Vaquero, A., & Ferreiro, J. (2014). Rentabilidad económica de los viveros de empresa en Galicia. *Boletín económico del ICE*, 3049(march), 43–53. Retrieved from http://www.revistasice.com/CachePDF/BICE_3049_43-54__713327990179DFCC9FA609F005C93BFC.pdf.

Chapter 5

The Influence of University Context on Entrepreneurial Intentions

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Mari-Cruz Sánchez-Escobedo, and Ricardo Hernández-Mogollón

Abstract Studies have shown the influence of certain formal and informal environmental factors on entrepreneurial spirit. The aim of this research was to study the influence of university context on university students' entrepreneurial intentions. A structural model linking these two environmental variables to entrepreneurial intention was developed and used to achieve this aim. These two environmental variables were university context, which measured informal aspects, and entrepreneurial education, which reflected formal aspects. The relationships in the model were tested using partial least squares (PLS) analysis for a sample consisting of 2497 university students. Results highlight the importance of entrepreneurial education's effect on entrepreneurial intentions. To a lesser degree, results also reveal the importance of the university environment in which the student develops. The university context strongly and positively influences entrepreneurial intentions indirectly through entrepreneurial education. This chapter offers a novel methodological contribution in the study of data from the Global University Entrepreneurial Spirit Students' Survey. The data were analysed using an application of PLS structural equation modelling.

Keywords Attitudes • Beliefs • Education • Entrepreneurial education • Entrepreneurial intentions • Entrepreneurial University • Entrepreneurship • Environmental factors • Formal factors • Global University Entrepreneurial Spirit Students' Survey • GUESSS • Human behaviour • Informal factors • Institutional context • Intentions • Partial least squares • Planned behaviour • PLS • Theory of planned behavior • University context

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5.1 Introduction

Entrepreneurial activity is becoming an increasingly important issue for many governments worldwide, as well as in academia. The fact that business creation can contribute to economic growth (Sobel, 2008), create jobs (Fritsch & Noseleit, 2013), and boost innovation (Reynolds, Storey & Westhead, 1994) explains this interest from both public and private spheres. One of the ways this interest has been channelled to encourage business creation has been through higher education, and for several years, studies have in fact been documenting the relationship between educational attainment and business creation (Alvarez & Urbano, 2012). Furthermore, as part of its non-traditional third mission, the university is playing an increasingly important role in entrepreneurial development (Clark, 1998) based on commercializing the university's technological resources and creating value for society (Bueno & Casani, 2007).

Despite the quantity of resources and efforts expended on entrepreneurship, the reality is that only 4% of university graduates create a business immediately after they graduate (Peña, Guerrero, & González-Pernía, 2014). In addition, innovation systems within European universities still lack the necessary competition, particularly in terms of public to private knowledge and technology transfer and technology-based business creation (spin-offs and start-ups) (Rubiralta, 2004). The average spin-off creation per European university is 1.6 compared to 2.96 per North American university (Iglesias, Jambrino, & Peñafiel, 2012).

Against this backdrop, a need has emerged to learn more about the role of the university in society, especially in terms of how university context and entrepreneurship education drive business creation by university students. Such knowledge can ensure a more efficient distribution of resources aimed at business creation.

Many authors have studied the influence of the university context in entrepreneurial activity from a sociological standpoint, highlighting the importance of university context as determining the behaviour and decisions of individuals when creating businesses (Bruno & Tyebjee, 1982; Burch, 1986; Gómez & Salmerón, 2011; Kent, 1984; Manolova, Eunni, & Gyoshev, 2008). Specifically, applying the theory of institutional economics (North, 1990, 2005) to business creation, as several authors have already done (Aidis, Estrin, & Mickiewicz, 2008; Diaz, Urbano, & Hernández, 2005; Veciana & Urbano, 2008; Welter, 2011; among others), scholars have found that contextual factors influence entrepreneurial activity. Some of these factors are formal (legislation, education system, business creation courses, entities and programmes to support entrepreneurs, etc.), and some are informal (entrepreneurial spirit, attitudes towards business creation, entrepreneurial motivation, etc.). Nevertheless, the relationship between contextual factors and entrepreneurship is complex, which means that further research to test this hypothesis is necessary (Arenius & Minniti, 2005).

Research on the effect of education on entrepreneurship has failed to show conclusively whether education stimulates or hinders entrepreneurial intention because scholars have found evidence of both effects (Oosterbeek, Van Praag, & Ijsselstein,

2010; Peterman & Kennedy, 2003; Tkachev & Kolvereid, 1999). Nonetheless, it seems evident that education gives students better awareness of their potential to create a business and fosters determination to fulfil their intentions (Von Graevenitz, Harhoff, & Weber, 2010).

In the specific case of university students, most attempts at analysing entrepreneurial initiative have been from a psychological standpoint, which depicts intention as a predictor of goal-oriented planned behaviour, especially in the long term (Ajzen, 1991, 2002; Ajzen & Fishbein, 1980). Two models have proved most popular for performing this analysis: Shapero and Sokol's (1982) theory of entrepreneurial event and Ajzen's theory of planned behaviour Ajzen (1987, 1991). Both theories present intention as an antecedent of behaviour, derived from certain cognitive variables (attitude, perceived desirability and viability, perceived behavioural control, etc.) that authors have been unable to agree upon (Liñán & Chen, 2009). In addition to this lack of consensus, the academic community has criticized the use of convenience sampling of university students (Hemmasi & Hoelscher, 2005; Muñoz-Adánez, 1997, 1999).

These shortcomings of the current research highlight a considerable gap in the literature on antecedents of entrepreneurial intentions. The aim of this study was therefore to empirically test the influence of university context and entrepreneurial education on the entrepreneurial intentions of university students. Our main contribution is to highlight the influence of university context and entrepreneurial education on business creation by university students.

The context directly and indirectly conditions entrepreneurial intentions through entrepreneurial education. Likewise, entrepreneurial education is particularly effective at explaining entrepreneurial intentions. The informal factors of university context and/or a climate conducive to entrepreneurship within the university may inspire students to crystallize new ideas and may motivate them to become involved in entrepreneurial activity. Simultaneously, within this context, educational courses and programmes can affect students' entrepreneurial attitudes, values, and motivations, increase students' understanding, practical skills, and management in business creation, develop networks, and help students to identify opportunities.

We present a methodological contribution by applying partial least squares (PLS) structural equations modelling (SEM) to the analysis of a sample from the project GUESSS.¹ We first present the research model and hypotheses. We then describe the research method. Following this, we present the results of the data analysis. Finally, we offer a discussion of our results and present conclusions and limitations.

¹GUESSS (Global University Entrepreneurial Spirit Student's Survey) is a global research project analysing student's entrepreneurial initiative. Its aim is to assess entrepreneurial intention in the choice of degree and the activity of university students using comparisons across different locations and over time. Six waves of the survey have taken place—one every 2 years since 2003. In 2013, more than 500 universities from 34 countries took part in the survey. The GUESSS project is led by the Swiss Institute for Small Business and Entrepreneurship (HSG-KMU) and the Center for Family Business (CFB-HSG) at the University of St. Gallen, Switzerland.

5.2 Research Model and Hypotheses

The research model appears in Fig. 5.1. The aim of this model was to empirically test three hypotheses describing the influence of university context and entrepreneurial education on entrepreneurial intentions of university students.

The university context refers to the way in which the university creates a favourable climate for entrepreneurship, inspires students to develop ideas for new businesses, and motivates students to become involved in entrepreneurial undertakings. Entrepreneurial education refers to the way in which university systems provide the tools necessary to teach business creation and management through syllabuses, in particular increasing the understanding of entrepreneurial spirit and of entrepreneurial actions. This teaching should provide the student with practical administrative and/or management skills required to start a business, develop networks, or identify opportunities. Finally, entrepreneurial intention refers to a genuine, clear demonstration by a student that he or she wishes to start a business. In doing so, students show they are prepared to do anything to become an entrepreneur, that this is their professional goal, that they will do anything to create and run their own business, or that they are determined to create a business in the future.

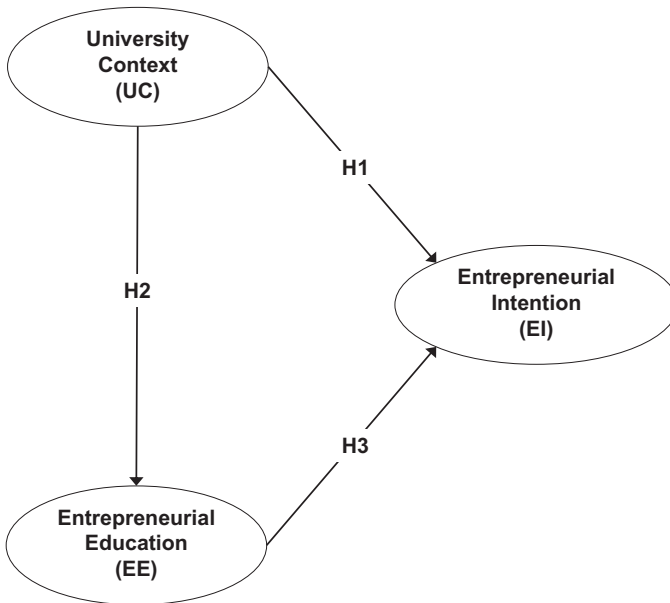


Fig. 5.1 Research model and hypotheses. Source: Author's

5.2.1 University Context as a Determinant of Entrepreneurial Intention

The development of entrepreneurial spirit occurs in a given context, time, and place. Therefore, the entrepreneur is defined by the moment, general and personal financial circumstances, and place and context. In short, the institutional context conditions human behaviour. For North (1990, 2005), institutional context is the set of formal rules of the game (laws, programmes, guidelines, etc.) and informal rules of the game (values, ideas, attitudes, social conventions, etc.) that regulate relationships between humans, aimed at reducing the uncertainty of daily life. Therefore, the entire institutional framework affects people's mental schemas, beliefs, attitudes, and intentions, all of which are considered important predictive factors of entrepreneurial behaviour (Ajzen, 1991, 2002).

Therefore, if the social and institutional context and values influence cognition, culture acts as an important factor. Indeed, according to Shapero and Sokol (1982), culture is paramount because, as they argue, the creation of a business is a result of social and cultural factors—not only national, regional, and local culture, but also the cultural aspects of organizations such as universities. Organizational culture, the context or environment within which organizations operate, may affect people's mental schema and intentions, thereby acting as a key factor in predicting entrepreneurial behaviour (Adler, Doktor, & Redding, 1986).

Labarca and Pérez (2009) argue that the presiding culture in universities should reward entrepreneurial behaviour and should encourage creativity, innovation, risk-taking, the discovery of opportunities, and so forth, such that the university context encourages an entrepreneurial attitude among students.

Entrepreneurial intentions are considered the first step in the long process of creating and building organizations by entrepreneurs. Entrepreneurial intentions have therefore been extensively studied among the university student population because students are highly representative of individuals with intentions and attitudes aimed at creating businesses and are at a crucial point regarding their professional career path (Krueger, 1993; Krueger, Reilly, & Carsrud, 2000).

These observations lead to the following hypothesis:

H1: University context positively affects entrepreneurial intention

5.2.2 University Context as a Determinant of Entrepreneurial Education

The current education system is experiencing growing pressure from the business environment, forcing the education system to produce a workforce that is flexible and creative, seeks opportunities, pursues goals, and is capable of taking decisions (Gibb, 2011). UNESCO (1998) mentions that higher education should be

strengthening co-operation with the world of work and should incentivize actions to developing entrepreneurial skills and initiative should become major concerns of higher education. The European Commission (2006) has spoken out on learning and entrepreneurial spirit in a similar vein, urging young Europeans to become the entrepreneurs of the future.

Universities themselves, within their third mission (Clark, 1998), are attempting to strengthen ties with business using different strategies and focuses. The importance of entrepreneurship in higher education is considerable, with entrepreneurship featuring in the three functions of the university, particularly education and training, which is a formal and informal part of the education system. This has meant widespread changes in university culture, organization, and relationships with surroundings (Villarreal & García, 2004). These changes have been used by universities to improve institutional opportunities. But the wholesale adoption of an entrepreneurial culture means a profound change that affects universities' identities, both outwardly and in terms of internal organization. Therefore, being able to install an entrepreneurial culture implies adopting structural measures that foster entrepreneurship through and throughout the university's three main functions: teaching, research, and social outreach (Villarreal & García, 2004).

Today, the main challenge for organizations, and by extension for universities, is creating a culture that enables organizational learning oriented towards intrapreneurship (Garzón-Castrillón, 2011). One of the enablers of organizational learning is the creation of a culture that encourages critical thinking, experimentation, innovative proposals, and the like (Chiva & Camison, 2002). It therefore seems necessary to develop a university context that fosters entrepreneurial spirit in people within the organization. Universities should not ignore the fostering of creativity in their students, but should instead train students to develop a strong capacity to produce ideas and solve problems.

Recent studies have shown a relationship between higher educational attainment and business creation (Mueller, 2006; Wagner & Sternberg, 2004). Other researchers have found empirical evidence that individuals with greater formal educational attainment are more likely to become entrepreneurs and run businesses that have greater chances of growth and survival (Jo & Lee, 1996; Robinson & Sexton, 1994; Yusuf, 1995). Scholars have also reported evidence to the contrary (Stuart & Abetti, 1990).

Nonetheless, there seems to be a consensus that universities should offer entrepreneurial training in a suitable context such that this programme may be as effective as possible. This favourable university environment should include science parks, incubators, entrepreneurship chairs, competitions, international programmes, virtual platforms, networking sessions, contact with technology-based entrepreneurial ventures, curricular and non-curricular teaching, and so forth.

These observations lead to the following hypothesis:

H2: The university context positively affects entrepreneurial education

5.2.3 Entrepreneurial Education as a Determinant of Entrepreneurial Intention

Entrepreneurial education programmes, aimed at promoting entrepreneurial spirit and business creation, have emerged and spread widely in recent years (Athayde, 2009; Bae, Qian, Miao, & Fiet, 2014; Fayolle, 2013; Souitaris, Zerbinati, & Al-Laham, 2007).

Martin, McNally, and Kay (2013) showed the existence of a direct or indirect link between entrepreneurial education and the intention to start a business, suggesting that the teaching activities aimed at encouraging entrepreneurial attitude seem to influence individuals' confidence and self-esteem (Ruiz, García, & Delgado, 2014; Sánchez, 2011; Volery, Müller, Oser, Naepflin, & Rey, 2013). Alvarez and Urbano (2012) and Zhang, Duysters, and Cloudt (2014) report a positive influence of entrepreneurial education on entrepreneurial intention and on the improvement of the capability to recognize opportunities in the environment.

Numerous studies have sought to determine the effect of entrepreneurial education on the entrepreneurial potential of students, which is evidence of the growing maturity of the academic discipline (Katz, 2003). Crant (1996) validated the hypothesis that education was positively associated with entrepreneurial intentions. Years later, Peterman and Kennedy (2003) measured the effect of entrepreneurial education on potential entrepreneurial intentions to start a business, observing strong relationships. Dutta, Li, and Merenda (2011) reported similar findings, namely that specialized entrepreneurial education has a positive relationship with students' predisposition to create a business in the future.

Nevertheless, some analyses go further by trying to determine the most suitable approaches, contents, and methods to develop entrepreneurial intentions among university students who contemplate undertaking an entrepreneurial venture at some point in their life (Do Paço, Ferreira, Raposo, Rodrigues, & Dinis, 2011, 2015; Souitaris et al., 2007). For example, Audet (2004) reports that only 8% of English-speaking students at the University of Quebec would try to start a business in the short term, whereas 45% claimed there was a 75% probability that they would start their own businesses one day. These findings are consistent with those of studies in Russia and Norway (Kolvereid, 1996; Tkachev & Kolvereid, 1999) and those of the study by Hattab (2014), who assessed whether and how entrepreneurial education affected entrepreneurial intentions among university students in Egypt. The study showed a positive relationship between entrepreneurial education and intentions and perceived desirability. Results failed to show a relationship with perceived viability or self-efficacy.

These observations suggest the following hypothesis:

H3: Entrepreneurial education positively affects entrepreneurial intention

5.3 Method

5.3.1 Survey Questionnaire and Sample

The data used in this study came from the *Global University Entrepreneurial Spirit Student's Survey* (GUESSS) international research project, which explores the entrepreneurial intentions and activity of university students in several countries.

The scales used to collect data on the variables were based on those proposed by Liñán and Chen (2009). We used 7-point Likert-type scales. For university context and education, the scales ranged from 1 = *not at all important* to 7 = *highly important*. The scale used to measure entrepreneurial intention ranged from 1 = *strongly disagree* to 7 = *strongly agree*.

University context was measured using three items: (1) The environment at my university inspires me to develop ideas for new businesses. (2) My university offers an environment conducive to my becoming an entrepreneur. (3) At my university, the students are motivated to become involved in entrepreneurial activity.

Entrepreneurial education was measured using five items: The courses I attended and the services I used... (1) ...increased my understanding of attitudes, values, and motivations of entrepreneurs. (2) ...improved my understanding of the actions needed to start a business. (3) ...improved my practical, administrative, and management skills for starting a business. (4) ...increased my ability to network. (5) ... improved my ability to identify an opportunity.

Finally, entrepreneurial intentions were measured using six items: (1) I am capable of doing anything to become an entrepreneur. (2) My professional goal is to become an entrepreneur. (3) I will do everything I can to create and run my own business. (4) I am determined to create a business in the future. (5) I have thought very seriously about starting a business. (6) I have a clear intention to create a business one day.

The questionnaire was anonymous. Respondents completed the questionnaire by responding online to ordinal response variables. The questionnaire was sent to all students at the University of Extremadura. Data were collected from 18 October 2013 to 21 January 2014.

We received 2497 completed questionnaires. Table 5.1 presents the technical data sheet for the survey.

Table 5.1 Technical data sheet for the survey

Universe	22,814 students
Sample	2497 students
Method	Online questionnaire
Sampling error (+/-)	±2.2 %
Confidence level	97 %
Fieldwork period	October 2013 to January 2014
Data analysis tool	Smart PLS v. 2.0.M3

Hypothesis: $p=q=50\%$ or maximum uncertainty

Source: Author's

5.3.2 Data Analysis

To test the hypotheses, we used multivariate analysis. Specifically, we used variance-based partial least squares (PLS) structural equations modelling (SEM). We used Smart PLS vs. 2.0.M3 (Ringle, Wende, & Will, 2005) to analyse the data. PLS was suitable (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014; Sanz, Ruiz, & Aldás, 2008) because of the specific nature of analysis into entrepreneurial intentions and because the study was aimed at prediction, namely explaining the behaviour of the dependent variable (Roldán & Sánchez-Franco, 2012). Likewise, PLS is a suitable technique for highly complex structural models, and the existence of formative and reflective indicators makes this method suitable for our analysis. In light of the previous arguments, the current study examined how university context and entrepreneurial education affect entrepreneurial intentions.

5.4 Analysis of Results

Our model comprised variables whose indicators were reflective and formative. We first analysed the validity and reliability of the instruments used to measure the reflective variables. As per Sanz et al. (2008), we checked the individual reliability of each construct by confirming that Cronbach's alpha (Cronbach, 1951) was greater than 0.7 (Churchill, 1979; Nunnally & Bernstein, 1994). Likewise, we checked for composite reliability (Fornell & Larcker, 1981; Werts, Linn, & Jöreskog, 1974) by ensuring that values were greater than 0.6 (Bagozzi & Yi, 1988), although other authors have suggested that composite reliability values should be greater than 0.7 during initial stages and greater than 0.8 for basic research (Nunnally, 1978; Roldán & Sánchez-Franco, 2012). Next, we performed convergent validity analysis (significance and size of loadings, average variance extracted—AVE) using the AVE, whose values should be greater than 0.5 for each variable (Fornell & Larcker, 1981). Loadings should be greater than 0.7 (Hair et al., 2014). Data for these variables appear in Table 5.2.

To complete the evaluation of the measurement instruments for the reflective variables, we analysed discriminant validity using the cross-loadings of a given indicator with all latent variables. As highlighted by Fornell and Larcker (1981) and

Table 5.2 Analysis of reliability and discriminant validity

Latent variable	AVE	Composite reliability	Cronbach's alpha
Entrepreneurial education	0.776	0.945	0.928
University context	0.831	0.937	0.898
Entrepreneurial intentions	0	0	0

Source: Author's

Sanz et al. (2008), in operational terms, the process consists of comparing the AVE between each pair of factors with the square of the estimated correlation between the same factors. The corresponding data appear in Table 5.2.

In addition, we analysed the validity and reliability of the measurement instruments of the formative variables, using the criteria set forth by MacKenzie, Podsakoff, and Jarvis (2005). As per Sanz et al. (2008), we analysed collinearity in SPSS (Smart PLS does not perform this analysis by default). Adopting Belsley's (1991) method, we used a combination of condition indices and the variance decomposition proportion, using a proportion threshold of 0.5.

To analyse the structural model, we examined the significance of the structural relationships using bootstrapping with 5000 sub-samples (Hair et al., 2014) such that significant results constituted empirical support for the relationships posited in the hypotheses. Next, we examined the percentage of variance of the dependent latent variable, namely entrepreneurial intentions, which was explained by the constructs predicting it. According to Falk and Miller (1992), the value of R^2 should be greater than or equal to 0.1, while according to Sanz et al. (2008), the interpretation of the minimum value depends on the context of the study. Finally, we analysed the predictive relevance of the model using blindfolding, requiring positive values of Q^2 (Hair et al., 2014). The corresponding data appear in Table 5.3.

Regarding the model's predictive relevance for the endogenous latent variable, the variance of entrepreneurial intentions explained by the constructs predicting it (R^2) was equal to 0.108, which is greater than the threshold of 0.1 (Falk & Miller, 1992). Furthermore, according to the Stone-Geisser test, the value of Q^2 was positive (0.057). Hence, as per Hair et al. (2014), the model exhibits predictive relevance.

In terms of the variance explained by the dependent variables, the variable entrepreneurial education had a moderate value, whereas the endogenous variable entrepreneurial intentions had a low value. These values imply that although the model has predictive capability, additional relationships not captured by the model also explain the endogenous variable entrepreneurial intentions.

Our empirical data reveal the existence of a relationship between the variables under study and entrepreneurial intentions. For the analysis of significance, we performed a one-tailed student's t test because the hypotheses make direct, positive statements about relationships in the data. Our results show the significance of all hypothesized relationships, although we should note that the strongest relationship is the one between university context and entrepreneurial education (hypothesis 2). Results appear in Table 5.4.

Figure 5.2 shows the extent to which the predictive variables contributed to the explained variance of each endogenous variable. The latent variable university

Table 5.3 Predictive relevance

Endogenous latent variables	$Q^2 > 0$	$R^2 > 0.1$
Entrepreneurial education	0.264	0.344
Entrepreneurial intentions	0.057	0.108

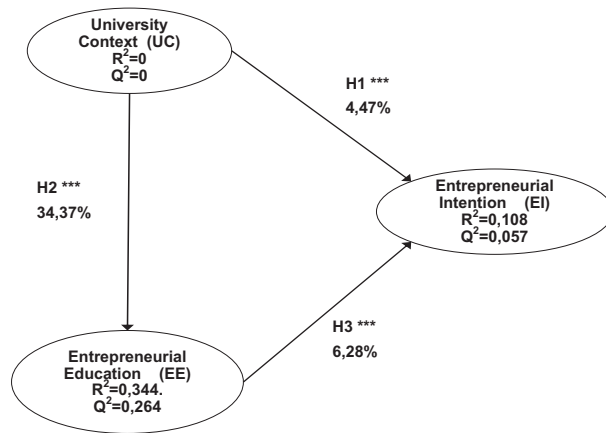
Source: Author's

Table 5.4 Significance of the hypotheses

Hypotheses	Student's <i>t</i>	Significance	Path coefficients
H1: University context → Entrepreneurial intentions	8.013	Significant**	0.208
H2: University context → Entrepreneurial education	35.849	Significant**	0.586
H3: Entrepreneurial education → Entrepreneurial intentions	6.056	Significant**	0.159

** $p < 0.001$, * $p < 0.01$, $p < 0.05$, ns: not significant (based on $t(499)$, one-tailed test) $t(0.05, 499) = 1.64791345$, $t(0.01, 499) = 2.333843952$, $t(0.001, 499) = 3.106644601$

Source: Author's



*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, ns: not significant (based on $t(499)$, one-tailed test)

Fig. 5.2 Results for the structural model. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, ns: not significant (based on $t(499)$, one-tailed test). Source: Author's

context accounted for 4.47% of the explained variance of the variable entrepreneurial intentions, which in turn accounted for 6.28% of the explained variance of entrepreneurial intentions. In addition, results show that university context explained 34.37% of the explained variance of entrepreneurial education.

5.5 Discussion and Conclusions

Our empirical data support H1. The model predicts 4.47% of the variance of entrepreneurial intentions, and we can therefore consider university context a significant antecedent of entrepreneurial intentions. In other words, university context explains a small part of entrepreneurial intentions, measured in terms of a genuine, clear assertion by students to become an entrepreneur in the future by creating and running a business.

Therefore, it seems that our findings are consistent with the literature. Studies have shown that the institutional context (North, 1990), social or cultural context (Shapiro & Sokol, 1982), and even the organizational environment (Labarca & Pérez, 2009), affect individuals and their beliefs, attitudes, and entrepreneurial intentions. Context is thus an important predictor of entrepreneurial behaviour (Adler et al., 1986; Ajzen, 2002). Furthermore, given the influence of university context on entrepreneurial education and the influence of entrepreneurial education on entrepreneurial intentions, results also reveal an indirect influence on entrepreneurial intentions via entrepreneurial education. This finding reinforces the idea that the context in general, and the context created by the university in particular, positively affects entrepreneurial intentions of university students both directly and indirectly through the education they receive.

H2 is also significant. This finding shows the influence of university context on entrepreneurial education, which explains 34.4% of the variance of entrepreneurial education. Hence, university context is a significant antecedent of entrepreneurial education because university context explains more than a third of the variance of entrepreneurial education. Therefore, a considerable portion of entrepreneurial education is affected by the university context.

In turn, H3 is also compatible. Entrepreneurial education exerts a positive significant influence on entrepreneurial intentions, although it explains only 6.28% of its variance. Although the literature contains empirical evidence of the opposite relationship (Oosterbeek et al., 2010; Peterman & Kennedy, 2003; Tkachev & Kolvereid, 1999), our findings are consistent with studies that have reported a positive link between entrepreneurial education and entrepreneurial intentions (Von Graevenitz et al., 2010). Therefore, according to our results, entrepreneurial education positively affects entrepreneurial intention, as many authors have already found (Audet, 2004; Hattab, 2014; Martin et al., 2013, among others).

5.6 Conclusion

Given the importance of environmental factors in entrepreneurial spirit (Alvarez & Urbano, 2012) and the increasingly prominent role of entrepreneurial spirit in universities (Clark, 1998), we analysed two variables university context and entrepreneurial education. In this study, we explored these two variables' effect on entrepreneurial intentions. As a result, we proposed a new research model yielding results showing that university context directly and indirectly—through entrepreneurial education—conditions entrepreneurial intentions of university students, while education also directly explains entrepreneurial intentions. The informal factors of the university context, such as a university environment conducive to entrepreneurship, can inspire students to develop new ideas and can motivate students to become involved in entrepreneurial activity. In turn, thanks to a university context that fosters entrepreneurship, formal factors like the entrepreneurial education system can affect the attitudes, values, and entrepreneurial motivations of students,

increasing their understanding, helping them to develop practical and managerial skills for starting a business, and encouraging them to develop their networks and identify opportunities.

5.7 Limitations of the Study

This study has two main limitations. First, our model evaluates potential entrepreneurs who demonstrate a clear intention to start a business. This intention, however, does not necessarily refer to the short term and is in fact likely to be a long-term commitment (Souitaris et al., 2007). We are therefore unable to verify whether this intention ultimately results in the appearance of new firms (Kolvereid, 1996; Souitaris et al., 2007), which is the desired effect for society. In fact, the percentage of university students who create businesses in the period from when they complete their studies to age 30 is 6.2% (GEM, 2013). This figure highlights the weakness of models that predict entrepreneurial intentions. This is an important observation because the literature on business creation shows that successful ventures are created by entrepreneurs aged around 40 years who have experience in the sector, have usually worked in positions of responsibility, are opportunity entrepreneurs, and have a certain level of income (Peña et al., 2014). Unsurprisingly, numerous scholars have displayed scepticism regarding the use of samples of university students to address the issue of potential business creation (Hemmasi & Hoelscher, 2005; Muñoz-Adánez, 1999). In addition, we encountered a technical difficulty in that we were unable to perform a longitudinal study that would have allowed us to test a causal relationship between entrepreneurial intentions and business creation. This difficulty is enhanced by the need for researchers, especially young researchers, to produce short-term research findings in response to pressure for stability and rewards from university accreditation systems. The second limitation of this study is that although our model does not directly link attitudes to intentions (but rather to a formal educational framework and an informal environment), it measures the entrepreneurial intentions by university students using uncommon scales. The choice of scales means that future studies must contrast the choice of scales by using more homogenous scales.

5.8 Directions for Future Research

These limitations present several opportunities for further research. The first opportunity is to perfect the predictive model. Despite obtaining positive results, we could add to the model certain intermediate variables (attitude, subjective norm, perceived control) commonly used in models measuring entrepreneurial intentions. We could also use well-tested scales that would give greater robustness to the model. Despite diversity in the content of these scales, which makes it difficult to generalize and

compare results (Liñán & Chen, 2009), it is helpful to use scales and measures that have been empirically tested. A second opportunity is that although the sample is significant, the use of larger samples covering different university environments and entrepreneurial education systems could enrich our findings and increase their generalizability. Finally, because of the evidence of gender differences in men's and women's entrepreneurial behaviours, we could analyse how these gender differences condition entrepreneurial intentions (Gupta, Turban, Wasti, & Sikdar, 2009) among university students.

References

- Adler, N. J., Doktor, R., & Redding, S. G. (1986). From the Atlantic to the Pacific century: Cross-cultural management reviewed. *Journal of Management*, 12(2), 295–318.
- Aidis, R., Estrin, S., & Mickiewicz, T. (2008). Institutions and entrepreneurship development in Russia: A comparative perspective. *Journal of Business Venturing*, 23(6), 656–672.
- Ajzen, I. (1987). Attitudes, traits, and actions: Dispositional prediction of behavior in social psychology. *Advances in Experimental Social Psychology*, 20, 1–63.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, 32, 1–20.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.
- Alvarez, C., & Urbano, D. (2012). Factores del entorno y creación de empresas: Un análisis institucional. *Revista Venezolana de Gerencia*, 17(57), 9–38.
- Arenius, P., & Minniti, M. (2005). Perceptual variables and nascent entrepreneurship. *Small Business Economics*, 24(3), 233–247.
- Athayde, R. (2009). Measuring enterprise potential in young people. *Entrepreneurship: Theory and Practice*, 33(2), 481–500.
- Audet, J. (2004). L'impact de deux projets de session sur les perceptions et intentions entrepreneuriales d'étudiants en administration. *Journal des petites entreprises et de l'entrepreneuriat (JSBE)*, 10(1/2), 3–16.
- Bae, T., Qian, S., Miao, C., & Fiet, J. (2014). The relationship between entrepreneurship education and entrepreneurial intentions: A meta-analytic review. *Entrepreneurship: Theory and Practice*, 38(2), 217–254.
- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16(1), 74–94.
- Belsley, D. A. (1991). *Conditioning diagnostics: Collinearity and weak data in regression*. New York: Wiley.
- Bruno, A. V., & Tyebjee, T. T. (1982). The environment for entrepreneurship. In A. Kent, D. L. Sexton, & K. H. Vesper (Eds.), *Encyclopedia of entrepreneurship* (pp. 288–307). Prentice Hall: Englewood Cliffs, NJ.
- Bueno, E., & Casani, F. (2007). La tercera misión de la universidad enfoques e indicadores básicos para su evaluación. *Revista de Economía Industrial*, 366, 43–59.
- Burch, J. G. (1986). *Entrepreneurship*. New York: Wiley.
- Chiva, R., & Camison, C. (2002). Aprendizaje organizativo y teoría de la complejidad: Un estudio de casos en el sector cerámico. *Investigaciones Europeas de Dirección y Economía de la Empresa*, 8(3), 181–198.

- Churchill, G. A., Jr. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 16(1), 64–73.
- Clark, B. (1998). *Creating Entrepreneurial Universities: Organizational Pathways of Transformation*. International Association of Universities and Elsevier Science, New York.
- Comisión Europea (1995). *White Paper on Education*.
- Comisión Europea. (2006). Aplicar el programa comunitario de Lisboa: Fomentar la mentalidad empresarial mediante la educación y la formación. COM/2006/0033 final.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *psychometrika*, 16(3), 297–334
- Crant, J. M. (1996). The proactive personality scale as a predictor of entrepreneurial intentions. *Journal of Small Business Management*, 34(3), 42–49.
- Díaz, C., Urbano, D., & Hernández, R. (2005). Teoría económica institucional y creación de empresas. *Investigaciones Europeas de Dirección y Economía de la Empresa (IEDEE)*, 11(3), 209–230.
- Do Paço, A. M. F., Ferreira, J. M., Raposo, M., Rodrigues, R. G., & Dinis, A. (2011). Behaviours and entrepreneurial intention: Empirical findings about secondary students. *Journal of International Entrepreneurship*, 9(1), 20–38.
- Do Paço, A. M. F., Ferreira, J. M., Raposo, M., Rodrigues, R. G., & Dinis, A. (2015). Entrepreneurial intentions: Is education enough? *Journal of International Entrepreneurship*, 11, 57–75.
- Dutta, D. K., Li, J., & Merenda, M. (2011). Fostering entrepreneurship: Impact of specialization and diversity in education. *International Entrepreneurship Management Journal*, 7, 163–179.
- Falk, R. F., & Miller, N. B. (1992). *A primer for soft modeling*. Akron, OH: University of Akron Press.
- Fayolle, A. (2013). Personal views on the future of entrepreneurship education. *Entrepreneurship and Regional Development*, 25(7/8), 692–701.
- Fornell, C., & Larcker, D. F. (1981). Structure equation models: LISREL and PLS applied to customer exist—voice theory. *Journal of Marketing Research*, 18(2), 39–50.
- Fritsch, M.; Noseleit, F. (2013). Investigating the anatomy of the employment effect of new business formation *Camb. J. Econ.* 37(2), 349–377.
- Garzón-Castrillón, M. A. (2011). El aprendizaje para impulsar el intra-emprendimiento en organizaciones complejas. *Ide@s CONCYTEG*, 6(74), 919–939.
- Gómez, S., & Salmerón, R. (2011). Influencia del entorno institucional en el desarrollo del emprendimiento español. Un análisis empírico. *Revista Venezolana de Gerencia*, 16(54), 191–208.
- Gibb, A. (2011). Concepts into practice: meeting the challenge of development of entrepreneurship educators around an innovative paradigm: The case of the International Entrepreneurship Educators' Programme (IEEP). *International Journal of Entrepreneurial Behavior & Research*, 17(2), 146–165.
- Gupta, V. K., Turban, D. B., Wasti, S. A., & Sikdar, A. (2009). The role of gender stereotypes in perceptions of entrepreneurs and intentions to become an entrepreneur. *Entrepreneurship: Theory and Practice*, 33(2), 397–417.
- Hair, J. F., Jr., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review*, 26(2), 106–121.
- Hattab, H. (2014). Impact of entrepreneurship education on entrepreneurial intentions of university students in Egypt. *The Journal of Entrepreneurship*, 23(1), 1–18.
- Hemmasi, M., & Hoelscher, M. (2005). Entrepreneurship research: Using students as proxies for actual entrepreneurs. *Journal of Entrepreneurship Education*, 8, 49–59.
- Iglesias, P., Jambrino, C., & Peñafiel, A. (2012). Caracterización de las Spin-Off universitarias como mecanismo de transferencia de tecnología a través de un análisis clúster. *Revista Europea de Dirección y Economía de la Empresa*, 21, 240–254.
- Jo, H., & Lee, J. (1996). The relationship between an entrepreneur's background and performance in new venture. *Technovation*, 6(4), 161–171.
- Katz, J. A. (2003). The chronology and intellectual trajectory of American entrepreneurship education 1876–1999. *Journal of Business Venturing*, 18, 283–300.

- Kent, C. A. (1984). *The environment for entrepreneurship*. Lexington, MA: Lexington Books.
- Kolvereid, L. (1996). Prediction of employment status choice intentions. *Entrepreneurship: Theory and Practice*, 20(3), 47–57.
- Krueger, N. F. (1993). The impact of prior entrepreneurial exposure on perceptions of new venture feasibility and desirability. *Entrepreneurship: Theory and Practice*, 18(1), 5–21.
- Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, 15, 411–432.
- Labarca, I., & Pérez, L. (2009). Cómo fomentar la intención emprendedora en los estudiantes de ingeniería y arquitectura de la Unet. *Seventh LACCEI Latin American and Caribbean Conference for Engineering and Technology*. June 2–5. San Cristóbal, Venezuela.
- Liñán, F., & Chen, Y. (2009). Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrepreneurship: Theory and Practice*, 33, 593–617.
- MacKenzie, S. B., Podsakoff, P. M., & Jarvis, C. B. (2005). The problem of measurement model misspecification in behavioral and organizational research and some recommended solutions. *Journal of Applied Psychology*, 90(4), 710–730.
- Manolova, T. S., Eunn, R. V., & Gyoshev, B. S. (2008). Institutional environments for entrepreneurship: Evidence from emerging economies in Eastern Europe. *Entrepreneurship: Theory and Practice*, 32(1), 203–218.
- Martin, B. C., McNally, J. J., & Kay, M. J. (2013). Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes. *Journal of Business Venturing*, 28, 211–224.
- Mueller, P. (2006). Entrepreneurship in the region: Breeding ground for nascent entrepreneurs? *Small Business Economics*, 27(1), 41–58.
- Muñoz-Adánez, A. (1997). El perfil del emprendedor y el perfil del universitario español en relación con el mismo. In A. Muñoz Adánez & F. Cachón (Eds.), *Proyecto Emprendizaje: Cuatro estudios sobre la Universidad española*. Madrid: Euroforum-Fundación General de la UCM.
- Muñoz-Adánez, A. (1999). Es emprendedor el universitario español? In A. Muñoz Adánez & M. Bautista (Eds.), *El Espíritu Emprendedor y la Creación de Empresas* (pp. 1–14). Madrid: Editorial Complutense.
- North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge university press.
- North, D. C. (2005). Institutions and the process of economic change. *Management International*, 9(3), 1.
- Nunnally, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.
- Oosterbeek, H., Van Praag, M., & Ijsselstein, A. (2010). The impact of entrepreneurship education on entrepreneurship skills and innovation. *European Economic Review*, 54, 442–454.
- Peña, I., Guerrero, M., & González-Pernía, J. L. (2014). *Global Entrepreneurship Monitor. Informe GEM España 2014*. Ed. Universidad de Cantabria (Santander), Asociación Red GEM España, CISE.
- Peterman, N., & Kennedy, J. (2003). Enterprise education: Influencing students' perceptions of entrepreneurship. *Entrepreneurship: Theory and Practice*, 28, 129–144.
- Reynolds, P., Storey, D. J., & Westhead, P. (1994). Cross-national comparisons of the variation in new firm formation rates: an editorial overview. *Regional Studies*, 28(4), 343–346.
- Ringle, C. M., Wende, S., & Will, A. (2005). *SmartPLS 2.0 (beta)*. Hamburg, Germany: SmartPLS.
- Robinson, P. B., & Sexton, E. A. (1994). The effect of education and experience of self-employment success. *Journal of Business Venturing*, 9(2), 141–156.
- Roldán, J. L., & Sánchez-Franco, M. J. (2012). Variance-based structural equation modeling: Guidelines for using partial least squares in information system research. In M. Mora, O. Gelman, A. Steenkamp, & M. Raisinghamani (Eds.), *Research methodologies, innovations and philosophies in software systems engineering and information systems* (pp. 193–221). Hershey: IGI Global.

- Rubiralta, M. (2004). *Transferencia a las empresas de la investigación universitaria. Descripción de los modelos europeos*. Madrid: Fundación COTEC para la Innovación Tecnológica.
- Ruiz, R., García, F., & Delgado, N. (2014). Condicionantes de la intención emprendedora en el alumnado universitario: Un análisis desde la perspectiva de género. *Revista de Estudios Empresariales*, 2, 81–96.
- Sánchez, J. C. (2011). University training for entrepreneurial competencies: Its impact on intention of venture creation. *International Entrepreneurship and Management Journal*, 7(2), 239–254.
- Sanz, S., Ruiz, C., & Aldás, J. (2008). La influencia de la dependencia del medio en el comercio electrónico B2C. Propuesta para un modelo integrador aplicado a la intención de compra futura en internet. *Cuadernos de Economía y Dirección de la empresa*, 36, 45–75.
- Shapero, A., & Sokol, L. (1982). The social dimensions of entrepreneurship. In C. Kent, D. Sexton, & K. Vesper (Eds.), *The encyclopedia of entrepreneurship* (pp. 72–90). Englewood Cliffs, NJ: Prentice-Hall.
- Sobel, R. S. (2008). Testing Baumol: Institutional quality and the productivity of entrepreneurship. *Journal of Business Venturing*, 23(6), 641–655.
- Souitaris, V., Zerbinati, F., & Al-Laham, A. (2007). Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. *Journal of Business Venturing*, 22(3), 566–591.
- Stuart, R. W., & Abetti, P. A. (1990). Impact of entrepreneurial and managerial experience on early performance. *Journal of Business Venturing*, 5, 151–162.
- Tkachev, A., & Kolvereid, L. (1999). Self-employment intentions among Russian students. *Entrepreneurship and Regional Development*, 11, 269–280.
- Unesco. (1998). Higher education in the twenty-first century. Vision and action. *World Conference on Higher Education*. París. October, 5–9.
- Veciana, J. M., & Urbano, D. (2008). The institutional approach to entrepreneurship research: Introduction. *International Entrepreneurship and Management Journal*, 4(4), 365–379.
- Villarreal, E., & García, A. (2004). Una propuesta de indicadores para la caracterización de las universidades emprendedoras. XIII Jornadas de la AEDE. San Sebastián 13 y 14 de septiembre.
- Volery, T., Müller, S., Oser, F., Naepflin, C., & Rey, N. (2013). The impact of entrepreneurship education on human capital at upper-secondary level. *Journal of Small Business Management*, 51(3), 429–446.
- Von Graevenitz, G., Harhoff, D., & Weber, R. (2010). The effects of entrepreneurship education. *Journal of Economic Behavior and Organization*, 76(1), 90–112.
- Wagner, J., & Sternberg, R. (2004). Start-up activity, industrial characteristics and the regional milieu: lessons for entrepreneurship support policy from German microdata. *Annals of Regional Science*, 38, 219–240.
- Welter, F. (2011). Contextualizing entrepreneurship—Conceptual challenges and ways forward. *Entrepreneurship: Theory and Practice*, 35(1), 165–184.
- Werts, C. E., Linn, R. L., & Jöreskog, K. G. (1974). Intraclass reliability estimates: Testing structural assumptions. *Educational and Psychological Measurement*, 34(1), 25–33.
- Yusuf, A. (1995). Critical success factors for small business: Perceptions of South Pacific entrepreneurs. *Journal of Small Business*, 23(2), 68–63.
- Zhang, Y., Duysters, G., & Cloudt, M. (2014). The role of entrepreneurship education as a predictor of university students' entrepreneurial intention. *International Entrepreneurship and Management Journal*, 10(3), 623–641.

Chapter 6

Universities in the Context of the Knowledge-Based Society According to Systemism: Evidences from a Brazilian Community University

Ademar Schmitz, David Urbano, Gertrudes Aparecida Dandolini,
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Abstract An increasing body of literature has begun to emerge on innovation and entrepreneurship in the academic setting. However, literature is still fragmented, requiring more systematic studies, considering both economic and social aspects of innovation and entrepreneurship within universities. This chapter contributes to this subject by discussing the suitability of using systemism as an approach to understand innovation and entrepreneurship as mechanisms that allow universities to contribute to socioeconomic development and to preserve their own sustainability. Particularly, the case of the University of Southern Santa Catarina (Unisul), in Brazil, is analyzed. Results show that systemism is suitable, among other reasons, because universities are in fact complex systems, it allows to consider the three levels by which innovation and entrepreneurship have been studied within universities (individual, organization, and interaction), and it offers clear conceptual dimensions that can be applied to both theoretical and empirical levels of research.

Keywords Complex systems • Economic development • Entrepreneurship • Innovation • Knowledge society • Social development • Sustainability • Systemism • Universities

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6.1 Introduction

Universities are medieval organizations created for the conservation and transmission of knowledge, but they evolved over the centuries into organizations in which knowledge is also created and put to use (Etzkowitz, 2013). This evolution resulted from two academic revolutions. The first revolution added the mission of generating knowledge through research to the traditional mission of preserving and transmitting knowledge, known as teaching. Then, the second revolution made economic and social development a third mission of universities in addition to teaching and research (Etzkowitz, 2003a), which is accomplished through a more intensive use and application of knowledge within the university and on its surroundings.

In order to contribute to socioeconomic development, universities need to closely interact with its surroundings, especially with industry and government, known as the triple helix of innovation (Etzkowitz, 2003a, 2003b). The triple helix of innovation refers to the interweaving of university, industry and government with a spiral pattern of linkages to advance economic and social development through the strategy of innovation (Etzkowitz, Webster, Gebhardt, & Terra, 2000). Therefore, in the knowledge-based society, universities are increasingly challenged to become more socially and economically relevant organizations (Nelles & Vorley, 2011).

Universities in the context of the knowledge-based society have gained substantial importance in recent literature. It has been discussed from the perspective of innovation (Clark, 1996; Strier, 2011; van Vught, 1999), from the perspective of entrepreneurship (Clark, 1998; Etzkowitz, 2003a, 2003b, 2013; Etzkowitz et al., 2000; Urbano & Guerrero, 2013), and from the perspective of innovation and entrepreneurship at the same time (Abreu & Grinevich, 2013; Wood, 2011; Wright, 2014). Studies include both traditional innovation and entrepreneurship, more related to economic development, and their relation with social development (Abreu & Grinevich, 2013), known as social innovation and social entrepreneurship. In addition, it has been argued that besides contributing to economic and social development, innovation and entrepreneurship should contribute to the sustainability of the universities (Etzkowitz, 1998; Etzkowitz et al., 2000; Philpott, Dooley, O'Reilly, & Lupton, 2011).

Despite the increasing number of studies, literature is still fragmented (Mars & Rios-Aguilar, 2010; Nelles & Vorley, 2011; Rothaermel, Agung, & Jiang, 2007; Urbano & Guerrero, 2013; Wood, 2011), requiring more systematic studies (Guenther & Wagner, 2008; Mazdeh, Razavi, Hesamamiri, Zahedi, & Elahi, 2013; Urbano & Guerrero, 2013; Wood, 2011), considering both the economic and social aspects of innovation and entrepreneurship within universities (Abreu & Grinevich, 2013; Mars & Rios-Aguilar, 2010; Mazdeh et al., 2013; Wood, 2011). Furthermore, no relevant study has been identified considering innovation and entrepreneurship in the academic setting from the perspective complex systems.

Complex systems, also known as complex systems theory, is a scientific field that studies common properties of complex systems that might appear in nature, society and science. Systemism is a research approach for such systems proposed by Bunge (1997, 2000, 2003, 2004). In this approach, both individual agency and structure are

considered within a given context or environment (Bunge, 2003, 2004). Systemism applies to systems in general, but it has found in the social sciences the most relevant discussions and applications (Casti, 1981; Gräbner & Kapeller, 2015; Hofkirchner, 2007; Pickel, 2004, 2007; Reihlen, Klaas-Wissing, & Ringberg, 2007; Schneider, 2013; Wan, 2011, 2012).

The aim of this chapter is to evidence the suitability of using systemism as an approach to understand innovation and entrepreneurship as mechanisms that allow universities to contribute to socioeconomic development and to preserve their own sustainability. Particularly, the case of the University of Southern Santa Catarina (Unisul), in Brazil, is analyzed.

Consistent with the objective of the research, the development of the case study (Eisenhardt, 1989; Yin, 2014) was adopted as the strategy to analyze Unisul's evidence. Unisul's main documents (the Institutional Development Plan (IDP), the Institutional Pedagogical Project—IPP-, the Statute—STA-, the General Regiment—REG-, and Unisul's Innovation and Entrepreneurship Agency—Agetec-) were integrated in a case study database using NVivo 11 (software for qualitative data organization and analysis) and analyzed in light of the conceptual framework.

This study contributes theoretically and practically. Theoretical contributions include a unique study evidencing the suitability of modeling universities as social systems in the context of the knowledge based society. This is especially relevant because it brings a systemic view of innovation and entrepreneurship in the academic setting, allowing not only the study of events, but also of the internal and external elements involved and their respective inter-relations. Practical contributions include the fact that mechanisms not only allow understanding of the system, but also the possibility of control (Bunge, 2004). The outlined mechanisms contribute to understand how universities work in the context of the knowledge based society, allowing the creation of more appropriate policies.

After this brief Introduction the chapter is structured in four sections. Section 6.2 presents a detailed systematic literature review on innovation and entrepreneurship in the academic setting. In Sect. 6.3, systemism is discussed as an approach to model and understand social systems. Section 6.4 outlines a preliminary systemic conceptual framework for innovation and entrepreneurship within universities, and presents evidences of each element of the framework according to Unisul. Finally, Sect. 6.5 presents the main conclusions of the study, limitations, and future research lines.

6.2 Innovation and Entrepreneurship in the Academic Setting

Both innovation and entrepreneurship are extensive fields of study, consisting of a wide range of purposes and objectives, and therefore, various definitions can be found in traditional literature (Sam & van der Sijde, 2014). However, even though they are commonly used together within universities, not many studies have explicitly defined them and discussed their relation. The systematic literature review being

conducted by the authors identified near 400 hundred articles related to innovation and entrepreneurship in the academic setting. Terms related to innovation and to entrepreneurship co-occur in more than half the articles, but only a few explicitly discuss their relation.

For Etzkowitz et al. (2000), entrepreneurial activities within universities are undertaken with the objective of improving regional economic performance, as well as for the university financial advantage. On the other hand, innovation is both the development of new products and the creation of new institutional arrangements to foster innovation (Etzkowitz, 2003a). According to Yokoyama (2006), entrepreneurial activities in universities are multifold, including the establishment of business corporations, overheads, consultancy, service to the community, and even scholarships. Abreu and Grinevich (2013) define as entrepreneurial any activity that occurs beyond the traditional academic roles of teaching and/or research that is innovative, carries an element of risk, and leads to financial rewards for the individual academic or his/her university, encompassing activities that result in social welfare increase and financial rewards (Abreu & Grinevich, 2013).

Wood (2011) defines innovation within the university as any invention, new technology, idea, product, or process that has been discovered through university research that has the potential to be commercialized. According to this author, the central idea is that university research leads to innovations, and some of those innovations may have commercial applications that lead entrepreneurship. According to Wright (2014), research plays an important role in creating innovations that lead to academic entrepreneurship. He claims for policies that should allow an appropriate balance between innovation and entrepreneurship within universities.

Innovation and entrepreneurship in the academic setting are being studied under concepts such as innovative universities (Clark, 1996; Strier, 2011; van Vught, 1999), university innovation (Chen et al., 2013; O'Shea et al., 2008), academic innovation (Chen et al., 2013; Chang, Chen, Hua, & Yang, 2006; Conklin, 1978; Lindquist, 1974; Ross, 1976; Schachter, 1986), entrepreneurial universities (Audretsch, 2014; Etzkowitz, 1984, 1998, 2003a, 2003b, 2013; Etzkowitz et al., 2000; Guenther & Wagner, 2008; Guerrero, Cunningham, & Urbano, 2015; Guerrero & Urbano, 2012; Guerrero, Urbano, Cunningham, & Organ, 2014; Jacob, Lundqvist, & Hellsmark, 2003; Kirby, Guerrero, & Urbano, 2011; Mainardes, Alves, & Raposo, 2011; Nelles & Vorley, 2011; Philpott et al., 2011; Sam & van der Sijde, 2014; Urbano & Guerrero, 2013; Yokoyama, 2006), university entrepreneurship (Nelles & Vorley, 2011; Rothaermel et al., 2007; Todorovic, McNaughton, & Guild, 2011), and academic entrepreneurship (Abreu & Grinevich, 2013; Doutriaux, 1987; Etzkowitz, 2003a, 2003b, 2013; Goldstein, 2010; Guerrero et al., 2014, 2015; Guerrero & Urbano, 2012; Klofsten & Jones-Evans, 2000; Mars & Rios-Aguilar, 2010; Mazdeh et al., 2013; Tijssen, 2006; Urbano & Guerrero, 2013; Wood, 2011; Wright, 2014).

Both theoretical frameworks and empirical models related to these concepts are very heterogeneous and they originated from different disciplines, but they can be classified in four groups. The first group comprises those studies, discussing innovation and entrepreneurship in the academic setting based on changes that occur inside universities and on their relations with government and industry in the knowledge-

based society (Audretsch, 2014; Clark, 1996; Etzkowitz, 1984, 1998, 2003a, 2003b, 2013; Etzkowitz et al., 2000; Mainardes et al., 2011; Ross, 1976; Sam & van der Sijde, 2014). The second group comprises empirical articles studying the factors affecting the creation and development of entrepreneurial universities, and the respective economic and social impacts (Guerrero et al., 2014, 2015; Guerrero & Urbano, 2012; Kirby et al., 2011; Urbano & Guerrero, 2013). The third group comprises those articles, both theoretical and empirical, which explain innovation and entrepreneurship in the university based on the definitions of academic entrepreneurship (Wood, 2011; Wright, 2014), academic innovation (Lindquist, 1974; Schachter, 1986), university entrepreneurship (Rothaermel et al., 2007), academic entrepreneurship (Abreu & Grinevich, 2013; Doutriaux, 1987; Klofsten & Jones-Evans, 2000), academic innovation (Chang et al., 2006; Conklin, 1978), and the entrepreneurial university (Guenther & Wagner, 2008; Jacob et al., 2003; Philpott et al., 2011; Yokoyama, 2006). Finally, the fourth group of articles comprises those studies investigating ways to define and measure the performance of universities related to entrepreneurship, based on entrepreneurship, entrepreneurial intensity and entrepreneurial orientation (Mazdeh et al., 2013; Tijssen, 2006; Todorovic et al., 2011).

Independent of these theoretical frameworks, the concept of the entrepreneurial university is seen as the most well articulated in the evolution of the university towards the requirements of the knowledge-based society (Goldstein, 2010). As such, literature tends to indicate characteristics and activities of such universities. The indicated characteristics confirm the changes occurring within universities and on their relation within the knowledge based society. In particular, the work developed by Clark (1996, 1998) and Etzkowitz (2003b, 2013), Etzkowitz (2004) expands the idea of academic entrepreneurship to encompass both the individual with entrepreneurial inclinations and the academic organization with a requirement to demonstrate engagement with entrepreneurship (Brennan, McGovern, & McGowan, 2007). Therefore, universities tend to be increasingly more independent of the government, and at the same time more highly interactive with other social spheres, acquiring resources from the market, as well as meeting the needs of society in terms of knowledge (Mainardes et al., 2011).

Preliminary results of the systematic literature review also indicate more than 20 different activities associated to innovation and entrepreneurship in the academic setting. In general terms, they are related to: regional socioeconomic development (Etzkowitz, 2003a, 2003b, 2004) and the universities' sustainability (Etzkowitz, 1998; Etzkowitz et al., 2000; Philpott et al., 2011); individuals within universities, to the university itself, and to the relation of the university with its surroundings (Guerrero & Urbano, 2012; Ropke, 1998; Urbano & Guerrero, 2013); the process and results of knowledge creation, knowledge dissemination and knowledge application (Etzkowitz, 2003a, 2003b, 2004, 2013); profit-gain of the university or its partners, and to social development of the communities surrounding the university (Abreu & Grinevich, 2013; Yokoyama, 2006); and, fulfilling the universities missions and their relations within the knowledge based society (Goldstein, 2010; Mainardes et al., 2011). This means that innovation and entrepreneurship activities within universities are related to both organization growth, including autonomy and sustainability, and regional socioeconomic development.

In this sense, innovation and entrepreneurship in the academic setting can be seen as continuous and complementary processes that allow current production systems and social standards to be improved or replaced in order to bring economic and social development of regions, states and countries, while contributing to the autonomy and sustainability of universities. This idea widens Schumpeter's (1934) concept of creative destruction, more related to economic development, in which science and creativity are used to develop new and novel knowledge (innovation), applicable to economic and social demands or opportunities, and the application of this knowledge to stimulate economic and social development (entrepreneurship). From an economic perspective, this represents a process in which new products, processes, organizational and marketing methods are created and put to use in order to generate economic value (Neves & Neves, 2011). From a social perspective, it represents a process in which knowledge is transformed in products, services, and models that attend social needs and create new social relationships and collaborations, increasing the ability of society to act (Murray, Caulier-Grice, & Mulgan, 2010), that is, creating social value.

Concerning the knowledge required in this creative destruction process, innovative knowledge provides the understanding of a particular subject or technology that serves as the basis of a commercial opportunity (Shah & Pahnke, 2014) or a social demand. Entrepreneurial knowledge, on the other hand, provides an understanding of the entrepreneurial process and networks from which to draw resources and expertise (Shah & Pahnke, 2014) in order to apply the innovative knowledge for regional socioeconomic development and for the sustainability of the universities.

Given the interrelatedness and complementary roles of innovation and entrepreneurship in the academic setting, it seems reasonable to address them explicitly together at theoretical and empirical levels. As argued by Drucker (2006), entrepreneurship and innovation are systematic behaviors, and therefore a systematic approach is required to integrate them into studies. Particularly important is to consider innovation and entrepreneurship from a knowledge creation, dissemination and application perspective, in order to increase regional socioeconomic development and the sustainability of the universities.

6.3 Systemism

According to Bunge (2000, 2003), there are three main research approaches in social studies. One is individualism, according to which everything is either an individual or a collection of individuals (Bunge, 2003). Another is holism, according to which the universe is a homogenous spot, so that every part of it influences every other part (Bunge, 2003). However, both individualism and holism are deficient. Individualism, by only studying the components of social systems, overlooks their structure (Bunge, 2000) and ignores their emergent properties (Bunge, 1979). Holism, on the other hand, by only studying the structure of social systems, plays down individual action (Bunge, 2000) and refuses to explain their emergent

properties (Bunge, 1979). The alternative to both individualism and holism is systemism, according to which everything is either a system or a component of a system, and every system has peculiar (emergent) properties that its components lack, making room for both individual agency and social structure (Bunge, 2000).

According to systemism, social science research is about social systems research, in which society is not an unstructured collection of independent individuals, but a system of interrelated individuals organized into systems (Bunge, 2000). Therefore, the emergence, maintenance, or dismantling of any social system can ultimately be explained in terms of individual preferences, decisions and actions, but these individual events are largely determined by social context (Bunge, 2000). Therefore, in order to model and understand social systems, it is needed to take into consideration what it consists of, the environment in which it is located, how its components and environmental items are related, and how it works. This means that a system can be design by its composition, environment, structure, and mechanism (Bunge, 2003). Table 6.1 brings and describes each of the elements of a system *s* according to systemism.

The system's composition is the collection of all parts of the system (Bunge, 2003). In the case of social systems, composition is made of individuals and artefacts (Bunge, 2003). The system's environment is the collection of items, other than those in the system, that act on or is acted upon by some or all components of the system (Bunge, 2003). In the case of social systems, environment may include items of society, economy, and politics. The system's structure is the collection of relations, in particular bonds, among components of the system of among these and item in its environment (Bunge, 2003). In the case of social systems, structures are real bounds (Bunge, 2004), such as rules and conventions. Finally, the system's mechanism is the collection of processes that make it behave the way it does (Bunge, 2003), that is, the processes that bring or prevent some change in the system (Bunge, 1997, 2003). In the case of social systems, there are social mechanisms, which are process involving at least two agents engaged in forming, maintaining, transforming, or dismantling the system (Bunge, 1996).

Even though systemism ontology in very clear, its methodology, as in any other approach to model complex systems, brings some challenges (Pickel, 2007), including the definition of the entities to be considered (von Bertalanffy, 1968) and the identification of the interactions between the components (Axelrod & Cohen, 2000). Therefore, in practice, only notions of the composition, environment, structure, and mechanism at a given level are used (Bunge, 2003).

Table 6.1 Elements of a system *s* according to systemism (based on Bunge, 2003)

Symbol	Element	Description
C(<i>s</i>)	Composition	Collection of all the parts of <i>s</i>
E(<i>s</i>)	Environment	Collection of items, other than those in <i>s</i> , that act on or are acted upon by some or all components of <i>s</i>
S(<i>s</i>)	Structure	Collection of relations, in particular bonds, among components of <i>s</i> or among these and items in its environment
M(<i>s</i>)	Mechanism	Collection of processes in <i>s</i> that make it behave the way it does

Table 6.2 Methodological prescription for systemism (based on Bunge, 1997, 2000, 2003)

Step	Description
1	Recognize the study object as a social system, placing it into a wider context
2	Conjecture the system's composition, environment and structure
3	Distinguish the various levels of the system and exhibit their relations
4	Hypothesize the mechanism that keep the system running or leads to its decay or growth
5	Test empirically the hypothesized mechanisms considering the conjectured system
6.1	If hypotheses are true, explain the system functioning based on the proposed model
6.2	Otherwise, refine or modify the model and start over

Furthermore, even though systemism postulates that social systems are concrete entities, this does not make them self-evident and easily observable (Pickel, 2007). Therefore, social systems have to be conjectured in order to be modeled (Pickel, 2007) and tested in order to be explained (Bunge, 1997). Based on Bunge (1997, 2000, 2003), the overall procedure presented in Table 6.2 might be used as a methodological prescription, allowing studies to be conducted both at the theoretical and empirical levels.

The first step is to recognize the study object as a social system within a wider context. In the second step, the system has to be brock down into its composition, environment and structure. As social systems are real, but partly hidden (Pickel, 2007), their composition, environment and structure can only be conjectured (Bunge, 1997). The third step is to distinguish the various levels of the system and exhibit their relations. This will allow the elucidation of the micro–macro relations and identification of emergent properties. Bunge (2003) argues that depending to the aims of the study, the relationship between the components of a system, and between the systems and its environment do not need to be reduced to its individual constituent parts (Schneider, 2013). The fourth step is to hypothesize the mechanism that keeps the system running or leads to its decay or growth. By focusing on social mechanisms, it is possible to offer an intermediary level of explanation that avoids theorizing at a level that is either to abstract or too close to the empirical data (Pickel, 2004; Schneider, 2013). In the fifth step, the hypothesized mechanisms have to be tested. According to Bunge (1997), the conjectured system needs to be empirically testable if it is to be regarded as scientific. Finally, in the sixth step, if the hypothesized mechanisms turn out be true, the system's functioning might be explained. Otherwise, the model need to be refined or modified, and tested again.

6.4 Universities According to Systemism

6.4.1 A Systemic Conceptual Framework

Universities are social systems formed by individuals and artefacts, inside an economic, political, and social context. Dynamic and non-linear interactions between the internal components of a university, and between these and those from

its environment, make them also complex systems. Therefore, universities can be studied from the perspective of complex social systems. Systemism, in particular, allows integrating the three levels by which innovation and entrepreneurship have been discussed in the academic setting: individual level (students, faculty, and staff), organization level (the university), and environment level (interaction) (Guerrero & Urbano, 2012; Ropke, 1998; Urbano & Guerrero, 2013). As argued by Bunge (2000), systemism makes room for both individual agency (individual level) and social structure (organizational level), and emphasizes the role of the environment (interaction level) and the mechanisms that allow it behave the way it does.

Figure 6.1 depicts a university as a social system, in the context of the knowledge-based society. The university is organized considering micro (individual) and macro (organization) levels, in which individuals contribute to the organization (agency), and the organization affects the individuals (structure). This is represented by bottom-up and top-down bounds and processes. The university operates in the context of the knowledge-based society, whose main elements are industry, government, and communities. The relation of the university with these items of the environment is also given by bounds and processes. Bounds are formal and informal relations among the components of the university and among these and those from the knowledge-based society. Processes, on the other hand, are the mechanisms that allow universities operate the way it does. In this case, the mechanisms are related to innovation and entrepreneurship in the processes of knowledge creation, dissemination and application. It is through these processes that universities contribute to regional socioeconomic development, while preserving their own sustainability.

Social systems are composed of individuals and artifacts (Bunge, 2003). As such, universities are composed of individuals such as students, faculty, and staff, and artifacts such as laboratories, databases, and technologies. Individuals and artifacts might be grouped at intermediary levels, according to their roles in academic or administrative structures. Examples of such groupings are classes, research projects, academic departments, and administrative departments. Both physical and intellectual technologies, such as computers, networks, and systems might be considered. Even though artefacts do not have agency, they influence what and how individuals act and interact in the organization and with the environment.

A social system's environment includes society, economy, and politics (Bunge, 2003). Currently, universities operate in the knowledge-based society, in which they affect and are affected. Therefore, universities' operation is not only based on the individual inputs and outputs, but also by the characteristics of their environment. As argued by Etzkowitz et al. (2000), in the knowledge society, universities need to closely interact with industry and government for socioeconomic development. However, in order to consider both economic and social aspects of innovation and entrepreneurship, also communities need to be considered. To foster social innovation and entrepreneurship, it is needed not only generate knowledge for the need of communities, but also with them (Murray et al., 2010).

The structure of a system is defined by the relations among its components, called endostructure, and among its components and those of the environment, called exostructure (Bunge, 2003). Internally, the components of the university are related according to their academic and administrative roles. According to their aca-

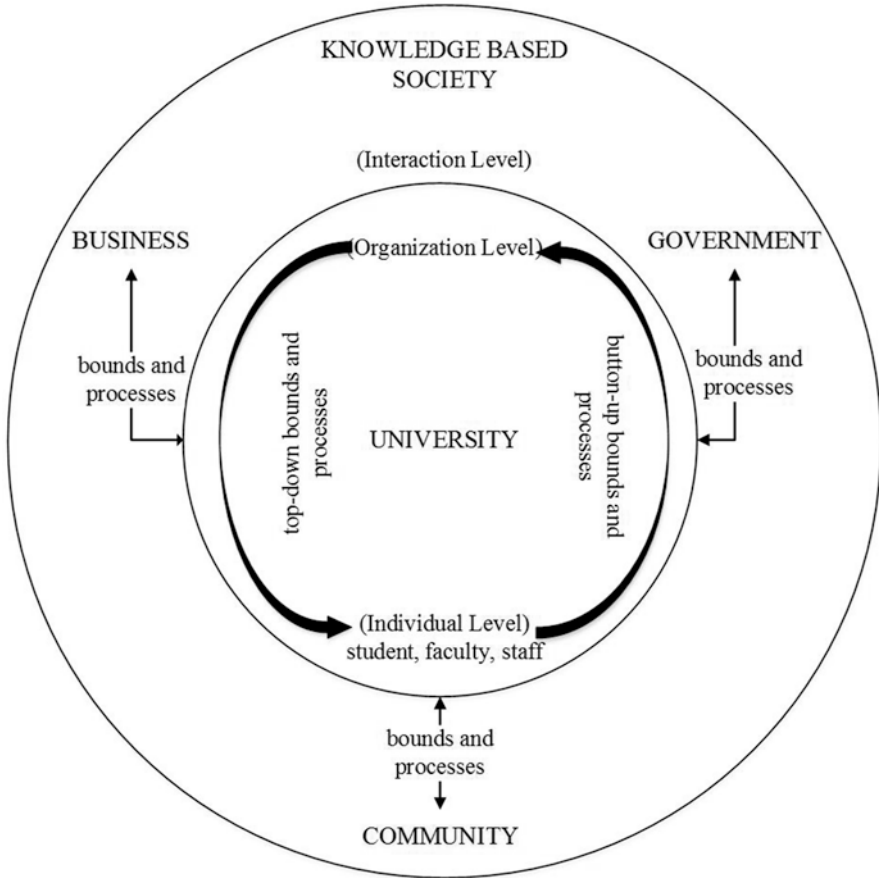


Fig. 6.1 A systemic conceptual framework for innovation and entrepreneurship in the academic setting

ademic roles, they can be grouped to form classes and project teams, but also act together informally. Concerning the exostructure, two types of relation can be identified: input and output (Bunge, 2003). While input concerns to does relations coming from the environment, output concerns to does relations going to the outside.

A mechanism is a process in a concrete system, such that it is capable of bringing about or preventing some change in the system as a whole or in some of its subsystems (Bunge, 1997). It is hypothesized that innovation and entrepreneurship are mechanisms that allow universities to constantly adapt and respond to challenges imposed by the knowledge society. Innovation and entrepreneurship can be considered continuous and complementary processes that allow productions systems and social standards be replaced my new or better ones. Mechanisms can take the form

of agency-structure relations (bottom-up mechanism or upward causation), or structure-agency relations (top-down mechanisms or downward causation). They can also take cue form of input–output relations, linking the components of the system with those of the environment.

This systemic conceptual framework offers many potential avenues for future research, including increments in its theoretical foundation and its empirical validation. The descriptive study presented in the next section illustrates each of the systemic elements of the framework according to a particular university. It does not intend to test the conjectured model nor to test the hypothesized mechanisms. It only evidences each element of the systemic conceptual framework according a specific university.

6.4.2 The Case of Southern University of Santa Catarina

The University of Southern Santa Catarina (Unisul) is a community university located in southern Santa Catarina, Brazil. Brazilian community universities are characterized as public, but non-state organizations. This means they do not have regular public funding, and therefore, their financial sustainability depends on their operations (teaching, research, and extension). Their public status, however, highly integrated to the communities, make contribution to regional socioeconomic development even more important, but their funding depends on external incomes such as student fees, services, projects funding, among others.

Unisul's Institutional Development Plan (IDP) defines it as “a community educational organization for the production, development and dissemination of knowledge through research, teaching and extension, at all levels and areas of knowledge, in physical and distance learning modalities”. In consonance with the Brazilian Law, Unisul is “an education organization towards teaching, research and extension” (IDP, STA, REG), aiming to promote (STA):

Teaching and learning in all levels. [...] Research, extension, knowledge application, and development and dissemination of theoretical and applicable knowledge. [...] Technological development, scientific research, social and community development. [...] Exchanges and cooperation with national and international organizations.

These specific objectives stress the generation, dissemination and application of knowledge functions of universities, in line with regional needs and in cooperation with other organizations. The participation of the University in solving regional problems, in partnership with multiple private, state and community organizations, can be seen in the following passages of the IDP:

The University features and helps to articulate significant movements in communities, [...] in various areas of knowledge and, above all, in partnership with many private, state and community organizations. [...] The University is integrated to the community through a portfolio directed to the cities in which it operates, offering courses, research and extension projects, providing services that complement public policies.

The relationship and dialogue with its surroundings are present in the social responsibility policies of Unisul, as defined by the IDP:

Sharing of knowledge produced in the University with the community, expanding the access to knowledge and affecting the community through scientific, technical and cultural activities. [...] Dialogue with the various sectors of society and the public sector, with the productive sector and the labor market, and with social, cultural and educational organizations.

Unisul's commitment to regional development is made clear in the IDP when it says "Unisul implements its community and innovative nature, among other ways, in the commitment to regional development, participating effectively in the integrated development of the communities where it acts". Regional socioeconomic development is further stressed by the IPP:

Communities see Unisul as a partner in the development of their regions and an ally to retain young people and adults in their places of origin. [...] The University has contributed significantly to the socioeconomic development of its State.

The analyzed documents also revealed how the Unisul contributes to regional development, especially in social aspects (IDP):

Unisul offers a wide list of social services and organizes joint actions with social organizations, creating diversified environments for teaching and learning activities. The provision of social services is associated with academic practice and technical training, related not only to internships and tutoring, but also to curriculum proposals involving research and extension associated with teaching.

Despite the references to social and economic development, it seems that Unisul has greater emphasis on social development, as can be seen in the IPP, when it says "social inclusion through education, production and circulation of knowledge relates to the social role of the university, once they relate to its social commitment, the Organization's main objective".

Concerning sustainability, the non-state community character makes economic and financial sustainability even more important. The need for sustainability is evident in the following passages of the IDP:

Financial sustainability gains an even bigger importance in the context of a community university. The economic and financial aspects have a strong appeal in decision-making regarding products and services offering, once the organization depends on incomes to ensure its operations.

The IDP further emphasizes the need for decisions guided not only on public interest, but also on structural and market dimensions, allowing a sustainable development:

Benchmarking, market and interests of internal and external stakeholders have been aligned with the dimensions in which decisions are taken: academic, structural and market ones. [...] Economic, financial, social and environmental balance, internalizing the spirit of collaborative attitudes in achieving sustainable, effective and relevant results to the development of the different regions of the state and the country. [...] Viability of resources to teaching, research, extension, and management to promote economic and social development.

According to the analyzed documents, Unisul is composed of human, physical and technological resources. Regarding human resources, both the STA and the REG say “the university community consists of faculty, students, technical/administrative staff, and volunteers”, so specified:

Faculty consists of professors with recognized moral character, technical and teaching skills that meet legislation, statutory and regimental requirements. The student body consists of the students enrolled in all teaching modalities offered by Unisul. Technical and administrative staff consists of employees with recognized moral character, technical and professional capacity. The volunteer body consists of individuals not employed nor remunerated by Unisul, which expressly opt for voluntary service.

Physical resources, also referred to as physical infrastructure, consist of classrooms, auditoriums, living spaces, physical and virtual laboratories, among others (PDI). Technological resources, also known as technological infrastructure, are made up of microcomputer resources, data centers and audiovisual (PDI).

The analyzed documents refer to society, characterized as the knowledge society, as the environment in which Unisul operates, as can be seen in the following passage of the IPP:

In the context of the knowledge society, the University ceases to be a unique center of knowledge, culture, science and technology. As a space linked to the complexity of social relations, the University is characterized as action and social practice, where society is principle, normative and evaluative reference.

The IPP also shows the need to know the individuals and the organizations with which the University is related, as well as the need for ongoing dialogues and joint activities:

The University should recognized itself as a member of the community, participating in public policy development and various community movements through research projects, teaching and extension. In this dynamic, it is possible to discuss relevant issues of society and contribute to its cultural, economic and social development. [...] Relations between the subjects of society linked to the public or to the private sectors, social, cultural and educational organizations, feed the actions of the university and lead people from different social and cultural communities to dialogue and to interact.

By operating in the knowledge-based society, Unisul interacts with public, private and community organizations. This means that Unisul explicitly considers the interactions with industry, government and communities.

The analyzed documents show two internal structures of Unisul: one academic and one administrative. Academic structure assumes that teaching, research and extension constitute Unisul’s main and inseparable activities (EST), organized in knowledge areas, known as academic units, which act according to the following hierarchy (IDP):

The Pro-Rectorcy of Teaching, Research and Extension has the attribution to define, implement and monitor policies and guidelines for teaching, research and extension, in conjunction with other Pro-Rectorcies and Campuses Administrations. The Academic Units promote academic articulation and integration, structured in knowledge areas and technical and professional fields, at different levels and modalities, in order to qualify and give sustainability to the teaching, research and extension. At the Campus Administration, the Management of Teaching, Research and Extension has the attribution to act on the implementation of the

organizational policies and guidelines defined by the Pro-Rectorcy of Teaching, Research and Extension. Whining campuses, Program Coordinations have the task to coordinate the actions required to generate, maintain, and promote teaching, research and extension within their respective programs. As for research and extension projects, they are of responsibility of their coordinators, in conjunction with other areas of academic management.

According to the Statute, Unisul's administrative structure is formed by a Central Administration, the Campus Administration and Program Administration. Unisul has three pro-rectories, namely Pro-Rectorcy of Education, Research and Extension, Pro-Rectorcy of Operations and Academic Services, and Pro-Rectorcy of Institutional Development. Unisul is organized in three campuses (Tubarão, Grande Florianópolis, and Virtual), two mainly concerning physical presence learning, and one concerning exclusively to distance learning.

Individuals (students, faculty and staff) are linked to structures according to what is defined in STA: "faculty and technical-administrative staff maintain employment contract with Unisul; students are those individuals enrolled in all teaching modalities offered by Unisul". Besides these forms of linkage (employment contract and enrolment), the analyzed documents do not detail how individuals relate specifically to each of the teaching, research and extension activities. Furthermore, although the analyzed document often cite external relations, as evidenced in previous subsections, they do not detail how the internal elements relate to external elements. They do not make clear how students, faculty and staff relate to those individuals from public, private and community organizations.

In order to understand innovation and entrepreneurship as mechanisms that make Unisul contribute to regional socioeconomic development and allow its sustainability, there is needed to understand how innovation and entrepreneurship are stated in Unisul's strategic identity, and how they are related to Unisul's teaching, research and extension functions. Concerning Unisul's strategic identity, innovation and entrepreneurship are explicitly cited in its mission, vision, values, and objectives (IDP):

[Unisul's mission is] to promote education at all levels and modalities to form fully and lifelong, responsible citizens, committed to the development of science, technology and innovation, contributing to the improvement of life in society.

[Unisul's vision] is be a community university of vanguard, entrepreneurial and global, recognized for expanding access to education of quality and for contributing to sustainable development in Santa Catarina and in Brazil, in partnership with the State and other organizations.

Unisul's vision clearly mentions regional development in partnership with government and other organizations. The organizational values also emphasize the culture of entrepreneurship and innovation, mentioning its responsibility for regional development (IDP):

Entrepreneurial Attitude: strengthening the culture of entrepreneurship and innovation, in all its areas of operation, in order to generate rapid and effective responses to the demands of society; proactiveness in generating creative solutions, integrated with organizational objectives and strategies, from all installed competences, whether in research, teaching, extension, or management.

Community Integration: transformational leadership with responsibility with its surroundings and community, developing behaviors and attitudes; establishment of direction and motiva-

tion purposes with a view to the synergistic engagement in pursuit of sustainable regional development; outstanding presence in the national and international scene, educational and associative networks, in partnership with the State and the private sector.

Within Unisul's strategic objectives, innovation and entrepreneurship appear mainly when it seeks to increase the portfolio of products and services, to expand scientific production and knowledge assets, to foster innovation and entrepreneurship, and to promote pedagogical innovation (IDP).

In consonance with the Brazilian Law, Unisul considers teaching, research and extension its basic, complementary and inseparable functions (IDP). The link between teaching, research and extension are explained in the following passages of the IDP, making them "a continuous and necessary movement between academy and society in production, socialization and application of knowledge" (IPP):

The link between teaching, research and extension promotes formation of competent professionals to support innovative processes in terms of economic and social development. [...] Unisul articulates science, innovation and marked in its training activities, so that teaching, research and extension are articulated to promote meaningful learning.

Concerning innovation in the teaching function, the analyzed documents show that innovations can appear in the form of curriculum, teaching methodologies, teaching environments and teaching materials, where curriculum innovations are often cited in the IDP and IPP as one of the principles of didactic-pedagogic organization of Unisul.

The IPP and PPP seek to offer flexible and innovative learning curriculums towards the integration and coordination of areas of knowledge, scientific disciplines, modalities and levels of education, and the practices of teaching, research and extension. [...] Innovation of curriculum components becomes significant when related on society demands, on academic-administrative organization of the university and in the permanent configuration of knowledge for the construction and socialization of knowledge. [...] Curriculum innovation lies in the fact of enhancing cognitive and affective experiences coming from a relationships space that gives meaning and direction to the formation process. [...] The idea that the teaching materials have their meaning and their purpose when put into use implies a systematic evaluation process in order that it can guide the necessary changes to their suitability and innovation. [...] The same goes for the incorporation of technological advances in curricular organization, which is a mandatory topic of discussion in the academic world (PPI).

In the teaching process, Unisul concerns about students practical activities, such as internships and tutoring, as these contribute to the formation of quality students, in line with the reality in which they live (IPP). Moreover, by offering products and services outside the traditional 6-month cycle, Unisul features innovations in the provision of products and services (IPP). Innovation and entrepreneurship are also stressed in educational policies of Unisul:

Promotion of continuous movement between production, socialization and application of knowledge. [...] Promotion of curricular flexibility for permanent access to university. [...] Foment of practices and resources to enable the development of entrepreneurship culture in formation processes.

Unisul sees research as a proponent of novel and innovative solutions to society's demands, and extension as the relationship with the productive sector and other segments of society toward innovation and regional development:

Research and extension are understood as a method for elaboration and structuring of knowledge and for direct dialogue of academic knowledge with society (PPI). [...] Research and extension promotion aims to innovate and consolidate knowledge produced within the university and consolidate the relationship that Unisul keeps with society, pursuing alternatives to sustainable development (PPI). [...] Research is understood as a proponent of novel and innovative processes and products. The application of such research takes place through extension, in relations with the productive sector or specific public and private segments, aiming innovation and regional development (IPPI, REG). [...] The university extension is configured as an integrated, participatory and humane movement involving university and community in joint knowledge production (REG).

Extension is also seen as an integrated, participatory and humane movement between the university and the community for the joint knowledge production. Approximation to the productive sector and other sectors of society towards innovative solutions is further emphasized in the research policies of Unisul (PPI):

Approximation to the productive sector, the educational sector and the social sector, providing the intellectual capacity installed in the search for innovative solutions, articulated with public policy and science, technology and innovation.

Similarly, dialogue with the community to find solutions for social challenges, dissemination of academic knowledge, and entrepreneurial activities are emphasized in the extension policies of Unisul (IPP):

Promotion of permanent dialogue with the community in seeking solutions to social challenges, based on knowledge production and the construction of knowledge with the society dynamics. [...] Dissemination of academic production, expanding access to scholarly knowledge. [...] Articulation and development of entrepreneurial initiatives with the productive sector, government, professional and representative associations, promoting a culture of entrepreneurship and innovation.

It is worth to mention that there are no references to processes related to intellectual property and technology transfer in the research and extension policies of Unisul. Furthermore, despite the numerous references to innovation and entrepreneurship related to teaching, research and extension, except for those that refer to teaching, more specific processes related to innovation and entrepreneurship are identified only from its Innovation and Entrepreneurship Agency (Agetec), defined by the IDP as:

Through Agetec, Unisul is creating a nucleus of innovation able not only to approximate research to investors and establish an intellectual property production culture, but also to promote relations with the community via social technologies and innovation processes with socio-cultural impacts. Agetec is a center of innovation and entrepreneurship created with the purpose of strengthening relations between university, government and productive sector to generate scientific and technological knowledge to companies and other organizations.

By analyzing Agetec's regulation, specific activities related to innovation and entrepreneurship can be identified:

Project Office: operates in fund raising for research and extension projects; supports project design, and management. [...] Intellectual Property and Technology Transfer Office: operates in the management of intellectual property and in the support of technology transfer. [...] Coordination of Incubators and Parks: operates in the definition of organizational policies for incubators and science/technology parks, as well as in management, coordination and organizational representation of incubators and parks. [...] Entrepreneurship Center:

operates in stimulating, promoting and disseminating entrepreneurship and innovation culture within Unisul and its surroundings, promoting policies, strategies, drivers and actions that contribute to value and business creation, and sustainable development. [...] Legal Advice: acts to ensure legal certainty and speed related to Agetec's and its structures relations with the productive sector and the government.

These evidences from Unisul's organizational documents show empirically each of the elements of the systemic conceptual framework for innovation and entrepreneurship in the academic setting. First, it evidences Unisul as a social system, in the context of the knowledge-based society, aiming to contribute to regional socioeconomic development at the same time it tries to preserve its sustainability. In accordance with the Brazilian Law, its functions are teaching, research and extension, and they include knowledge creation, dissemination, and application. Second, it evidences the internal components (students, faculty, staff, and artefacts) and some of the items belonging to the environment in which Unisul operates, such as government, industry, and communities.

Third, it evidences the internal relations (academic and administrative structure) of Unisul's components, and some of the interactions among these components and the items of its environment. More specifically, Unisul interacts with public, private and community organizations. However, organizational documents do not evidence in detail how individuals relate specifically to each of the teaching, research and extension activities, neither the exact bounds defining the exostructure of Unisul (relations between the internal components and those from its environment). Finally, it evidences the role of innovation and entrepreneurship as mechanisms that allow universities to contribute to regional socioeconomic development and to preserve its own sustainability. The analyzed documents clearly evidence innovation and entrepreneurship within Unisul's strategic plan, and related to its teaching, research, and extension, which allow the creation, dissemination and application of knowledge.

Concerning the specific mechanisms related to innovation and entrepreneurship within Unisul, it is worth to mention that they include, but are not restricted to:

- Innovations in curriculums, including curricular content and organization, teaching methodologies, environment and materials;
- Training and formation of students with potential for innovation and entrepreneurship;
- Research and development in consonance with economic and social needs of the university surroundings;
- Contracted and collaborative research with government, industry, and communities;
- Extension of knowledge in order to apply university knowledge to regional development;
- Existence of an intellectual property policy in order to preserve the intellectual rights of students, faculty, partners, and so on;
- Existence of a technology transfer office in order to increment the knowledge transferred from the University to industry and society;
- Existence of a project office in order to increment fund raising for research and extension, in addition to increment the quality of project's management;

- Maintenance of social and business incubators in order to accelerate the creation of social and traditional business;
- Maintenance of a research park in order to provide environments for innovation and entrepreneurship, bringing together university, industry and government;
- Consulting, technical and social services in many areas of knowledge;
- Portfolio management in accordance with regional needs and economic/financial sustainability.

These extensive and multifold mechanisms show the continuous and complementary roles of innovation and entrepreneurship in the academic setting, in consonance to what is argued in Sect. 6.3 (innovative knowledge and entrepreneurial knowledge). Furthermore, they show that innovation and entrepreneurship within universities are related both to being innovative and entrepreneurial (curriculum innovation and portfolio management, for example) and to fostering innovation and entrepreneurship (technology transfer and spinoff creation, for example).

6.5 Conclusions

The aim of this chapter was to evidence the suitability of using systemism as an approach to understand innovation and entrepreneurship as mechanisms that allow universities to contribute to socioeconomic development and to preserve their own sustainability. Particularly, according to Yin (2014) and Eisenhardt (1989), the case of the University of Southern Santa Catarina (Unisul), in Brazil, was analyzed.

The increasing literature on innovation and entrepreneurship in the academic setting turns out to be fragmented, heterogeneous, and from multiple disciplines. It includes terms such as academic innovation, university innovation, innovative universities, academic entrepreneurship, university entrepreneurship, and entrepreneurial universities. Even though the terms innovation and entrepreneurship are used together in many studies within universities, not many have explicitly address them together at theoretical and empirical levels. Furthermore, no relevant study has been identified explicitly considering innovation and entrepreneurship in the academic setting from the perspective of complex systems theory.

The conceptual framework outlined in this chapter reflects Bunge's systemism for complex systems, including the concepts of composition, environment, structure, and mechanisms to model and understand social systems. According to this conceptual framework, universities are complex social systems, in the context of the knowledge-based society, that need to contribute to regional socioeconomic development, while maintaining their sustainability. This system might be explained by its composition at micro and macro levels, by its environment, by the bounds that inter-relate components and relate components to its environment, and by the innovation and entrepreneurship mechanisms that make it behave the way it does. The innovation and entrepreneurship mechanisms are related to the knowledge creation, dissemination, and application functions of universities.

The descriptive study evidenced each of the elements of the framework, including its composition, elements of the knowledge society, relations between its components and its environment, and some mechanisms associated to innovation and entrepreneurship in the processes of knowledge creation, dissemination and application.

As a result, it can be stated that systemism is suitable to model universities as social systems, in order to understand the role of innovation and entrepreneurship in the academic setting. First, systemism is an approach to model and understand complex system, which is case of universities in the context of the knowledge-based society. Second, systemism allows to consider the three levels by which innovation and entrepreneurship have been studied within universities: individual, organization and environmental. Third, systemism offers clear conceptual dimensions that can be applied to both theoretical and empirical levels of a research. Fourth, it allows the use of cross-disciplinary knowledge to understand how the system works, and to consider both what is and how people see it data. Therefore, multidisciplinary knowledge and both quantitative and qualitative research methods might be used. Finally, systemism allows the explanation of the dynamics of the system.

The main limitation of this chapter is related to the fact that only organizational documents were considered as source of evidence for the case study. Strategic documents may not represent what actually happens at operational levels of the university. They lack details on how in fact both relations (bounds) and mechanisms (processes) work in practice. From a knowledge perspective, this means that only declarative knowledge was considered, lacking procedural, and even conditioning knowledge.

Further studies are needed to evolve in the discussion of innovation and entrepreneurship in the academic setting from the perspective of complex systems, and as mechanisms that allow universities to contribute to regional socioeconomic development, while preserving their sustainability. Several aspects need to be explored at both theoretical and empirical levels. At the theoretical level, it is suggested to incorporate into the conceptual framework some elements of innovation and entrepreneurship that have not been addressed in previous studies. At the empirical level, deeper explorative studies are suggested to advance the system conjecturing, as are explanatory studies to test the hypothesized mechanisms.

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References

- Abreu, M., & Grinevich, V. (2013). The nature of academic entrepreneurship in the UK: Widening the focus on entrepreneurial activities. *Research Policy*, 42(2), 408–422.
- Audretsch, D. B. (2014). From the entrepreneurial university to the university for the entrepreneurial society. *Journal of Technology Transfer*, 39(3), 313–321.

- Axelrod, R. M., & Cohen, M. D. (2000). *Harnessing complexity: Organizational implications of a scientific frontier*. New York: The Free Press.
- Brennan, M., McGovern, P., & McGowan, P. (2007). Academic entrepreneurship on the island of Ireland: Re-orientating academia within the knowledge economy. *Irish Journal of Management*, 28(2), 51–77.
- Bunge, M. (1979). A systems concept of society: Beyond individualism and Holism. *Theory and Decision*, 10, 13–30.
- Bunge, M. (1996). *Finding philosophy in social science*. New Haven, CT: Yale University Press.
- Bunge, M. (1997). Mechanism and explanation. *Philosophy of the Social Sciences*, 27(4), 410–465.
- Bunge, M. (2000). Systemism: The alternative to individualism and holism. *Journal of Socio-Economics*, 29, 147–157.
- Bunge, M. (2003). *Emergence and convergence: Qualitative novelty and the unity of knowledge*. Toronto: University of Toronto Press.
- Bunge, M. (2004). How does it work? The search for explanatory mechanisms. *Philosophy of the Social Sciences*, 34(2), 182–210.
- Casti, J. (1981). Systemism, system theory and social system modeling. *Regional Science and Urban Economics*, 11, 405–424.
- Chang, Y. C., Chen, M. H., Hua, M., & Yang, P. Y. (2006). Managing academic innovation in Taiwan: Towards a 'scientific-economic' framework. *Technological Forecasting and Social Change*, 73(2), 199–213.
- Chen, S. H., Huang, M. H., & Chen, D. Z. (2013). Driving factors of external funding and funding effects on academic innovation performance in university-industry-government linkages. *Scientometrics*, 94(3), 1077–1098.
- Clark, B. R. (1996). Substantive growth and innovative organization: New categories for higher education research. *Higher Education*, 32(4), 417–430.
- Clark, B. R. (1998). *Creating entrepreneurial universities: Organizational pathways of transformation*. Oxford: Pergamon-Elsevier Science.
- Conklin, G. H. (1978). Frustration of academic innovation: Can new teaching techniques survive in academic marketplace. *Teaching Sociology*, 5(2), 125–140.
- Doutriaux, J. (1987). Growth pattern of academic entrepreneurial firms. *Journal of Business Venturing*, 2(4), 285–297.
- Drucker, P. F. (2006). *Innovation and entrepreneurship—Practice and principles*. New York: Harper.
- Eisenhardt, K. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532–550.
- Etzkowitz, H. (1984). Entrepreneurial scientists and entrepreneurial universities in American academic science. *Minerva*, 21(2–3), 198–233.
- Etzkowitz, H. (1998). The norms of entrepreneurial science: Cognitive effects of the new university-industry linkages. *Research Policy*, 27(8), 823–833.
- Etzkowitz, H. (2003a). Innovation in innovation: The Triple Helix of university-industry-government relations. *Social Science Information*, 42(3), 293–337.
- Etzkowitz, H. (2003b). Research groups as 'quasi-firms': The invention of the entrepreneurial university. *Research Policy*, 32(1), 109–121.
- Etzkowitz, H. (2004). The evolution of the entrepreneurial university. *International Journal of Technology and Globalization*, 1(1), 64–77.
- Etzkowitz, H. (2013). Anatomy of the entrepreneurial university. *Social Science Information*, 52(3), 486–511.
- Etzkowitz, H., Webster, A., Gebhardt, C., & Terra, B. R. C. (2000). The future of the university and the university of the future: Evolution of ivory tower to entrepreneurial paradigm. *Research Policy*, 29(2), 313–330.
- Goldstein, H. A. (2010). The 'entrepreneurial turn' and regional economic development mission of universities. *Annals of Regional Science*, 44(1), 83–109.

- Gräbner, C., & Kapeller, J. (2015). New perspectives on institutionalist pattern modeling: Systemism, complexity, and agent-based modeling. *Journal of Economic Issues*, 49(2), 433–440.
- Guenther, J., & Wagner, K. (2008). Getting out of the ivory tower: New perspectives on the entrepreneurial university. *European Journal of International Management*, 2(4), 400–417.
- Guerrero, M., Cunningham, J., & Urbano, D. (2015). Economic impact of entrepreneurial universities' activities: An exploratory study of the United Kingdom. *Research Policy*, 44(3), 748–764.
- Guerrero, M., & Urbano, D. (2012). The development of an entrepreneurial university. *The Journal of Technology Transfer*, 37(1), 43–74.
- Guerrero, M., Urbano, D., Cunningham, J., & Organ, D. (2014). Entrepreneurial universities in two European regions: A case study comparison. *The Journal of Technology Transfer*, 39, 415–434.
- Hofkirchner, W. (2007). A critical social systems view of the Internet. *Philosophy of the Social Sciences*, 37(4), 471–500.
- Jacob, M., Lundqvist, M., & Hellsmark, H. (2003). Entrepreneurial transformations in the Swedish University system: The case of Chalmers University of Technology. *Research Policy*, 32(9), 1555–1568.
- Kirby, D. A., Guerrero, M., & Urbano, D. (2011). Making universities more entrepreneurial: Development of a model. *Canadian Journal of Administrative Sciences*, 28(3), 302–316.
- Klofsten, M., & Jones-Evans, D. (2000). Comparing academic entrepreneurship in Europe: The case of Sweden and Ireland. *Small Business Economics*, 14(4), 299–309.
- Lindquist, J. (1974). Political linkage: Academic innovation process. *Journal of Higher Education*, 45(5), 323–343.
- Mainardes, E. W., Alves, H., & Raposo, M. (2011). The process of change in university management: From the “Ivory Tower” to entrepreneurialism. *Transylvanian Review of Administrative Sciences*, 33, 124–149.
- Mars, M. M., & Rios-Aguilar, C. (2010). Academic entrepreneurship (re)defined: Significance and implications for the scholarship of higher education. *Higher Education*, 59(4), 441–460.
- Mazdeh, M. M., Razavi, S. M., Hesamamiri, R., Zahedi, M. R., & Elahi, B. (2013). An empirical investigation of entrepreneurship intensity in Iranian state universities. *Higher Education*, 65(2), 207–226.
- Murray, R., Caulier-Grice, J., & Mulgan, G. (2010). *The open book of social innovation*. London: The Young Foundation.
- Nelles, J., & Vorley, T. (2011). Entrepreneurial architecture: A blueprint for entrepreneurial universities. *Canadian Journal of Administrative Sciences*, 28(3), 341–353.
- Neves, C. E. B., & Neves, F. M. (2011). Research and innovation: New challenges for higher education in Brazil and in Germany. *Caderno CRH*, 24(63), 481–501.
- O’Shea, R. P., Chugh, H., & Allen, T. J. (2008). Determinants and consequences of university spinoff activity: a conceptual framework. *The Journal of Technology Transfer*, 33(6), 653–666.
- Philpott, K., Dooley, L., O’Reilly, C., & Lupton, G. (2011). The entrepreneurial university: Examining the underlying academic tensions. *Technovation*, 31(4), 161–170.
- Pickel, A. (2004). Systems and mechanisms: A symposium on Mario Bunge’s philosophy of social science. *Philosophy of Social Sciences*, 34(2), 169–181.
- Pickel, A. (2007). Rethinking systems theory: A programmatic introduction. *Philosophy of the Social Sciences*, 37(4), 391–407.
- Reihlen, M., Klaas-Wissing, T., & Ringberg, T. (2007). Meta theories in management studies: Reflections upon individualism, holism, and systemism. *Management*, 10(3), 49–69.
- Ropke, J. (1998). The entrepreneurial university, innovation, academic knowledge creation and regional development in a globalized economy. *Working Paper, Department of Economics, Philipps-Universität Marburg, Germany*.
- Ross, R. D. (1976). Institutionalization of academic innovations: 2 models. *Sociology of Education*, 49(2), 146–155.

- Rothaermel, F. T., Agung, S. D., & Jiang, L. (2007). University entrepreneurship: A taxonomy of the literature. *Industrial and Corporate Change*, 16(4), 691–791.
- Sam, C., & van der Sijde, P. (2014). Understanding the concept of the entrepreneurial university from the perspective of higher education models. *Higher Education*, 68(6), 891–908.
- Schachter, H. L. (1986). State coordinating agencies and academic innovation: A policy sector perspective. *Higher Education*, 15(3–4), 333–342.
- Schneider, C. (2013). Researching transnationalisation and higher education in the context of social mechanisms. *Journal of Contemporary European Studies*, 21(4), 480–495.
- Schumpeter, J. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.
- Shah, S. K., & Pahnke, E. C. (2014). Parting the ivory curtain: understanding how universities support a diverse set of startups. *The Journal of Technology Transfer*, 39(5), 780–792.
- Strier, R. (2011). The construction of university-community partnerships: entangled perspectives. *Higher Education*, 62(1), 81–97.
- Tijssen, R. J. W. (2006). Universities and industrially relevant science: Towards measurement models and indicators of entrepreneurial orientation. *Research Policy*, 35(10), 1569–1585.
- Todorovic, Z. W., McNaughton, R. B., & Guild, P. (2011). ENTRE-U: An entrepreneurial orientation scale for universities. *Technovation*, 31(2–3), 128–137.
- Urbano, D., & Guerrero, M. (2013). Entrepreneurial universities: Socioeconomic impacts of academic entrepreneurship in a European region. *Economic Development Quarterly*, 27(1), 40–55.
- van Vught, F. (1999). Innovative universities. *Tertiary Education and Management*, 5(4), 347–354.
- von Bertalanffy, L. (1968). *General system theory: Foundations, development, applications*. New York: George Braziller.
- Wan, P. Y. Z. (2011). Emergence à la systems theory: Epistemological totalausschluss or ontological novelty? *Philosophy of the Social Sciences*, 41(2), 178–210.
- Wan, P. Y. Z. (2012). Dialectics, complexity, and the systemic approach: Toward a critical reconciliation. *Philosophy of the Social Sciences*, 43(4), 411–452.
- Wood, M. S. (2011). A process model of academic entrepreneurship. *Business Horizons*, 54(2), 153–161.
- Wright, M. (2014). Academic entrepreneurship, technology transfer and society: Where next? *Journal of Technology Transfer*, 39(3), 322–334.
- Yin, R. K. (2014). *Case study research: Design and methods*. Thousand Oaks: Sage.
- Yokoyama, K. (2006). Entrepreneurialism in Japanese and UK universities: Governance, management, leadership, and funding. *Higher Education*, 52(3), 523–555.

Chapter 7

Entrepreneurial University: Educational Innovation and Technology Transfer

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Abstract In modern knowledge societies, universities have had to broaden their traditional teaching and research functions to include the third mission, thus strengthening their commitment to society and industry. Tackling this objective requires defining new educational models which are more focused on continuous learning, innovation, social engagement and productive creation. It is a responsibility of the universities to work with their students and staff to create an environment that supports social and economic development based on entrepreneurial and innovative foundations.

The objective of this paper is to show how educational innovation in entrepreneurship and technology transfer consolidates the third mission and transforms higher education institutions into entrepreneurial universities. The results obtained suggest that public investment to promote entrepreneurship in universities is efficient. To improve these results it is necessary to determine standards in entrepreneurial education to introduce them into the academic curriculum and strengthen incubators focused on the creation of academic spin-offs from university R&D results.

Keywords Academic spin offs • Doctoral programs • Educational innovation • Effectiveness of entrepreneurship public funds • Entrepreneurial activity • Entrepreneurial culture • Entrepreneurial policies • Entrepreneurial skills • Entrepreneurial university • Entrepreneurship • Entrepreneurship competences • Entrepreneurship public expenditure • Entrepreneurship promotion • Higher education • Investment in Education • Monitoring entrepreneurship learning outputs • R&D results • Technology transfer • Third mission • University governance

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7.1 Introduction

Nowadays, universities play an increasingly important role in achieving economic growth and social progress. Their traditional missions of teaching and research are being broadened to include third mission activities that facilitate their engagement with society and industry. Universities should play an active role in the economic and social development of their region.

In the current situation, society is facing new economic and social scenarios. As demonstrated in the OECD Innovation Strategy, entrepreneurial abilities and attitudes, risk-taking behaviour and creativity will be crucial competences in the economy of the future (OECD, 2009). Therefore, it is necessary to analyse the capacity of our universities for, on the one hand, transferring the entrepreneurial culture to their students and staff and, on the other, transferring university R&D results to creating new spin-offs and high tech start-ups. An entrepreneurial university has to work on both an educational approach and an R&D approach.

The objective of this paper is to show how educational innovation in entrepreneurship and technology transfer consolidate the third mission and transform higher education institutions into entrepreneurial universities, using *GEM* data, spin-off data and the entrepreneurial activity of the University of the Basque Country (UPV/EHU). We are trying to improve university governance in educational innovation and technology transfer by:

1. Building bridges between secondary and higher education and developing protocols of educational innovation to promote entrepreneurial competences.
2. Supporting the design of new educational models to activate entrepreneurship competences in the academic curriculum, aligned with public policies.
3. Boosting university programmes devoted to supporting academic spin-offs and technology transfer.

Fundamentally, there are two gaps in the field of entrepreneurial education. On the one hand, we see a multitude of entrepreneurial education programmes without a clear standard defining the competence of entrepreneurship, or an indicator of entrepreneurial learning allowing us to monitor the phenomenon at all levels of education. And secondly, there is a lack of effort in educational innovation for training in entrepreneurship skills in all knowledge areas, especially in the doctoral programmes closest to the transfer mechanisms. If this gap is not covered, it may be difficult to increase the figures for higher quality academic entrepreneurship: which is what transforms scientific research results into business fabric through the creation of spin-offs.

The work is carried out as follows. The theoretical framework that guides entrepreneurship activities at the university are given below from two perspectives: entrepreneurial education and transfer of university research results. Subsequently, we will show the activities and results of entrepreneurial activity at the University of the Basque Country (UPV/EHU) compared with the general rate of entrepreneurial activity in the Basque Country, to discover the differences and similarities of university entrepreneurship with respect to the general. Finally, we will show the findings and implications of the work for policy makers and for those responsible for university governance.

7.2 Theoretical Frame Work

In the last few decades the so-called university third mission has gained momentum, as a result of which it seems compulsory for academic institutions to be more involved in economic and social development (Arroyo-Vázquez & Jiménez-Sáez, 2008). Clark (1996, 1998, 2001), Etzkowitz (1998, 2004), Gibb (2005), Kuratko (2005), Maskell and Robinson (2002), and Ropke (1998) among others, coined the term entrepreneurial university, which implies the existence of an entrepreneurial culture focused on training, research and transfer activities, which guides the attitude and way in which the university institution and community carries out its activities (Corti & Riviezzo, 2008; Klofsten & Jones-Evans, 2000).

An entrepreneurial society is a society which is more open to continuous learning, innovation, social commitment and productive creation. That is why it is the work of universities to counteract the adverse effects of the environment and work with their students to create an environment which is conducive to social development on the pillars of entrepreneurship, innovation and the transfer of science and technology. It is therefore up to the university to take the entrepreneurial role that Peter Drucker claimed for the individual, a university that “spoils and disorganises”, that innovates by causing change (Drucker, 1986). To build an entrepreneurial university, it is necessary to guide university governance on a double perspective: educational innovation aims to improve entrepreneurial education and technology transfer aims to promote the creation of academic spin-offs.

7.2.1 *Entrepreneurial University. Educational Innovation Approach: Entrepreneurial Education*

Policy makers used to define measures of economic promotion to increase the entrepreneurial activity rate but they can also influence through entrepreneurial education. Education seems to be an important tool for stimulating entrepreneurship (Backes-Gellner & Werner, 2007; Harris & Gibson, 2008; Kuratko, 2005; Mitra & Matlay, 2004; Raposo & Do Paço, 2011). Entrepreneurship research provides evidence that there is a positive and robust link between entrepreneurial education and entrepreneurship performance (The Small Business Economy, 2007).

Hansemark (1998) considered that entrepreneurship education focuses on the need for achievement, through a model for changing attitudes and motivation, compared to traditional education whose only aim is the transformation of knowledge and abilities. Jamieson (1984) organised the entrepreneurship education topic into a three-category framework: education about enterprise (theoretical knowledge), education for enterprise (training programmes for new start-ups) and education in enterprise (for business owners in expansion). But as Garavan and O’Cinnéide noted (1994), we have to make differences between entrepreneurial education and training programmes for entrepreneurs or established business owners.

The European Union has recommended education based on competences at all education levels. One of these competences is “to be an entrepreneur”. So, entrepreneurial education is one of the common objectives for the education systems of the EU (European Commission, 2008, 2012, 2014). Nevertheless, this concept has been distorted, reflecting only one part of its meaning—being a business owner. But entrepreneurship is more than the simple business creation (Kuratko & Hodgetts, 2004); it supposes new ideas and creative solutions.

The European Parliament and strategic reports from the US Education Department (Consortium for Entrepreneurship Education, 2012; European Commission, 2014) define “an entrepreneur” as a person who has the ability to actively tackle problems or the future, being capable of taking decisions without waiting for other people to resolve them. Therefore, it is not only a synonym for being a “business owner” but is also associated to the ability of being an autonomous, decisive and active person. In this sense, the EU suggested to the OECD to include it in existing PISA indicators to measure competences and learning performance in entrepreneurship education (European Commission, 2014).

Literature on entrepreneurship confirms that entrepreneurial people have a high potential for generating social, productive and cultural changes in the areas in which they act. They are agents of change, accelerators of employment and the creation of new business. Consequently, they are a very necessary part of our societies. That is why “*the most relevant objectives of enterprise education are to develop enterprising people and encourage an attitude of autonomy using suitable learning processes*” (Raposo & Do Paço, 2011). In this environment, when considering its third mission, the university must be a key element in the promotion of entrepreneurial competence, making a special effort to join secondary and higher education to monitoring learning processes and designing transversal entrepreneurial training in doctoral programmes, in order to strengthen the transference of R&D.

The traditional educational models of Mediterranean countries do not provide standards based on promoting skills such as “learning by doing”, as happens in the Anglo-Saxon environment. It is necessary to work towards methodologies that bring our educational model closer to the Anglo-Saxon one, observing the perspective of promoting skills and encouraging students, in order to establish lines of exchange and feedback with other European countries (Anglo-Saxon and Scandinavian) and develop transferable tools to other EU countries (i.e., western Europe). This will make it possible to promote homogeneous models to boost entrepreneurial competences in the youth of Europe and generate standards for entrepreneurial competences which can be included in academic curricula.

The entrepreneurial concept is a basic one for renewing the educational scenario. A PISA report shows that the youth of Europe, mainly in the Mediterranean area, have a relative lack of skills and attitudes for an autonomous, engaged, involved development with society. Moreover, the GEM Spain 2013 Report shows low scores in entrepreneurship education, with primary and secondary education being one of the worst factors assessed (Hernández, 2014). In addition, we must emphasise that at a local level, according to the GEM Spain 2014 Report, the Basque Country does

not stand out, in absolute terms, as an entrepreneurial region, being the Spanish autonomous community with the third least entrepreneurial activity in the state. (Fernández-Laviada, 2015).

To tackle this situation, it is necessary to define strategies that promote new ways of understanding educational models. These educational models must be more focused on continuous learning, innovation, social engagement and productive creation. It is a responsibility of the universities to work with their students and teachers to create an environment that supports social and economic development based on entrepreneurial and innovative foundations.

As affirmed by Holmgren et al. (2004), research in this area is putting more emphasis on what needs to be done than on the search for effective techniques for teaching and training students in entrepreneurial skills. In this situation, it is especially important to develop the competence of entrepreneurship in the classroom.

The European Commission (2014) indicates a lack of indicators about entrepreneurship education to cover all levels of education and deficiencies in monitoring entrepreneurial learning performance (self-reported). If all of the stakeholders have a common vision, they will improve the entrepreneurial ecosystem and provide a number of benefits to the community, increasing the efficiency of public expenditure and investment in entrepreneurial education and R&D.

The aim is to avoid the creation of isolated activities. The entire ecosystem (education and social system) and community (education: students, teachers...) must be involved in the educational processes as well as in the promotion of innovation, entrepreneurship and growth. They should all consider the same patterns for becoming an entrepreneur: attitudes, skills and knowledge.

7.2.2 Entrepreneurial University. Technology Transfer Approach: Spin-Off Generation

The role of university education in the economic growth and social progress of a region is currently not part of any debate. In almost all countries, university graduates have higher employment rates, their productivity is higher, they enjoy higher wages and they make less use of public subsidies. Also not part of any discussion is the contribution of university research in the technological development and generation of new products for companies (Mansfield (1991, 1998) measures the enormous contribution of universities in the generation of new products in different sectors). More controversial is their role in the use of the technological knowledge that they generate. Some authors warn of the risks of adopting the third mission; for example, Nelson (2004) warns of the danger in the long term of the privatisation of the scientific commons; Heller and Eisenberg (1998) point out that the excessive fragmentation of the intellectual property generated by the commercialisation of university research can slow down the advancement of science as a result of deadlocks and Henderson, Jaffe, and Trajtenberg (1998), citing patents, come to the conclusion that the search for commercialisation leads to a deterioration in quality.

However, against these caveats, there is another school of thought, which is gaining popularity, which argues for the need of universities to adopt the entrepreneurial mission, the so-called third mission.

This current of opinion originated in American universities and accelerated in the wake of the Bayh-Dole Act. It has subsequently spread throughout Europe, with the OECD passing the intellectual property rights of scientific knowledge to the university (WIPO). However, in spite of this, there are still big differences in the rate of creation of university start-ups between countries and between universities within the same country, as clearly illustrated by Di Gregorio and Shane (2003).

The implementation of R&D results and knowledge in the innovation process is a basic function of entrepreneurial activity (Schumpeter, 1934). There is abundant empirical literature that supports the role of universities, not only as generators of technology and knowledge, but also as platforms for developing powerful industrial and technological foci (Audretsch, 1998; Corti & Riviezzo, 2008; Grimaldi, Kenney, Siegel, & Wright, 2011; Svensson, Klofsten, & Etzkowitz, 2012). Traditionally, studies on entrepreneurial universities have focused on assessing the university-company relationship, the ability to commercialise the results of scientific research and technology transfer mechanisms (O'Shea, Allen, Chevalier, & Roche, 2005; Wright, Clarysse, Mustar, & Lockett, 2007). However, as indicated by Etzkowitz (2004), the university must meet the challenge of acting as an economic entity in itself, even adopting what it needs from significant organisational innovations and governance to cope.

The university is much more than an agent generating patents and scientific publications (Audretsch, 2014). It is also an accelerator of entrepreneurship (Guerrero & Urbano, 2014) and the generator of new ideas, opportunities and business and cultural models. The prestige of the university and the faculty involved in the use of research also has a positive influence on the creation of start-ups. In fact, Goldfarb and Henrekson (2003), analysing the start-ups created by 101 American universities between 1994 and 1998, found that the prestige of the university, the policy of taking part in the capital for the start-up and keeping low royalty rates for the inventors were the most important factors affecting the probability of the rate increasing.

Fortunately, in recent decades, the creation of technology incubators in universities is a common tool of economic policy (Mian, 2011). These infrastructures are key to the development of new products, the promotion of innovation and growth based on new technologies and the use of research results generated in universities through the creation of spin-offs.

One of the key factors in encouraging the creation of start-ups is the ownership of intellectual property rights. If they fall into the hands of researchers, then the university has no incentive to commercially exploit the results of scientific research, especially if we are talking about highly qualified research scientists. The university has an incentive to create start-ups if it is the owner of these rights, but the problem then arises of how to encourage the research scientists. It does not appear that allocating the intellectual property rights to the university is sufficient to increase the rate of start-ups; we also need to incentivise researchers to do so.

The main incentive that motivates researchers is prestige and this is achieved primarily through publications in high impact academic journals and through events. Ultimately, prestige gives them higher future income. Moreover, research that tends to lead to high-impact publications is incompatible with targeted research, which is more likely to find commercially exploitable results. There are some exceptions where the researcher can achieve both things at once: this is the case for knowledge areas in which industries have been created with a link to science, such as biotechnology, but they are not the general rule.

In addition to the above, in some university systems, mainly European, there are bureaucratic processes that make it difficult to combine university activity with business management, inflexible wage structures, difficulties in leaving the university activity and later returning to it, etc. These are aspects that greatly raise the opportunity costs of carrying out activities aimed at the creation of start-ups.

Finally, the entrepreneurial activity of the university is subject to problems of moral hazard and information asymmetries. To the extent that mechanisms are being developed that will reduce them, the rate for creating start-ups can be improved. In this sense, if the university has powerful OTRIs (Research Results Transfer Offices) that are capable of taking on the costs of start-ups, managing intellectual property and establishing relationships with venture capital investors (Hoyos-Iruarrizaga & Saiz-Santos, 2014), with sufficient financial resources to prevent the researcher having to make payments in the valley of death (Hoyos-Iruarrizaga, Blanco-Mendialdua, & Saiz-Santos, 2015), their participation in the start-ups conveys signals of quality to investors and their technical capability avoids investments of time for researchers, meaning the rate of creation of companies will probably be higher. In Spain, unlike in the large American and British universities, the OTRIs have structures that are too light, preventing them from carrying out all of the above functions. In fact, in order to take advantage of economies of scale, some of them have become associated to platforms for the transfer of knowledge, as is the case of Univalue G9,¹ which brings together the OTRIs of nine Spanish universities and where the University of the Basque Country (UPV/EHU) plays a leadership role.

7.3 The Third Mission at the University of the Basque Country (UPV/EHU)

The UPV/EHU is a teaching and research institution officially founded in 1985. Since then, 250,000 students have obtained their degrees there, 6500–7000 per year. The UPV/EHU is the Spanish University offering the highest number of degrees, with one third of these degrees having received quality certification from the Spanish Ministry of Education. The UPV/EHU represents 70 % of the research activities in

¹More information about Univalue at <http://www.univalueg9.com/>.

the Basque Country and only 50 % of the R&D expenditure. The University of the Basque Country (UPV/EHU) has three programmes devoted to entrepreneurship, aimed at supporting a double target: the generation of innovative, technology-based companies, enabling the use of research results generated at the university and the promotion of entrepreneurial culture amongst students, graduates, researchers and teachers. Given the effort made in recent years, the UPV/EHU is ranked 5th in terms of the creation of spin-offs in Spain (IUNE, 2014) and the ZITEK incubator of the spin-off programme at the UPV/EHU in Biscay is the 6th ranked incubator in Spain out of a total of 353, being the only university incubator in the top ten and ranked 4th for advanced incubation services (Blanco Jiménez et al., 2014).

The UPV/EHU has 7100 employees, 42,000 undergraduate students and 3000 graduate students. The UPV/EHU is the university of reference for young Basque people: it receives more than $\frac{3}{4}$ of the university students whose family residence is in the Basque Country. The activity generated globally by the UPV/EHU represents an annual injection of spending in the Basque Country of 720.5 million euros. It has agreements with over 400 international universities and was recently recognised as an “International Campus of Excellence” by the Spanish authorities.

The UPV/EHU has made special efforts in recent years to meet the requirements of the European Higher Education Area (EHEA), setting out the corrective action needed to ensure the quality and excellence of its teaching and research. There are a large number of useful indicators needed for the EHEA to measure and evaluate teaching quality, featuring relevant figures concerning university activity. Nevertheless, the evaluation of labour market insertion and entrepreneurial activity after studies have been completed is not usually considered.

The two main functions of a traditional university system, training and research, have been superseded by a third mission, with increasing importance in the current economic crisis: the transfer of knowledge and research on society and the entrepreneurial and economic environment. This third mission is accepted and known, but it is not widely implemented in the institution, which, like the rest of Spanish universities, does not have incentives but does have many barriers to overcome.

To this extent, within the UPV/EHU, the university programmes devoted to supporting the creation of university spin-offs and promotion of an entrepreneurial culture between the students, teachers and research staff are regarded as a key tool. Apart from entrepreneurial training programmes such as Hasten Ikasten, competitions for business ideas (Think Big) and competitions for the best start-ups (Abiatu), a variety of innovative activities have been developed to promote entrepreneurial culture such as Etorikizulan, Bus-Emprende or E-ginkana. These activities have had more than 2000 students participating per year.

The university must continue to develop attractive activities to train the university community to carry out its technology transfer obligations and give meaning to the third mission. Given the effort made over recent years, the UPV/EHU ranks 5th in terms of the creation of spin-offs for the period 2006–2011 (IUNE, 2014).

However, there is still a lot of work to do. Apart from these programmes promoting entrepreneurial culture, the UPV/EHU’s degrees do not consider entrepreneurial competences as a transverse competence and there is only specific training in the

Business and Economics faculties in a few specific subjects. Only some of the Master's programmes include entrepreneurship classes and none are offered in doctoral programmes.

7.4 Data and Methodology

In this section we try to measure the efficiency of the programmes listed in terms of the rate of creation of companies with the rate in the general population. It is hoped that if these programs are effective, it will be reflected positively in the rate of entrepreneurship with respect to the population as a whole.

Our data comes from three sources: GEM data and data on spin-offs and entrepreneurial activity from the University of the Basque Country (UPV/EHU).

We have used the Global Entrepreneurship Monitor (GEM)² project data relating to the adult population in the Basque Country and Spain. The questionnaire used is the one used in the methodology for the GEM project (Reynolds et al., 2005), which is common to all of the countries and regions taking part. The main indicator is the Total Entrepreneurial Activity Index (TEA index), which measures adults (between 18 and 64) involved in the creation process of a business with less than 42 months of activity.

To compare the entrepreneurship data for the general population with the university data, we have used the "Labour Market Insertion" statistics provided by Lanbide³ (the Basque employment service). This data source is based on the employment questionnaire produced annually by the UPV/EHU in collaboration with the Basque employment service, Lanbide. The survey is carried out 3–3.5 years after the degree in order to assess the employability of graduates. The UPV/EHU and Lanbide have carried out this activity since 2001 (class of 1998). The global data obtained also make it possible to assess the entrepreneurial profile of students with degrees annually (between 7000 and 8000 students). The comparison between the GEM data (TEA for the Basque Country) and the Lanbide-UPV/EHU data (TEA for the UPV/EHU) is very important for two reasons: firstly, because there is a full territorial match and secondly, because 2/3 of young Basque people study at the UPV/EHU, which increases the reliability rate of the sample for assessing university entrepreneurship in the Basque Country.

To assess the distinctive characteristics of the UPV/EHU university spin-offs compared with the average profile of the new companies created by the population in the Basque Country, we have used a private database from the UPV/EHU ZITEK spin-off programme, through which the 81 technology spin-offs and start-ups generated in recent years are continuously being monitored.

²More information on the project at www.gemconsortium.org.

³More information about Lanbide statistics at <http://www.lanbide.euskadi.eus/estadistica/insercion-laboral-universitaria-durante-2013/y94-estadist/es/>.

7.5 Results

Throughout the period 2000–2012, 3547 entrepreneurs with degrees have been identified at the UPV/EHU between the years 1998–2008. The average rate of entrepreneurship in the 11 years studied is 9.09%, with the first 6 years of the series being in excess of this average and the entrepreneurial activity after 2008 being less.

As can be seen in Table 7.1, the university entrepreneurship index is much higher than the overall population of the Basque Country, with rates over 50% higher than the average for the population throughout the entire series, with the exception of 2008.

Table 7.2 shows us that the female university entrepreneurship rate is 20 points higher than the average for the population. It should be clarified that female representation at the university level is higher than the male. Although data vary from year to year, between 60 and 65% of those who graduate every year are women.

As expected, the age samples from universities, mostly young, affect the rejuvenation of the average age of Basque entrepreneurs. The average age of the entrepreneur recently graduated from the UPV/EHU is about 30, although it is the 24–29 age group where there are more entrepreneurs (63.9%).

University degrees with the highest level of entrepreneurship are Business Studies, Business Administration and Management (24%), Architecture (20%), Law (14.6%), Fine Arts (10.2%), Dentistry and Physiotherapy (8.9%), Engineering (6.2%) and Journalism (4.7%). It is clear that the choice of studies and specialities is closely related to entrepreneurship as in some cases it is required for practising the profession, as is the case for architecture, or is linked to the sector, such as dentistry or law. In this respect, it should be pointed out that university vocational guidance services that work with secondary education students do not normally refer to the work format that is related to the choice of studies. It would be desirable to make improvements to information for students. On the other hand, we should mention that the fact that company-related studies appear in first place in the ranking is only because of the high number of graduates in these specialities at the UPV/EHU, which annually is about 15% of the total number of graduates at the university.

With regard to the sector of activity, the largest is the services sector, seeing significant differences in the sub-sector by comparison with the average in the Basque Country. While the majority of businesses in the Basque Country are consumption-oriented, the universities generate service companies with a more technical component: R&D services, technical office, design, education and health. As can be seen in the additional data relating to university entrepreneurship, a very high percentage of those surveyed claim that the tasks they carry out at their company are university-level functions (78.9%) and related to their studies (72.6%).

The additional data provided also show that 82.5% of university entrepreneurs choose to create value in their environment in the Basque Country. In addition, 84.2% acquired professional experience during their studies, before the decision to become an entrepreneur. The income that they declare from their business activity is very moderate, with the group showing particular concern for their training (66% have undertaken further studies).

Table 7.1 Entrepreneurial activity in the Basque Country (2004–2012) and entrepreneurial index for UPV/EHU graduates (1998–2008)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
TEA for the Basque Country	na	na	5.29 %	5.40 %	5.44 %	6.37 %	6.85 %	2.75 %	2.50 %	3.90 %	4.40 %
TEA for the UPV/EHU	9.6 %	14.4 %	12.50 %	10.30 %	9.00 %	10.10 %	8.10 %	7.40 %	6.00 %	5.90 %	6.70 %
Year of degree	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Year of interview	2001 Q4	2002 Q4	2003 Q4	2004 Q4	2005 Q4	2006 Q4	2007 Q4	2008 Q4	2009 Q4	2010 Q4	2011 Q4
Year for GEM comparison	na	na	2004	2005	2006	2007	2008	2009	2010	2011	2012
Net TEA Diff. for UPV/EHU and the Basque Country	na	na	7.21 %	4.90 %	3.56 %	3.73 %	1.25 %	4.65 %	3.50 %	2.00 %	2.30 %
% TEA Diff. for UPV/EHU and the Basque Country	na	na	136.3 %	90.7 %	65.4 %	58.6 %	18.2 %	169.1 %	140.0 %	51.3 %	52.3 %

Source: Compiled from GEM and Lanbide-UPV/EHU^a reports (2000–2012)

^aUPV/EHU graduates are interviewed 3.5 years after completing their degree to assess their ex-post employability. This employability analysis has been under way since the promotion in 1998

Table 7.2 Profile of the entrepreneur and the company created by the UPV/EHU versus the Basque Country

Characteristic	UPV/EHU (2000–2012)	Basque Country (pop. 18–64) GEM 2012	Comparison
TEA	9.09%	4.4%	(+)>TEA for the UPV/EHU
Gender	54.1% women	34%	(+)>female index
Average age	30	42	(+)>youth ^a
Age group with the highest number of entrepreneurs	24–29 (63.95%)	25–45 (56%)	idem
Degrees	Business Studies and Business Administration and Management (24%) Architecture (20%) Law (14.6%) Fine Arts (10.2%) Dentistry and Physiotherapy (8.9%) Engineering (6.2%) Journalism (4.7%)	46% University Studies	Comparison not applicable
Sector	85.3% Services (R&D, technical office, design, education and health, 40%)	74.4% Services (consumer, 43%)	(=) services, more technically and R&D oriented in the UPV/EHU
Employment generated	+10 jobs (7.9%)	+6 employees (6.6%)	(+)>generation of employment
Self-employment rate	7.7%	51.6%	(+)<self-employment index
<i>Additional UPV/EHU data</i>			
Business headquarters	82.5% Basque Country		
Prior work experience	84.2% acquired work experience during their studies		
Direct relationship with the studies	72.6%		
University-level functions	78.9%		
Average monthly income (net, full-time, 14 payments)	1235 euros		–
Ownership and scope of action	Private and national (90.1%)		
Subsequent training	66% (43.6% postgraduate and 32.9% in languages)		

Source: Compiled from GEM and Lanbide-UPV/EHU^a reports (2000–2012)

^aUPV/EHU graduates are interviewed 3.5 years after completing their degree to assess their ex-post employability. This employability analysis has been under way since the promotion in 1998

In conclusion, the main impact that is sought in an entrepreneurial activity is the generation of employment in their environment. In this sense, we should stress that university entrepreneurship has a self-employment rate far below the average for the Basque Country and also a higher initiative rate with a capacity for growth.

The distinguishing characteristics of the spin-offs and NTBCs (new technology-based companies) generated by the UPV/EHU are shown below. As we have mentioned before, the University of the Basque Country (UPV/EHU) has three university programmes devoted to entrepreneurship, one per campus (Zitek, *Entreprenari* and *Inizia*) aimed at supporting a double target: the generation of innovative, technology-based companies, enabling the use of research results generated at the university and the promotion of entrepreneurial culture among students, graduates, researchers and teachers.

Table 7.3 shows the characteristics of the UPV/EHU spin offs and NTBCs (ZITEK programme, UPV/EHU and Biscay Council). The main outputs from this ZITEK programme in 2013–2014 are:

New start-ups in 2013 and 2014: 9 and 14

New start-ups in ZITEK incubators: 25

Persons taking part in entrepreneurial culture activities: 2065

As mentioned previously, the ZITEK incubator is the 6th ranked in Spain, the only university incubator in the top ten, and the 4th ranked for advanced incubation services (Blanco Jimenez et al., 2014). University programmes support a very specific profile of business initiatives, technology-based companies and companies based on the results of scientific research, usually with high potential. For that reason, the quality of entrepreneurship in terms of type of activity and employment is much higher than the average. As shown in Table 7.3, the level of business survival is 63 %, with an average of 7.78 employees (in companies still operating). The bio and health sector represents 21 % of the total initiatives, with a much lower rate of survival, but with a higher level of employment (average of 13.4 employees) which is worth the risk involved. In 87 % of cases, the employment created is for more

Table 7.3 Characteristics and survival rate of UPV/EHU spin-offs

Spin-offs and NTBCs	Sector (%)	Survival (%)	Average employees	6–19 jobs (%)	>=20 jobs (%)
Bio and health	20.99	47.06	13.375	62.50	25.00
Services to companies	23.46	68.42	5	38.46	0.00
Engineering	22.22	66.67	6.54	45.45	0.00
ICTs	13.58	63.64	8	42.86	0.00
Creative and leisure industry	17.28	64.29	4.14	0.00	0.00
Junior companies	2.47	100.00	nd	0.00	0.00
UPV/EHU spin-off		62.96	7.78	39.13	4.35
Basque Country (pop. 18–64) GEM 2013		na	1.5	7.1	0.00

Source: Compiled from GEM and ZITEK UPV/EHU spin-offs and NTBCs (2000–2014)

than six employees and 1 out of every 4 has generated more than 20 jobs. We should also highlight the level of employment in the engineering and ICT sectors, which in almost half of the cases involves job creation for more than six employees. Additionally, we have to consider the quality of employment generated, with workforces normally represented by doctors and technologists.

As can be seen in Table 7.3, the business dimension in terms of employment and average employment generated by spin-offs is much higher than the average corporate profile for the Basque Country, reflected by the GEM for the Basque Country 2013.

7.6 Conclusions

Universities need to consolidate the third mission, developing traction protocols of educational innovation that ensure the promotion of entrepreneurship competences (as a transversal skill) in the academic curriculum, aligned with national and local policies of entrepreneurship, on a continuous path, building bridges between secondary and higher education.

Also, bearing in mind that doctoral programmes are the parts of education closest to the transfer mechanisms, universities should try to develop entrepreneurship competences in doctoral programmes in all knowledge areas. It is important to cover this gap to improve the figures for academic entrepreneurship based on the creation of spin-offs.

The creation of university spin-offs is a very complex task. It does not only depend on the existence of innovation and technology, but also on the entrepreneurial leadership of scientists and technologists, often officials of public universities, without incentives but with many barriers to a change of direction towards transfer; without interest in entrepreneurship, because their scientific reputation depends on their ability to publish their research results and not their transfer and with moral reservations about the meaning of the commercialisation of the results of scientific research. So, most of the time, the great challenge for the responsible university in this field is to convert a public official into an entrepreneur. Incompatibilities with ownership and participation on boards of directors of private companies while being a public official, no institutional motivation (incentive systems and scientific reputation based on publication and not on transfer) and little entrepreneurial training/vocation are some of the many barriers that impede or hinder this transformation. Changes are needed in university governance to eliminate or reduce them.

Even without a firm commitment to entrepreneurial education, the rate of entrepreneurship at the university is above average, as shown by the results analysed for the UPV/EHU, in a region in which, according to the Global Entrepreneurship Monitor Basque Country Report 2013, the working Basque population has an entrepreneurship rate two points lower than the rest of Spain (Peña et al., 2014). Therefore, the results from creating university companies are a testament to the effectiveness of using public funds to finance spin-off incubation programmes and

justify greater investment in this area. Monitoring the evolution of university entrepreneurship, its survival and impact on employment and economic growth in the Basque Country in greater detail seems to be a compulsory issue if we want to seriously evaluate the efficiency of public investment in this area.

References

- Arroyo-Vázquez, M., & Jiménez-Sáez, F. (2008). *La incorporación de la innovación y el emprendedurismo en la Educación Superior: Una formación de futuro*. Valencia: Actas V Congreso Iberoamericano de Docencia Universitaria.
- Audretsch, D. (1998). Agglomeration and the location of innovative activity. *Oxford Review of Economic Policy*, 14(2), 18–29.
- Audretsch, D. (2014). From the entrepreneurial university to the university for the entrepreneurial society. *Journal of Technology Transfer*, 39(3), 313–321.
- Backes-Gellner, U., & Werner, A. (2007). Entrepreneurial signalling via education. A success factor in innovative start-ups. *Small Business Economics*, 29(1–2), 173–190.
- Blanco Jiménez, F. J., Vicente Oliva, M. A., Manera Bassa, J., González-Blanch Roca, J. M., Marcos Sanz, R., & Polo García-Ocho, C. (2014, December). *Los servicios que prestan los viveros de empresas en España*. Rankings 2013, Funcas.
- Clark, B. (1996). Creando universidades emprendedoras en Europa. *Revista Valenciana d'Estudis Autonòmics*, 21, 373–392.
- Clark, B. (1998). *Creating entrepreneurial universities: Organizational pathways of transformation*. Oxford: Pergamon Press.
- Clark, B. (2001). The entrepreneurial university: New foundations for collegiality, autonomy, and achievement. *Higher Education Management*, 13(2), 9–24.
- Consortium for Entrepreneurship Education. (2012). *The State of Entrepreneurship Education 2012, Columbia, USA*.
- Corti, E., & Riviezzo, A. (2008). Hacia la universidad emprendedora: Un análisis del compromiso de las universidades italianas en el desarrollo económico y social. *Economía Industrial*, 368, 113–124.
- Di Gregorio, D., & Shane, S. (2003). Why do some universities generate more start-ups than others? *Research Policy*, 32, 209–227.
- Drucker, P. (1986). *La innovación y el empresario innovador. La práctica y los principios*. Barcelona: EDHASA.
- Etzkowitz, H. (1998). The norms of the entrepreneurial science: Cognitive effects of the new university-industry linkages. *Research Policy*, 27(8), 823–833.
- Etzkowitz, H. (2004). The evolution of the entrepreneurial university. *International Journal of Technology and Globalization*, 1(1), 64–77.
- European Commission. (2008). *Entrepreneurship in higher education, especially within non-business studies*. Brussels: Final Report of the Expert Group. Frank, H., & Korunka, C.
- European Commission. (2012). Rethinking education: Investing in skills for better socio-economic outcomes. *COM* (2012) 669.
- European Commission. (2014). *Indicators on entrepreneurial learning and competence*. Final Report of Expert Group on. Chatzichris, S.
- Fernández-Laviada, A. (Dir.). (2015). *Global Entrepreneurship Monitor Spain*. 2014 Report. CISE. Santander.
- Garavan, T. N., & O'Cinneide, B. (1994). Entrepreneurship education and training programmes: A review and evaluation—Part 1. *Journal of European Industrial Training*, 18(8), 3–13.
- Gibb, A. A. (2005). *Towards the Entrepreneurial University*. Entrepreneurship Education as a lever for change, NCGE Policypaper series, 15.

- Goldfarb, B., & Henrekson, M. (2003). Bottom-up versus top-down policies towards the commercialization of university intellectual property. *Research Policy*, 32, 639–658.
- Grimaldi, R., Kenney, M., Siegel, D., & Wright, M. (2011). 30 years after Bayh-Dole: Reassessing academic entrepreneurship. *Research Policy*, 40(8), 1045–1057.
- Guerrero, M., & Urbano, D. (2014). Academics' start-up intentions and knowledge filters: An individual perspective of the knowledge spillover theory of entrepreneurship. *Small Business Economics*, 43(1), 57–74.
- Hansemark, O. (1998). The effects of a program on need for achievement and locus of control of reinforcement. *International Journal of Entrepreneurship Behaviour and Research*, 4(1), 28–50.
- Harris, M. L., & Gibson, S. G. (2008). Examining the entrepreneurial attitudes of US business students. *Education+Training*, 50(7), 568–581.
- Heller, M. A., & Eisenberg, R. (1998). Can patents deter innovation? The anticommens in biomedical research. *Science*, 280(5364), 698–701.
- Henderson, R., Jaffe, A., & Trajtenberg, M. (1998). Universities as a source of commercial technology: A detailed analysis of University patenting. *Review of Economics & Statistics*, 80(1), 119–127.
- Hernández Mogollón, R. (Dir.). (2014). *Global Entrepreneurship Monitor Spain*. 2013 Report. CISE, Santander.
- Holmgren, C., From, J., Olofsson, A., Karlsson, H., Snyder, K., & Sundström, U. (2004). Entrepreneurship education: Salvation or damnation? *International Journal of Entrepreneurship*, 8, 55–71.
- Hoyos-Iruarrizaga, J., Blanco-Mendialdua, A., & Saiz-Santos, M. (2015). Bank financing constraints: The effects of start-up characteristics. In M. Peris-Ortiz & J.-M. Sahut (Eds.), *New challenges in entrepreneurship and finance* (pp. 209–224). New York: Springer.
- Hoyos-Iruarrizaga, J., & Saiz-Santos, M. (2014). *Business angels: Los mecenas del ecosistema emprendedor*. Madrid: ESIC.
- IUNE. (2014). *Actividad investigadora en la Universidad Española, Observatorio IUNE*. Retrieved from <http://www.iune.es>.
- Jamieson, I. (1984). Education for enterprise. In A. G. Watts & P. Moran (Eds.), *CRAC* (pp. 19–27). Cambridge: Ballinger.
- Klofsten, M., & Jones-Evans, D. (2000). Comparing academic entrepreneurship in Europe—The case of Sweden and Ireland. *Small Business Economics*, 14(4), 299–310.
- Kuratko, D. F. (2005). The emergence of entrepreneurship education: Development, trends and challenges. *Entrepreneurship Theory and Practice*, 29(5), 577–597.
- Kuratko, D. F., & Hodgetts, R. M. (2004). *Entrepreneurship: Theory, process and practice* (6th ed.). Mason, OH: Thomson/South Western Publishing.
- Mansfield, E. (1991). Academic research and industrial innovation. *Research Policy*, 20, 1–12.
- Mansfield, E. (1998). Academic research and industrial innovation: An update of empirical findings. *Research Policy*, 26, 773–776.
- Maskell, D., & Robinson, A. (2002). *The new idea of a university*. Thorverton: Imprint Academic.
- Mian, S. A. (2011). University's involvement in technology business incubation: What theory and practice tell us? *International Journal of Entrepreneurship and Innovation Management*, 13(2), 113–121.
- Mitra, J., & Matlay, H. (2004). Entrepreneurial and vocational education and training: Lessons from Eastern and Central Europe. *Industry & Higher Education*, 18(1), 53–69.
- Nelson, R. (2004). The market economy, and the scientific commons. *Research Policy*, 33, 455–471.
- O'Shea, R., Allen, T. J., Chevalier, A., & Roche, F. (2005). Entrepreneurial orientation, technology transfer and spin-off performance of US universities. *Research Policy*, 34, 994–1009.
- OECD (2009). *Policy responses to the economic crisis: Investing in innovation for long-term growth*. OECD, Directorate of Science, Technology and Industry.
- Raposo, M., & Do Paço, A. (2011). Entrepreneurship education: Relationship between education and entrepreneurial activity. *Psicothema*, 23(3), 453–457.

- Reynolds, P., Bosma, N., Autio, E., Hunt, E., De Bono, N., Servais, I., et al. (2005). Global entrepreneurship monitor. Data collection design and implementation 1998–2003. *Small Business Economics*, 24(3), 205–231.
- Ropke, J. (1998). *The entrepreneurial university. Innovation, academic knowledge creation and regional development in a globalized economy*. Working Paper, 3, Department of Economics, Philipps-Universität Marburg.
- Schumpeter, J. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.
- Svensson, P., Klofsten, M., & Etzkowitz, H. (2012). An entrepreneurial university strategy for renewing a declining industrial city: The Norrköping way. *European Planning Studies*, 20(4), 505–525.
- The Small Business Economy. (2007). *A report to the President, for data year 2006*. Washington, DC: United States Government Printing Office.
- Wright, M., Clarysse, B., Mustar, P., & Lockett, A. (2007). *Academic entrepreneurship in Europe*. Cheltenham: Edward Elgar.

Chapter 8

A Quest for the Research Centres About Entrepreneurship in Spanish Universities

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Abstract The research about entrepreneurship has a long tradition in academic literature. Various studies have identified the knowledge and evolution, and they have pointed the interest of the universities to research of this topic. If we analyse the most relevant journals we can established the future perspective of entrepreneurship. But ¿where are the principal research centres about entrepreneurship in Spain? We have searched in Web of Science (WOS) the chapters which analyse the entrepreneurship and we have identified the University of the Authors and the collaborative network. In this sense, we establish the relevance of Spanish University papers, the link between Spanish and foreign universities, the level of the university studies in the academic rankings, the increase of university research about entrepreneurship, and where are the principal research centres about entrepreneurship in Spain. All of this enable to establish link of research between different universities and to show to the Spanish government where incentivize the research about entrepreneurship.

Keywords Connection • Discussion • Domestic-oriented research • Early research • Entrepreneurial university • Entrepreneurship • Fragmentation • Impact Factor • International-oriented research • Journal • Network • Phase • Rankings • Research centres • Signing author • Spain • University • University community • Web of Science

8.1 Introduction

Shane and Venkataraman (2000) propose that entrepreneurship is the scholarly examination of how, whom, and with what effect opportunities to create future goods and are discovered, evaluated and exploited. Hitt, Ireland, Sirmon, and

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Trahms (2011) establish that entrepreneurship involves sources, the processes of discovery, evaluation and exploitation of opportunities and also the set of individuals who discover, evaluate and exploit these opportunities.

Entrepreneurship is a key concept of social science studies and business and management research (Landström, Harirchic, & Åström, 2012). It is a research topic which has attracted increased university attention during the last decades (Bruton, Ahlstrom, & Obloj, 2008; Busenitz et al., 2003; Welter & Lasch, 2008). The entrepreneurship research is approximately 40 years old and has become a significant topic of university activity involving thousands of scholars.

The research about entrepreneurship is developed by US and European universities (Terjesen, Hessels, & Li, 2016) and in Spain the university interest is growing. It is possible consider the interest by entrepreneurship in Springer research book series. For example, recently Springer has edited 26 research book series (Table 8.1), 394 books and CD Roms and 18,642 Webpages. We can find research books published in Springer that has been edited by Spanish researcher, for example, the book “Women’s Entrepreneurship and Economics” (2012) edited by Galindo, Miguel-Angel, Ribeiro, Domingo; “Entrepreneurship, Innovation and Economic Crisis” (2014) edited by Rüdiger, Klaus, Peris-Ortiz, Marta, Blanco-González, Alicia or “Entrepreneurship, Regional Development and Culture” (2015) edited by Peris-Ortiz, Marta, Merigó-Lindahl, José M.

Therefore, the purpose of this research is to identify the research centres in entrepreneurship. We have searched in Web of Science (WOS) the chapters which analyses the entrepreneurship and we have identified the University of the Authors and the collaborative network. In this sense, we establish the relevance of Spanish University papers, the link between Spanish and foreign university to analyse this phenomenon, the level of the university studies in the academic rankings, the increase of university research about entrepreneurship, and where is the principal research centres about entrepreneurship in Spain. All of this enable to establish link of research between different universities and to show to the Spanish government where incentivize the research about entrepreneurship.

The structure of the paper run as: first, we establish a theoretical framework about the importance and phases of entrepreneurship research. Following that, we carry out an empirical study to test these assumptions and present the results. Finally, we identify the research centres in Spain and their relevance to developed practical entrepreneurship programs. We believe that it is positive to periodically reflect where the knowledge is acquired in order to establish a future networks between universities.

8.2 Conceptual Framework

Following Landström et al. (2012), we determine different phases of entrepreneurship research (Fig. 8.1): early research, fragmentation of the research, discussion about entrepreneurship and entrepreneurial universities.

Table 8.1 Book series edited by Springer about entrepreneurship

Book series	Editors
Entrepreneurship	Reihen-Hrsg.: Brettel, M., Koch, L.T., Kollmann, T., Witt, P.
Exploring Diversity in Entrepreneurship	Series Editors: Carsrud, Alan L., Brännback, Malin
Innovations management und Entrepreneurship	Reihen-Hrsg.: Gleich, Ronald, Spieth, Patrick, Täube, Florian
Innovation und Entrepreneurship	Series Editors: Franke, N., Harhoff, D., Henkel, J., Häussler, C.
Social Entrepreneurship Series	<i>n.d.</i>
Perspectives in Entrepreneurship	<i>n.d.</i>
International Studies in Entrepreneurship	Series Editors: Acs, Zoltan J., Audretsch, David B.
International Handbook Series on Entrepreneurship	Series Editors: Acs, Zoltan J., Audretsch, David B.
SpringerBriefs in Entrepreneurship and Innovation	Series Editors: Audretsch, David B., Link, Albert N.
Palgrave Studies of Entrepreneurship in Africa	Series Editors: Ibeh, K., Nwankwo, S., Mersha, T., Sriram, V.
FGF Studies in Small Business and Entrepreneurship	Editors-in-chief: Block, Joern H., Kuckertz, Andreas Series Editors: Grichnik, Dietmar, Welter, Friederike, Witt, Peter
Entrepreneurship and Development in South Asia: Longitudinal Narratives	Series Editors: Mitra, Jay, Majumdar, Satyajit
Palgrave Studies in Democracy, Innovation, and Entrepreneurship for Growth	<i>n.d.</i>
Cooperative Management	Series Editors: Zopounidis, Constantin, Baourakis, George
Managing the Asian Century	Series Ed.: Mandal, Purnendu
International Series in Advanced Management Studies	Editor-in-chief: Pastore, Alberto Series Editors: Dagnino, G.B. (et al.)
Science, Technology and Innovation Studies	Series Editors: Gokhberg, Leonid, Meissner, Dirk
Science, Technology and Innovation Studies	Series Editors: Gokhberg, Leonid, Meissner, Dirk
Innovation, Technology, and Knowledge Management	Series Ed.: Carayannis, Elias G.
Advances in Business Ethics Research	<i>n.d.</i>
A Journal of Business Ethics Book Series	
Management and Industrial Engineering	Series Ed.: Davim, J. Paulo
The Political Economy of the Middle East	<i>n.d.</i>
SpringerBriefs in Business	<i>n.d.</i>
Palgrave Pocket Consultants	<i>n.d.</i>
Innovation und Technologie im modernen Management	Wagner, Dieter, Mietzner, Dana (Hrsg.) Editor-in-chief: Sato, Ryuzo

n.d.: not available

Source: Own elaboration

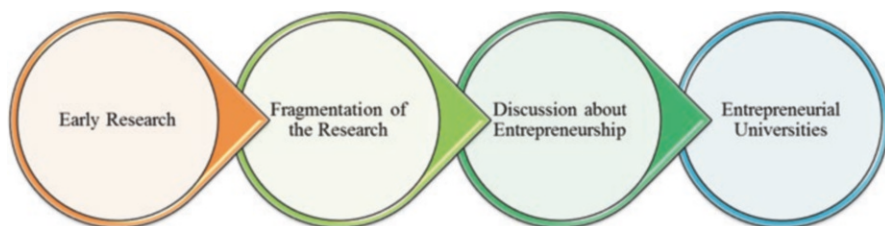


Fig. 8.1 Phases of entrepreneurship research. Source: Own elaboration

The first phase is the “take-off phase” (1980) i.e., early research on entrepreneurship conducted at university. In this phase, scholars who are interesting in the entrepreneurship picked up, begin to analyse the psychology research papers (entrepreneurial traits and personalities). In 1979 David Birch publishes *The Job Generation Process* which generates a big impact on the entrepreneurship research community and policy-makers and politicians, and provides an intellectual foundation for the incorporation of small businesses into the study of economic development. We can find many entrepreneurial contributions from individual scholars to the creation of professional organizations, academic conferences and scientific journals. In this phase, the number of scientific journals is increased (*Journal of Business Venturing*, *Entrepreneurship and Regional Development* or *Small Business Economics*).

The second phase is the “fragmentation of the research” (1990). The social dimension of entrepreneurship as a research topic was to a very large extent characterized by the building of a greater number of scientific journals and conferences, role models and an increase in educational programs and courses. A large number of universities became instrumental in building an infrastructure, i.e., directors of research centres and education programs in entrepreneurship at national and international level, editors of international scientific journals and chairmen of professional organizations (Finkle & Deeds, 2001; Katz, 2003). In this phase, the mobility of the scholars between universities is very limited and there is not a network between scholars.

The third phase is the “discussion about entrepreneurship” (2000). The research about entrepreneurship is mature and very interesting among different disciplines. To some extent different subgroups of scholars have emerged, and these groups are moving in somewhat different directions. We can find several approaches. In one hand, some scholars discuss that the entrepreneurship is integrating with others areas (for example, strategic management or marketing). In the other hand, some scholars discuss the independence of entrepreneurship research. In this moment of development, the relationship with real word is fundamental.

The fourth phase is the “entrepreneurial university” (2010). Scholars establish that it is necessary a connection between research and business. The closer collaboration between universities and firms is related to factors such as the develop-

ment of new technological platforms, budget constraints or the relevance of budget policies (Bercovitz & Feldman, 2006). . In this moment, the number of graduate courses in entrepreneurship is increased, as well as competitive research projects to develop research on entrepreneurship, implementation of contracts between universities and businesses, spin-offs, and the creation of business incubators within universities.

8.3 Sample and Methodology

Today, the academic research is the collaborative effort between different universities and the joint efforts between research institutions (Melin & Persson, 1996; Subramanyam, 1983). We establish that the research production is the network of interacting researchers rather than the individual author (Acedo, Barroso, Casanueva, & Galán, 2006; Liu, Bollen, Nelson, & Van de Sompel, 2005).

We have searched all the chapters published in academic journals included in the Web of Science Database (WOS). We have introduced in the field of the Brower of the Social Sciences on the topics “entrepreneurship” and “Spain” between 2010 and 2015.

The outcome of these searches was a total of 119 chapters published between 2010 and 2015 (Table 8.2). Thus, we elaborated a database with year, journal, university of signing authors, number of signing authors, and type of chapters (domestic or international).

Of aforementioned, 93 chapters were included in the domestic-oriented research dataset while the international-oriented dataset comprised 26 chapters. Table 8.3 presents the number of chapters published within the types of research (domestic and international oriented chapters).

Finally, the Table 8.4 shows that number of authors by chapter. The number of signing authors is usually between two (38 chapters) and three (47 chapters). We identify four chapters in which the number of signing authors than five authors (3.38 %). This corresponds to the practice area (Social Sciences), where it is usually to find two or three signing authors.

Table 8.2 Number of chapters

Year	Number	Percentage
2010	9	7,60%
2011	22	18,50%
2012	19	16,00%
2013	23	19,30%
2014	16	13,40%
2015	30	25,20%
Total	119	100%

Table 8.3 Number of domestic and international oriented chapters

Type	Number	Percentage
Domestic-oriented research	93	78,15%
International-oriented research	26	21,85%
Total	119	100%

Table 8.4 Number of authors

Authors	Number	Percentage
1	16	13,45%
2	38	31,93%
3	47	39,50%
4	14	11,76%
5	2	1,68%
6	1	0,84%
9	1	0,84%
Total	119	100%

8.4 Results

What are the universities with more researching about entrepreneurship? Table 8.5 ranks the top universities on the basis of their chapters.

We can establish that Autonomous University of Barcelona, University of Granada and University of Seville are research centres about entrepreneurship the first level. In the second level we can establish the universities with great scientific development in this area, for example, University of Valencia, University of Huelva, University of Oviedo and University of Deusto (private university). Also, in the third level we can identify the research centres of Uned, University Complutense of Madrid, University Jaume I, University of Alicante, University of Basque Country, University of Cadiz, University of Salamanca and University Polytechnic of Valencia.

What are the journals in which Spanish researchers on entrepreneurship publish? Firstly, in the Table 8.6 we have identified that the International Entrepreneurship and Management Journal has published 13 chapters in this 5 years. Secondly, we have identified that the Service Industries Journal has published eight chapters and the International Journal of Manpower, Revista de Historia Industrial and Small Business Economics has published five chapters which have been signed by Spanish authors.

We have find journals which has published one chapter: Academia-Revista Latinoamericana de Administración, Accounting Organizations and Society, Anales de Psicología, Annals of Regional Science, Anthropological Notebooks, Applied Economics Letters, Canadian Journal of Administrative Sciences, Carpathian Journal of Earth and Environmental Sciences, Computational and Mathematical Organization Theory, Computers in Human Behavior, Comunicar, Cuadernos de Economía y Dirección de la Empresa, Current Issues in Tourism, Economic Inquiry, Economics-The Open Access Open-Assessment E-Journal, Empirical Economics, European Journal of Law and Economics, European Planning Studies, Faedpyme International

Table 8.5 Number of signing authors per university

University	Signing Authors
Autonomous University of Barcelona	17
University of Granada	15
University of Seville	12
University of Valencia	9
University of Huelva	8
University of Oviedo	6
University of Deusto	6
Uned	5
University Complutense of Madrid	5
University Jaume I	5
University of Alicante	5
University of Basque Country	5
University of Cadiz	5
University of Salamanca	5
University Polytechnic of Valencia	5
University of Extremadura	4
University of Malaga	4
University Public of Navarra	4
University of Castilla-La Mancha	3
University of La Rioja	3
University of Leon	3
University of Zaragoza	3
University of A Coruna	2
University of Burgos	2
University of Jaen	2
University of La Laguna	2
University of Vigo	2
University Rey Juan Carlos	1
Cunef	1
Polytechnic University of Madrid	1
Ramon Llull University (Esade Business School)	1
University Carlos III	1
University Miguel Hernandez of Elche	1
University of Barcelona	1
University of Las Palmas de Gran Canaria	1
University of Santiago de Compostela	1
University of Vic	1
University of Vitoria	1
University Pablo de Olavide	1
University Polytechnic of Barcelona	1
University Rovira & Virgili	1

Review-Fir, Gestion y Politica Publica, Global Networks-A Journal of Transnational Affairs, History of Economic Ideas, Human Relations, Intangible Capital, International Business Review, International Journal of Climate Change Strategies and Management, International Journal of Contemporary Hospitality Management, International Journal of Heritage Studies, International Journal of Historical

Table 8.6 Journals with Spanish signing authors

JOURNAL	Frecuency
International Entrepreneurship and Management Journal	13
Service Industries Journal	8
International Journal of Manpower	5
Revista de Historia Industrial	5
Small Business Economics	5
Journal of Business Research	4
Psicothema	4
Revista de Economía Mundial	4
International Small Business Journal	3
Journal of Organizational Change Management	3
Management Decision	3
Service Business	3
Amfiteatru Economic	2
Arbor-Ciencia Pensamiento y Cultura	2
Economic Development Quarterly	2
Entrepreneurship and Regional Development	2
Environment and Planning C-Government And Policy	2
Historia y Comunicacion Social	2
Industrial Management & Data Systems	2
Jcms-Journal Of Common Market Studies	2
Revista de Economia Aplicada	2

Archaeology, Journal of Career Development, Journal of Knowledge Management, Journal of Management Inquiry, Journal of Policy Modeling, Journal of Rural Studies, Journal of Technology Transfer, Journal of World Business, Profesional de la Información, Rbgn-Revista Brasileira de Gestao de Negocios, Regional Studies, Revesco-Revista de Estudios Cooperativos, Revista Cientifica-Facultad de Ciencias Veterinarias, Revista de Educacion, Revista de Historia Economica, Revista del Clad Reforma y Democracia, Revista Espanola de Investigaciones Sociologicas, Revista Espanola de Pedagogia, Revista Latinoamericana de Psicologia, Rusc-Universities and Knowledge Society Journal, Spanish Journal of Agricultural Research, Spanish Journal of Psychology, Technovation, Thinking Skills and Creativity, and Transformations in Business & Economics.

If we analyse the impact factor of journals we can determine that the Spanish universities obtain a relevant impact in this field (Table 8.7). There are 76 academic journals with impact factor that have published chapters about authors signing of Spanish universities. 55 journals publish their chapters in English and 21 journals publish their chapters in Spanish language. That is, the Spanish universities take into account the internationality of English and encouraging writing in this language. Finally, ten academic journals that publish in Spanish scholars of the university community are published in Spain, indicating a great internationalization of Spanish research in entrepreneurship.

Table 8.7 Impact factor

JOURNAL	Impact Factor
International Entrepreneurship and Management Journal	0.746
Service Industries Journal	0.832
International Journal of Manpower	0.471
Revista de Historia Industrial	0.290
Small Business Economics	1.795
Journal of Business Research	1.480
Psicothema	1.210
Revista de Economía Mundial	0.237
International Small Business Journal	1.800
Journal of Organizational Change Management	0.462
Management Decision	1.429
Service Business	0.645

8.5 Discussion, Conclusion and Implications

The research about entrepreneurship has a long tradition in academic literature in social sciences. Various studies have identified the knowledge and evolution, and they have pointed the interest of the universities to research about this topic. Thus, we have determined different phases of entrepreneurship research (early research, fragmentation of the research, discussion about entrepreneurship and entrepreneurial universities) and we have established that the research is in the fourth phase “entrepreneurial universities”. In this phase the scholars establish that it is necessary a connection between research and business. The closer collaboration between universities and firms is related to factors such as the development of new technological platforms, budget constraints or the relevance of budget policies (Bercovitz & Feldman, 2006).

We have analysed the most relevant journals and we have identified the most important research centres in entrepreneurship in Spain. We have searched all the chapters published in academic journals included in the Web of Science Database (WOS) between 2010 and 2015. We have found a total of 119 chapters about entrepreneurship, 93 chapters in the domestic-oriented research and 26 chapters in the international-oriented. The number of signing authors is usually between two (38 chapters) and three (47 chapters).

We have established that Autonomous University of Barcelona, University of Granada and University of Seville are research centres about entrepreneurship the first level. In the second level, University of Valencia, University of Huelva, University of Oviedo and University of Deusto. In the third level, Uned, University Complutense of Madrid, University Jaume I, University of Alicante, University of Basque Country, University of Cadiz, University of Salamanca and University Polytechnic of Valencia.

We have identified that most of the research published by Spanish authors on entrepreneurship is in public universities. In private universities it is necessary to highlight the scientific production from the University of Deusto and the research

centre “Orkestra Basque Institute Competitiveness”. We have found other relevant types of Spanish research centres which analyses the entrepreneurship, for example, Orkestra Basque Institute Competitiveness or Bank of Spain.

There are 76 academic journals with impact factor that have published chapters about authors signing of Spanish universities. 55 journals publish their chapters in English and 21 journals publish their chapters in Spanish language. That is, the Spanish universities take into account the internationality of English and encouraging writing in this language. Finally, ten academic journals that publish in Spanish scholars of the university community are published in Spain, indicating a great internationalization of Spanish research in entrepreneurship.

Finally, we have identified that the International Entrepreneurship and Management Journal has published 13 chapters in this 5 years. Secondly, we have identified that the Service Industries Journal has published eight chapters and the International Journal of Manpower, Revista de Historia Industrial and Small Business Economics has published five chapters which have been signed by Spanish authors.

References

- Acedo, F. J., Barroso, C., Casanueva, C., & Galán, J. L. (2006). Co-authorship in management and organizational studies: An empirical and network analysis. *Journal of Management Studies*, 43(5), 957–983.
- Bercovitz, J., & Feldman, M. P. (2006). Entrepreneurial universities and technology transfer: A conceptual framework for understanding knowledge-based economic development. *Journal of Technology Transfer*, 31(1), 175–188.
- Bruton, G. D., Ahlstrom, D., & Obloj, K. (2008). Entrepreneurship in emerging economies: Where are we today and where should the research go in the future. *Entrepreneurship Theory and Practice*, 32(1), 1–14.
- Busenitz, L. W., West, G. P., Shepherd, D., Nelson, T., Chandler, G. N., & Zacharakis, A. (2003). Entrepreneurship research in emergence: Past trends and future directions. *Journal of Management*, 29(3), 285–308.
- Finkle, T. A., & Deeds, D. (2001). Trends in the market for entrepreneurship faculty. *Journal of Business Venturing*, 16, 613–630.
- Galindo, M. A., & Ribeiro, D. (2012). Women’s entrepreneurship and economics. *International Entrepreneurship Management Journal*, 8, 499–503.
- Hitt, M. A., Ireland, R. D., Sirmon, D. G., & Trahms, C. A. (2011). Strategic entrepreneurship: creating value for individuals, organizations, and society. *Academy of Management Perspectives*, 25(2), 57–75.
- Katz, J. (2003). The chronology and intellectual trajectory of American entrepreneurship education 1876–1999. *Journal of Business Venturing*, 18, 293–300.
- Landström, H., Harirchic, G., & Åström, F. (2012). Exploring the emerging knowledge base of the knowledge society. *Research Policy*, 41(7), 1154–1181.
- Liu, X., Bollen, J., Nelson, M. L., & Van de Sompel, H. (2005). Co-authorship networks in the digital library research community. *Information Processing and Management*, 41(6), 1462–1480.
- Melin, G., & Persson, O. (1996). Studying research collaboration using co-authorships. *Scientometrics*, 36(3), 363–377.

- Peris-Ortiz, M., & Merigó-Lindahl, J. M. (2015). *Entrepreneurship, regional development and culture*. New York: Springer.
- Rüdiger, K., Peris-Ortiz, M., & Blanco-González, A. (2014). *Entrepreneurship, innovation and economic crisis*. New York: Springer.
- Shane, S. A., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1), 217–226.
- Subramanyam, K. (1983). Bibliometric studies of research collaboration: A review. *Journal of Information Science*, 6(1), 33–38.
- Terjesen, S., Hessels, J., & Li, D. (2016). Comparative international entrepreneurship research: A review and research agenda. *Journal of Management*, 42(1), 299–346.
- Welter, F., & Lasch, F. (2008). Entrepreneurship research in Europe: Taking stock and looking forward. *Entrepreneurship Theory and Practice*, 32(2), 241–248.

Chapter 9

Title Variables that Determine the Characteristics of University Spin-Off Support Programs

José María Beraza-Garmendia and Arturo Rodríguez-Castellanos

Abstract The creation of knowledge-based firms has become particularly important in recent decades, bringing with it a proliferation of university support programs for setting up spin-offs. Nonetheless, there is no single model of support program for the creation of spin-offs. Indeed, what characterizes these programs is precisely that heterogeneity, and it is therefore difficult to establish criteria for classification. There may be different ways of doing so, all valid, but difficult to group. Using a review of the literature, this paper identifies a number of variables that determine the characteristics of support programs for setting up academic spin-offs: the origin of the initiative; area of activity; objectives; funding for the program; type of spin-off to which support is provided; organization of the support activities; degree of integration and degree of autonomy. It goes on to establish the conditions under which it appears that they should go in one direction or other and identifies four basic models: programs established at low-quality universities with unfavorable environments; programs established in high-quality universities with unfavorable environments; programs established at low-quality universities with favorable environments and programs established in high-quality universities with favorable environments. The results of the study may provide a good guide for academic authorities involved in implementing support programs for creating spin-offs or for improving the efficiency of existing programs.

Keywords Academic entrepreneurship • Academic spin-offs • Activity • Autonomy • Efficiency • Environments • Funding • Heterogeneity • Integration • Knowledge transfer • Knowledge-based firms • Models • Objectives • Origin of the initiative • Organization of the activities • Quality universities • R&D cooperation • Support programmes • Type of spin-off • University entrepreneurship

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9.1 Introduction

Increasingly, universities are taking an interest in capitalizing commercially on the results of their research and in achieving this aim by creating new companies rather than through licensing or other forms of R&D cooperation with existing firms (Mustar & Wright, 2010; Wright, Clarysse, Mustar, & Lockett, 2007), to such an extent that many leading universities have set up separate units for managing their interests in this area (Algieri, Aquino, & Succurro, 2013; Berbegal-Mirabent, Sabaté, & Cañabate, 2012; Helm & Mauroner, 2007; Shane, 2004).

The main reason for setting up programs to provide support in creating academic spin-offs is that there is a gap between the university research results and a fully developed project for creating a company that will be capable of commercially exploiting these results. Achieving this transformation requires the use of a series of material, financial, professional, business and intellectual resources over a given period of time.

However, in some way, the type of support offered will depend on how rich the environment is (Algieri et al., 2013; Hague & Oakley, 2000; Sternberg, 2014; Wright et al., 2007), given that a spin-off support program acts as a supplementary agent, supplying what the business environment cannot. Thus, Wright et al. (2007) argue that in favorable environments the spin-off process can follow a *business pull* strategy—i.e., one that does not depend on the activities of the university but benefits from the high degree of innovation existing in its environment. In less favorable environments, on the other hand, characterized by a weak entrepreneurial culture and a lack of other resources, universities need to play a more proactive role and implement a *technology push* strategy, in which they must conduct a process of selection and support throughout all stages of the process.

Local conditions are therefore very important for the development of spin-off support programs and no single model can be applied to all such programs (Clarysse, Lockett, Quince, & Van de Velde, 2002; Clarysse, Wright, Lockett, Van de Velde, & Vohora, 2005; Degroof, 2002; Novakovic & Sturn, 2000; Roberts & Malone, 1996). Each university is unique. Successful models can rarely be transferred from one country to another or even within the same country. To a great extent, everything depends on the local environment and the aspirations of the local government and institutional leaders (Smailes & Cooper, 2004).

It is also important to bear in mind that, above all, the university must ensure a scientific base in which ideas can flourish. For this reason, it is probably not advisable for all universities to become strategically involved in supporting the creation of spin-offs. Only those universities that have the necessary means (researchers, projects, programs and research resources) in the necessary quantity and quality that could give rise to a reasonable capacity to ‘export’ the results of their research, should become involved implementing a spin-off support policy (European Commission, 2002a).

Using a review of the literature, this identified a series of variables conditioning the characteristics of these support programs; establishes the conditions under

which it appears that they should go in one direction or another and outlines four basic models of programs. The results of the study may be a good guide for academic authorities interested in implementing a program of support for the creation of spin-offs or in improving the efficiency of existing programs.

The paper consists of an introduction and two other sections. Section 9.2 identifies different criteria that show the diversity of existing programs and which ultimately condition the model of support to be implemented. The third and last section identifies four basic models of academic spin-off support programs and describes their key features.

9.2 Design of Academic Spin-Off Support Programs

Those responsible for designing a program of support for the creation of spin-offs must make a series of decisions that condition the characteristics of the program. Based on a review of the existing literature, this paper will identify the main decisions that need to be adopted and analyze the conditions under which they should be geared in one direction or another. These decisions make it possible to appreciate the diversity of programs currently in existence and, ultimately, condition the model of support to be implemented.

9.2.1 *The Origin of the Initiative*

The initiative to implement the spin-off support program may be top-down or bottom-up (Novakovic & Sturn, 2000).

In *top-down* programs, the initiative to implement spin-off support programs comes from public authorities. Public financing is channeled through public agencies to a network of support programs connected to research institutions (e.g., the Spinno program in Finland, France Incubation in France and the EXIST program in Germany).

In *bottom-up* programs, the initiative to implement spin-off support programs comes from the university itself. Regardless of whether or not the initiative is private, some form of public aid is normally required for the programs to be financially sustainable.

The top-down model would appear to be the most suitable one when the intention is to establish national or regional programs with no existing base of support for the creation of spin-offs. This is the model followed, for example, by the French government to establish its network of incubators and seed capital funds.¹

¹ Seed capital funds finance the development stage of a project, when it is necessary to design a prototype, study the market and form the entrepreneurial team.

The bottom-up model is one of organic development, which may be more suitable for strong universities and/or those in areas with developed economies, where there are networks of collaboration and an abundance of private venture capital. Many spin-off support programs in the US and some in the UK, Sweden and the Netherlands might be included in this model.

9.2.2 *Area of Activity*

The area of activity of the support program may vary. It may support spin-offs originating in a single institution or in several (European Commission, 2002b).

Only the best universities would appear to have enough research activity, a sufficient flow of ideas with potential for commercialization and a large enough portfolio of intellectual property to justify making the necessary investments to maintain a reasonably-sized spin-off support program of their own (Hague & Oakley, 2000).

Given that many universities do not have a critical mass of research and financial resources to sustain a spin-off support program, collaboration is essential. If the institution's research base is too small to justify a support program, it may consider it worthwhile to set up a joint unit in collaboration with other universities and research centers from the local environment or even with geographical remote centers with similar technologies.

For this reason, and given that these programs are being promoted by public authorities in many countries, multi-institutional programs are becoming increasingly common. This shared model has been successfully adopted in France's *Incubation* program, Germany's EXIST program, and the *Wales Spin-Out* program in the UK (European Commission, 2002b).

This may therefore be one of the main models to be applied for developing spin-off support programs, especially in universities located in unfavorable settings.

9.2.3 *The Objectives*

The ultimate aim of a spin-off support program should be to increase, at a reasonable cost, the proportion of commercially marketable research results that are supported through to the point when they can become consolidated companies. However, their objectives may go beyond just achieving high and efficient research-to-company conversion rates (Hague & Oakley, 2000). The reasons why universities get involved in marketing research results in general and the creation of spin-offs in particular, must be examined in the light of the pressures they face, both externally (government and industry) and internally (aims of the university itself) (Smailes & Cooper, 2004).

In synthesis, we can identify four types of objective that can be pursued by support programs: economic development, financial gain, social benefits and support for the university's other two missions: education and research.

Spin-offs may reflect the university's wish to work for the economic development of the region. From this point of view, the university's support helps new companies to maintain themselves in their immediate geographical setting (Brett, Gibson, & Smilor, 1991; Mcqueen & Wallmark, 1991; Steffensen, Rogers, & Speakman, 2000).

In this case, the program is usually publicly financed, either because it does not charge for the services provided or does not invest in its spin-offs; or because the revenue that might be obtained would not cover the expenses of setting up and maintaining the support program.

Another possible objective is to obtain an additional source of funding or financial gain. The reasons are obvious: universities hope to obtain financial resources and significant profit by participating in the creation of tech-based companies (Bray & Lee, 2000). Universities may consider that the results of their research are a valuable resource and, given the financial pressures that nearly all universities face, they may decide to promote commercial exploitation of these results in the way that brings the greatest financial returns. In short, the formation of spin-offs can increase research financing.

Another possible objective is to achieve social benefits. Some universities, especially if they have a medicine school, are in a position to exploit scientific discoveries to achieve wider, more social, benefits. These social benefits are difficult to quantify but vitally important. Moreover, if the research is publicly financed, it seems logical that these benefits should be made available to society at large. A spin-off may be an effective mechanism for attracting the investment required to develop promising research and turn it into commercial products that solve social problems (Smailes & Cooper, 2004).

Finally, another possible objective is to favor the university's other two missions. The university's support to the creation of spin-offs reflects the institution's desire to encourage university technology transfer. Spin-offs have a very positive influence on research and teaching, creating opportunities for students to carry out PhD theses and final-year projects. The creation of spin-offs increases, rather than reduces, the levels of research, leads to higher standards of study and can improve the university's culture and image; it improves the university's contracting figures, since, initially at least, spin-offs tend to outsource their R&D activities; it generates new services offered by the university that reinforce its work; it leads to an increase in inter-relations between university researchers and the manufacturing sector and it can raise the institution's research levels to international levels more quickly than through the traditional route of publication.

Although the most obvious reason for commercializing research results is to generate income, it is not the most common (Condom, 2003; Hague & Oakley, 2000; Smailes & Cooper, 2004). To date, only a handful of universities throughout the world have obtained significant financial returns on their spin-offs and this has come from a small number of inventions, mostly in the area of life sciences.

Consequently, different universities may differ in their aims and objectives in creating spin-offs, and the results obtained may reflect those different objectives. Thus, for example, universities in depressed regions may seek to stimulate the creation of spin-offs oriented towards self-employment that generate jobs and improve

development in the region, without seeking profitable growth or financial returns for investors and the university itself. In contrast, universities with an excellent research base may seek to stimulate the creation of economically profitable spin-offs generating financial returns for investors and the university itself.

Although each university can choose to market its research results to achieve some of the above objectives, it is often more realistic to try to strike a balance between them. However, the institution needs to be clear as to the balance required between the different objectives it is going to adopt, since this will affect the policies and procedures governing the process of commercialization within the institution and the modus operandi of the technology transfer unit (Smailes & Cooper, 2004).

For their part, public authorities, who are increasingly urging universities to market their research results, must be realistic in their expectations of what can be achieved.

9.2.4 Program Financing

A spin-off support program has essentially two financing alternatives: self-financing or government funding (European Commission, 2002b).

Self-financing requires that the program be capable of obtaining sufficient revenues, either from charging for the services provided, from royalties received for licensing or from sale of its shareholdings in the spin-offs, to meet the expenses incurred in setting up and sustaining the program.

Alternatively, a program of this type must be government funded. This may be for several reasons: it may not charge for the services it provides; it may not invest in its spin-offs; or even if it does perform these activities, the income obtained may be insufficient to cover for the expenses of setting up and running the program.

In theory, if there were enough marketable ideas and if a large and stable percentage of the projects selected for the support programs were successful, these programs could operate autonomously, be self-financing, add value and attract private investors.

In practice, most spin-off support programs operate semi-commercially, with some form of government funding. Some organizations are even founded solely on grants and public capital.

The need to subsidize spin-off support programs is a consequence of the prevailing uncertainty. In reality, it is difficult to predict how likely it is that marketable research results will manage to get past the various stages in the process and attract venture capital. The rate of failure along the way is high and variable. Once that failure rate exceeds a certain level, the resources used to support failed projects are not made up for by the returns on successful projects.

The rational response of the market to this risk of failure is to outsource and improve the profitability of the programs, with a very strict initial selection process. Indeed, many venture-capital firms try to avoid intervening at these initial stages, at least until they have a properly-developed business plan.

Without some form of support from government or from non-profit organizations, therefore, the danger is that market forces will restrict the volume of marketable ideas to suboptimal levels from the perspective of technology transfer.

For this reason—apart from the fact that it is rarely possible—it is not advisable for funding to depend too heavily on private agents seeking financial returns on their investment.

In any case, the use of private financing requires agreements that will ensure clarity in the way the program is managed. Specifically, whether venture-capital firms fund support programs will depend on the maturity and depth of the local venture-capital market, a factor that varies widely throughout Europe, in contrast to the highly developed market in the US.

One danger of government funding, however, is that it may go to badly designed or managed programs. With the passage of time, therefore, the programs should reduce their reliance on government funding and seek to be self-sustainable.

Self-sustainability, however, does not mean that the returns on the investments made in the spin-offs will be enough to cover the entire cost of the support program, except in the case of universities with a large research base (Hague & Oakley, 2000).

To achieve their aims, most support programs will forever need financial support from the universities themselves, from regional governments and from the local business community.

It is important, then, to avoid raising unrealistic expectations on the results of the programs, which may lead to unsuitable financial planning, and ultimately discourage the government or non-profit organizations from providing financial support to the program.

9.2.5 The Type of Academic Spin-Off to Which Support is Provided

Academic spin-offs are not a uniform group either. Specifically, one might draw a distinction between *growth spin-offs*² and *lifestyle spin-offs*³ (Degroof, 2002). Thus, another decision that needs to be taken is whether or not the program is going to support both types of spin-off and if so, how (European Commission, 2002b).

Supporting growth spin-offs means giving support to projects that are developed to cater to a global market. Supporting lifestyle spin-offs, on the other hand, means providing support to projects with very limited growth prospects.

²Growth spin-offs are academic spin-offs that seek a global market for the technology. They tend to be strongly capitalised with capital being held by external institutions. They have highly professionalised management teams, strong growth orientation and their ultimate aim is to obtain profit from dividends or surpluses.

³Lifestyle spin-offs look for a market large enough to give the founder and his/her family a comfortable life, support job creation and retain employment in the new company's local area. They tend to have low capitalisation, be owned by people with links to the founder, have low management capacity, little or no growth orientation and their ultimate aim is survival.

As in the case of academic and student spin-offs, the resources, skills and activities to be provided by a program will be conditioned by the type of academic spin-off they seek to promote and vice versa. A differentiated approach is therefore required, depending on the type of spin-off the program wishes to promote.

Both academic authorities and government are generally very interested in promoting growth spin-offs, which have the most chance of attracting funding from risk capital and become star cases generating important revenue.

In growth-oriented programs, spin-offs are a means of transferring the ideas developed in the university quickly and deeply into the market, with the potential benefit of generating additional income that can be reinvested in the technology transfer process or in other university activities. The idea is to promote the creation of a relatively small number of spin-offs in fields of research excellence. They also serve to encourage and underpin entrepreneurial activity in the university. Such programs use criteria and techniques taken from venture capital. Indeed, to some extent, their principal operating objective is to obtain the necessary venture capital.

If the program is oriented towards this type of spin-off, therefore, it has important implications on the university's commitment to technology transfer, since it requires important resources in terms of management capacity and funding.

In programs that support lifestyle spin-offs the purpose is to facilitate the creation of a relatively large number of spin-offs which do not individually have great prospects, but which together may have a significant impact on the local economy. These programs are seen more as a service offered by the university to help their personnel introduce a technology onto the market on a small scale.

Given that they have different needs, therefore, it seems recommendable for the universities to have different programs for these two types of academic spin-off. The university has to be clear as to the type of academic spin-offs it wants to promote and what form this support is going to take, as the two types cannot be efficiently supported within a single program. If it wants to promote the creation of both types of spin-off, it will need to establish differentiated programs.

Programs of support for the creation of growth spin-offs are more likely to occur in major universities in which there is a tradition of technology transfer, networks of contacts between university and investors, and where there is continuous monitoring and assessment of projects before they are started up.

9.2.6 Organization of Support Activities

According to Condom and Valls (2003), there are two generic models of organization for managing technology transfer in the university. In the first, a single body is in charge of administrating this activity in the institution, using the different systems (contracting, patent licensing and spin-offs). This option is necessary in small universities, due to a lack of resources and the limited volume of activity. In the second model, each of the different mechanisms is the responsibility of a different unit. This second model strengthens the institution's actions

in the field of technology transfer, but requires a minimum level of activity in each of the different areas. Consequently it is more likely to be found in larger universities.

It is therefore not possible to make a general recommendation on whether or not it is more advisable to separate licensing activities from promotion of spin-offs (European Commission, 2002b).

The advantages of separation include:

- Greater quality of management due to greater experience and specialization.
- Raised profile of spin-off as alternative to technology transfer in the university context.

The advantages of an integrated approach include:

- Familiarity with the university environment.
- The ability to consider the relative merits of different commercialization strategies within one organization leading to better coordination and not encouraging the spin-off route where it is not appropriate.
- Achieving critical mass for the two activities in a medium-sized or small university.

9.2.7 Degree of Integration

Another issue that arises is whether the university supports the spin-offs directly in all stages offering all services that they might need, or whether it is better to have a division of labor, in such a way that the university provides the services corresponding to some stages in the process or some services corresponding to each of the stages, and the other services are offered by external agents.

In a study on the creation of tech-based companies in Spanish technology centers, Segura, Fernández, Foruria, and Aramburu (2003) listed the resources that should be outsourced (and therefore contracted or provided by another agent) in order of importance: market consultancy for devising marketing studies and policies that match the characteristics of the target markets; economic and financial support (public and private) through the definition of needs and resources, both in fixed assets and in human resources and other items; and suitable spaces and facilities for the companies to locate in.

The resources they consider should be performed by the technology centers themselves are: technology (the true competitive factor and the essential seed of the company); location and application for grants, development of prototypes, search for clients and, lastly, the necessary support and advice, although the latter could also be outsourced.

In short, creation of a spin-off is a collective process, which begins in the university environment but which can and must be sustained by nearby networks established by support agents, which will in turn aid the spin-off in creating its own network of relations. Universities must avoid the risk of trying to integrate and con-

trol most of the activities in the process of creating spin-offs such as, for example, funding, incubation, management of science and technology parks, etc., which do not really correspond with their mission.

9.2.8 Degree of Autonomy

The European Commission (2004) distinguishes between three types of TTI: specialized departments within public research organizations; subsidiary organizations and independent intermediaries. This classification can also be applied to spin-off support programs, as Fig. 9.1 shows. Another question that arises, therefore, in designing these programs is the amount of autonomy they have at an institutional level to perform their activity.

Programs integrated into the university structure tend to depend on the offices of the Vice-rectors of Research, and their personnel belong to the university staff. These programs have advantages and disadvantages. Because they are integrated within the organization, they generally have lower fixed costs; in addition, the proximity to researchers ensures close relations which can result in greater familiarity with the research projects and facilitate the spin-off marketing process. However, direct supervision by the university tends to limit the management autonomy of these programs when it comes to decision-making, business creation strategies and incentive schemes.

In many cases, subsidiary programs tend to form part of a foundation, separate from the university's administrative structure. These foundations are normally presided over by the rector of the university. They have their own board of directors and their own budget. Employees need not be university staff and they enjoy greater autonomy in decision-making, strategy selection and in their capacity to take shares in the capital of the spin-offs. Moreover, this separation gives the universities greater security against possible lawsuits for license contracts, violations of intellectual property or the business of the spin-offs. The main disadvantage is

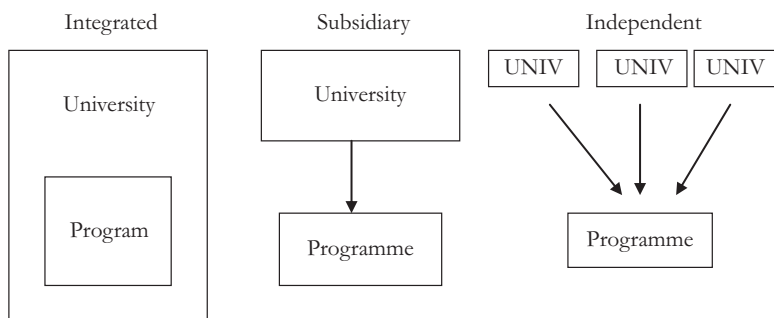


Fig. 9.1 Types of spin-off support programs by degree of autonomy. **Source:** Authors

that their creation is more costly and they run the risk of being less familiar with the researchers. In addition, the fact that they are non-profit making can make it more difficult to attract capital.

There are also programs that do not work with a single university, but offer their services to various. In some cases they have been established by a group of universities, each of which has a stake in their capital. In other cases, they are independent programs that have developed systematic and long term collaboration agreements with different universities. On some occasions too, they have been promoted by government to overcome a lack of (human and financial) resources and achieve a critical mass. There is a trend in some countries, such as Germany, France, Sweden and Norway, to concentrate technology transfer services in general and the creation of spin-offs in particular at regional or sectorial level. The principal advantages of this model are the professionalization of the way transfer activities are managed, the achievement of economies of scale and greater access to marketing opportunities by spin-offs. The main disadvantages are greater distance from researchers, insufficient incentives for taking advantage of opportunities and weak management of the portfolio of research results of each of the universities involved.

9.3 Synthesis and Proposed Typology

Taking into account the above considerations, it can be stated that there is no single model of support program for creating spin-offs. Precisely what characterizes these programs is their heterogeneity, and it is difficult to find criteria for classification. There may be different ways of going about this, all valid, but difficult to group together. Below we propose a typology for academic spin-off support programs and describe the attributes that characterize each of the categories.

From the point of view of a spin-off support program, the two external factors that condition their characteristics are the nature of the environment and the quality of the university. Combining the two factors, one can distinguish four possible situations.

Each of these situations can be associated with a model of spin-off support program with its own characteristics, as shown in Table 9.1.

The content of this table is discussed below.

Unfavorable environment/low-quality university. In unfavorable environments, characterized by a weak entrepreneurial culture and a lack of other resources, if the university, in turn, is of low quality, characterized by having a weak scientific base for marketable ideas to emerge from, and by lacking other resources and capacities, it is unlikely that the institution itself will consider establishing a program of support for the creation of spin-offs. It may consider participating in a multi-institutional program promoted by the public administration.

The objective is regional development through the creation of as many spin-offs as possible. Generally, however, these spin-offs are not exclusively technological in nature: the majority tend to be based on skills developed in the university. Few have

Table 9.1 Types of spin-off support program

	Unfavorable/low quality	Unfavorable/high quality	Favorable/low quality	Favorable/high quality
Origin	Top down	Top down	Bottom-up	Bottom-up
Scope	Multi-institutional	Individual	Multi-institutional	Individual
Objectives	Economic development/ Promoting an entrepreneurial culture	Economic development/ Supporting research	Economic development	Financial gain/ Supporting research
Financing	Public	Public/ Self-financing	Self-financ./ Public	Self-financing
Type of academic spin-off	Students/ Lifestyle	Lifestyle/ Growth	Lifestyle	Growth/Venture capital backed
Activities	Awareness/ Support	Awareness-raising/ Detection/ Support/ Investment	Management of intellectual property	Management of intellectual property/ Investment
Spin-off exclusivity	Spin-off	Transfer	Transfer	Transfer/Spin-off
Integration	Low	High	Low	Medium
Autonomy	Independent	Non-profit subsidiary	Independent	Non-profit subsidiary

Source: Authors

an ambition to grow and even fewer achieve it. This means that the results achieved do not meet initial expectations. Public financing is crucial because of the scarcity of the institution's resources. The level and complexity of the activities carried out and the resources used are limited. The needs of the spin-offs supported are limited, and they therefore receive a basic standardized package of services, with no need for the program to make investments.

Only a very small number of university personnel are involved in supporting the creation of spin-offs and they normally form part of the university structure (technology transfer unit, business relations or research), drawing on existing organic units.

From the point of view of the university, therefore, the program's degree of integration is very limited. The few services that the university does provide are in to the first stages of the process, with special emphasis on awareness-raising and promoting an entrepreneurial culture; the rest are performed by the multi-institutional program and external collaborators.

The multi-institutional nature of the program means that it has a high degree of autonomy vis-à-vis the university. The main advantages of this type of program are the professionalization of the management of activities and the achievement of economies of scale. The main disadvantage is the greater distance from researchers.

Unfavorable environment/high-quality university. In unfavorable environments, characterized by a weak entrepreneurial culture and a lack of other resources, even if the university is of high quality, characterized by having a scientific base from which marketable ideas can emerge, it is unlikely that the process of creating spin-offs will take place spontaneously.

On many occasions, the primary reason why universities get involved in marketing research results in general, and creating spin-offs in particular, must be considered in the light of external pressures from the public administration and industry.

The aim is to create spin-offs with an ambition for growth—albeit this ambition may not be proven at the time of the start-up—which will set up in the region, foster regional development and forge links with the research institution that will encourage industry relations.

The basis for the creation of the spin-off is the existence of a protectable technology that can create a competitive advantage. Companies based only on skills developed in the university do not tend to be supported. Consequently, fewer spin-offs are created than in the previous situation.

Public financing at the initial moment is crucial due to the level and complexity of the activities to be performed and the resources to be used. Self-sustainability can only be considered as a target in the medium or long term.

A program's orientation towards the creation of growth spin-offs has important implications on the university's commitment to technology transfer, since it requires important resources in terms of management capacity and funding. Several issues need to be addressed, such as the management of intellectual property rights, funding by means of venture capital, the establishment of incubators with specialist amenities, etc. As a result, public financing is required to finance the initial stages and training of the entrepreneurs.

However, given that the real growth potential of the spin-offs may not initially be obvious, venture-capital firms tend not to be interested in these spin-offs. To make up for this lack of interest in financing spin-offs at the initial stages and in order to smooth the way to finally taking a stake in their capital, universities have set up investment funds to participate in the first rounds of financing, after the spin-off has been established.

Where the environment lacks an entrepreneurial culture, networks (formal and informal) between the university and the business world, specialist professional consultants and a developed venture-capital sector; and where the university is interested in promoting technology transfer as a means of improving its research activities, the program needs to be more integrated, providing its services at all stages of the process.

Administrative inflexibility and a lack of university entrepreneurial culture, possible conflicts of interest and the threat of litigation and the greater freedom to finance spin-offs, make it advisable to create a legally independent subsidiary unit.

Favorable environment/low-quality university. In favorable environments, characterized by an entrepreneurial culture and the availability of other resources, if the university is of low quality, characterized by having a weak scientific base for marketable ideas and lacking other resources and capacities, it is unlikely that the insti-

tution itself will consider establishing a spin-off support program. It may consider establishing a joint unit in collaboration with other universities or research centers in the environment, to market sporadic more promising research results.

The goal is regional development, by facilitating creation of spin-offs promoted by university staff. These spin-offs do not tend to be exclusively technological in nature; they also tend to be based on skills developed in the university. Few are ambitious to grow.

Given that little or no financial return can be expected, it is unlikely that the university will make any significant investment, unless it is funded by grants from the regional government, which may be conditional on support for local business creation.

The university will need to be clear about matters related to intellectual property, but may be more flexible about issues of conflict of interest, if it wishes to help its researchers to create new local companies while continuing to work in the university. Agreements on exploitation of intellectual property will tend to be not as strict, seeking to create more firms than would probably be theoretically justifiable.

In an entrepreneurial culture with a large private supply of services, in which researchers have sufficient entrepreneurial spirit to promote the creation of a new firm by themselves, and the needs of most of the spin-offs are limited, the level and complexity of the activities developed and resources used is very reduced, with no need for the program to make investments. One of the main activities involves programming specific training courses for researchers who plan to set up their own firm.

Consequently, the number of university staff devoted to aiding the creation of spin-offs may be limited and they may form part of the university's technology transfer unit.

The degree of integration of the program is very limited. The few services the university provides correspond to the first stages of the process, with particular emphasis on establishing a flexible framework and on management of intellectual property; the rest is performed by the private supply of services from the environment and, where applicable, by the multi-institutional program.

Favorable environment/high-quality university. In favorable environments, characterized by an entrepreneurial culture and by the availability of other resources, if the university is of high quality, characterized by having a scientific base from which marketable ideas can emerge, and by having other resources and capacities, it will see it as natural to create spin-offs and will establish its own unit for promoting them. The creation of spin-offs is viewed as one possible means of marketing the research results. A spin-off will only be created if the circumstances arise that make it the best path to commercialization.

The aim is to obtain financial resources and economic benefit from its participation in those technologically-based business initiatives. They seek the route with the greatest financial return. Moreover, the creation of spin-offs increases the levels of research, leads to higher standards of study and can improve the culture and image of the university.

The spin-offs created are characterized by having high levels of capitalization, an international market, and sophisticated management structures and processes. In short, they can be classed as *venture-capital-backed spin-offs* (Heirman & Clarysse, 2004).

The program of support for the creation of spin-offs is capable of being self-financing, obtaining income through royalties perceived as payment for licensing or through the sale of its holdings in the spin-off's capital, which compensates for the expenses incurred. The returns on this investment will be long-term and highly speculative.

The favorable environment resolves the problems of searching for funding and specialist advice, via *business angels* or via venture capital. It also resolves the problem of detecting and finding the demand for its companies. Consequently, the program focuses on investment activities, through the creation of funds to participate in the first rounds of funding, after the spin-off has been created, with the aim of obtaining returns on its investments.

The high degree of activity in the creation of spin-offs and the aim of obtaining financial gain require the establishment of specific programs for the creation of spin-offs, with policies and procedures that emphasize control the spin-offs in which it has holdings.

The degree of integration of the activities performed and the resources used by the support program is relatively limited. One essential competence of the support unit is to have a profound knowledge of the different technological areas, in order to be in a position to make a suitable assessment of the marketable ideas and an evaluation of the intellectual property, but the activities of support and funding are provided by the rich business environment.

The financial risk assumed, possible conflicts of interest and litigation and the greater freedom to negotiate with potential members and to finance the spin-offs make it advisable to create a legally independent subsidiary unit.

References

- Algieri, B., Aquino, A., & Succurro, M. (2013). Technology transfer offices and academic spin-off creation: The case of Italy. *Journal of Technology Transfer*, 38(4), 382–400.
- Berbegal-Mirabent, J., Sabaté, F., & Cañabate, A. (2012). Brokering knowledge from universities to the marketplace. The role of knowledge transfer offices. *Management Decision*, 50(7), 1285–1307.
- Bray, M. J., & Lee, J. N. (2000). University revenues from technology transfer: Licensing fees vs. equity positions. *Journal of Business Venturing*, 15(5/6), 385–392.
- Brett, A. M., Gibson, D. V., & Smilor, R. W. (1991). Conclusion. In A. M. Brett, D. V. Gibson, & R. W. Smilor (Eds.), *University spin-off companies, economic development, faculty entrepreneurs, and technology transfer*. Savage, MD: Rowman & Littlefield.
- Clarysse, B., Lockett, A., Quince, T., & Van de Velde, E. (2002). *Spinning off new ventures: A typology of facilitating services*. Brussels: Institute for the Promotion of Innovation by Science and Technology in Flanders.
- Clarysse, B., Wright, M., Lockett, A., Van de Velde, E., & Vohora, A. (2005). Spinning out new ventures: A typology of incubation strategies from European research institutions. *Journal of Business Venturing*, 20(2), 183–216.
- Condom, P. (2003). *Transferència de tecnologia universitària. Modalitats i estratègies*. PhD thesis. Universidad de Girona.
- Condom, P., & Valls, J. (2003). La creación de empresas desde la universidad: Las spin-off. *Iniciativa Emprendedora*, 38, 52–69.

- Degroof, J. -J. (2002). *Spinning off new ventures from research institutions outside high tech entrepreneurial areas*. Ph.D. dissertation. Massachusetts Institute of Technology.
- European Commission. (2002a). *Cooperation between the research system and industry to promote innovative firms*. Luxembourg: Office for Official Publications of the European Communities.
- European Commission. (2002b). *University spin-outs in Europe. Overview and good practice*. Luxembourg: Office for Official Publications of the European Communities.
- European Commission. (2004). *Technology Transfer Institutions in Europe. An overview*. European Commission, DG Enterprise.
- Hague, D., & Oakley, K. (2000). *Spin-offs and start-ups in UK universities*. London: Committee of Vice-Chancellors and Principals of the Universities of the United Kingdom.
- Heirman, A., & Clarysse, B. (2004). How and why do research-based start-ups differ at founding? A resource-based configurational perspective. *Journal of Technology Transfer*, 29(3/4), 247–268.
- Helm, R., & Mauroner, O. (2007). Success of research-based spin-offs. State-of-the-art and guidelines for further research. *Review of Managerial Science*, 1(3), 237–270.
- Mcqueen, D. H., & Wallmark, J. T. (1991). University technical innovation: Spin-offs and patents, in Göteborg, Sweden. In A. M. Brett, D. V. Gibson, & R. W. Smilor (Eds.), *University spin-off companies, economic development, faculty entrepreneurs, and technology transfer*. Savage, MD: Rowman & Littlefield.
- Mustar, P., & Wright, M. (2010). Convergence or path dependency in policies to foster the creation of university spin-off firms? A comparison of France and the United Kingdom. *Journal of Technology Transfer*, 35(1), 42–65.
- Novakovic, M., & Sturn, D. (2000). *Start-up on Campus-European models for the stimulation of academic spin-offs*. Vienna: Forum Gründungsforschung-Interdisziplinäre Jahreskonferenz zur deutschsprachigen Gründungsforschung, 5–6 octubre.
- Roberts, E. B., & Malone, D. (1996). Policies and structures for spinning off new companies from research and development organizations. *R&D Management*, 26(1), 17–48.
- Segura, I., Fernández, C. V., Foruria, C., & Aramburu, A. (2003). *Informe sobre la creación de empresas de base tecnológica desde los centros tecnológicos*. Madrid: Federación española de entidades de innovación y tecnología.
- Shane, S. (2004). *Academic entrepreneurship. University spinoffs and wealth creation*. Cheltenham: Edward Elgar.
- Smailes, B., & Cooper, S. (2004). Academic enterprise and sustainable wealth-creation. In K. Tang, A. Vohora, & R. Freeman (Eds.), *Taking research to market. How to build and invest in successful university spinouts*. London: Euromoney Institutional Investor Plc.
- Steffensen, M., Rogers, E. M., & Speakman, K. (2000). Spin-offs from research centers at a research university. *Journal of Business Venturing*, 15(1), 93–111.
- Sternberg, R. (2014). Success factors of university spin-offs: Regional government support programs versus regional environment. *Technovation*, 34(3), 137–148.
- Wright, M., Clarysse, B., Mustar, P., & Lockett, A. (2007). *Academic Entrepreneurship in Europe*. Cheltenham: Edward Elgar.

Chapter 10

Entrepreneurial Initiatives in Colombian Universities: The Innovation, Entrepreneurship and Business Center of Sergio Arboleda University

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and Carlos Rueda-Armengot

Abstract In its most general and broad term, the university is still considered today as the most important hub of any society in terms of scientific research, knowledge transfer and spread of humanistic culture. However, in recent years, the university has acquired an increasingly important role as a strategic focus of innovation, creativity and entrepreneurship, both within societies of developed countries and in developing regions, where it is necessary to push towards the establishment of a business network that generates employment and welfare.

As a way to reinforce this entrepreneurial attitude in universities, and more specifically in higher education institutions located in Colombia, this study presents the case of the Innovation, Entrepreneurship and Business Center of Sergio Arboleda University—Sergio i+E in Bogota, Colombia. The aim of this work is to present the processes, methodologies and tools developed by the aforementioned center in its efforts to serve as an instrument to promote entrepreneurship among the university community and serve as a link among other Colombian groups and institutions, all in order to motivate and promote progress and a generation a self-sustaining development initiatives.

As part of this work, some examples and data from major entrepreneurial projects that have been carried out in the Sergio i+E center will be presented, in order to show clearly the need of developing and strengthen own institutions inside the university to encourage and promote entrepreneurial attitudes and skills of the students, as well as provide them with consultancy and advisory mechanisms in their

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emerging business projects, while serving as a focus of development and realization of ideas within Colombian society.

Keywords Bogota • Business centre • Business network • Colombia • Creativity • Economic growth • Entrepreneurial attitudes and skills • Entrepreneurship • Higher Education Institutions—HEI • High-quality accreditation • Humanistic culture • Initiative • Innovation • Knowledge transfer • Private and public sector • Scientific research • Self-employment • Sergio Arboleda University • Sergio i+E center • Social development

10.1 Introduction

Entrepreneurs cause change in society creating new business and generally promoting economic growth, profitability and development (Jamshidi, Arad, & Poor, 2015). In this context, knowledge is the basic component for economic and social development. This is only viable in a joint work scenario, between the Higher Education Institutions (hereafter HEI) and the private and public sector, being necessary to reinforce education and research, encourage the transfer of research results and promote relations between the HEI and the productive sectors (Vaqueiro-García, Ferreiro-Seoane, & Alvarez-García, 2015).

The core activities of the HEI have focused mainly on teaching, research and promotion, which are usually performed separately and on a specialized way. The proposal of the entrepreneurial university requires greater integration and dynamic interaction between these three types of substantive activities to strengthen and enhance each other, for which HEI must work in order to create and strengthen joints between them (Cervilla, de Pepe, & Gonzalez, 2014). This is the reason why there is a distinction between general education and entrepreneurship education. Entrepreneurship education is geared towards the promotion of entrepreneurship, stimulating entrepreneurial skills for an enterprising career in starting and leading a business and achieving self-employment (Ajetunmobi & Ademola, 2014). This entrepreneurial education is an activity to cultivate entrepreneurial talents with entrepreneurial consciousness, entrepreneurial quality, entrepreneurial knowledge, and entrepreneurial capability. It aims at training individuals with entrepreneurial traits, for example, independence, creativity, capability to seek opportunities, and courage to take risks, enabling them to adapt to the need of the future society (Li-li & Lian-sen, 2015). It is an important responsibility of HEI to further develop entrepreneurship education on the existing basis from aspects of educational content, form, and conditions to train many entrepreneurial talents so as to offer steady human resources to achieve sustainable development of national economy and all-round social progress (Li-li & Lian-sen, 2015).

In this line of action described above, it is also necessary to add the transfer of knowledge and innovation for the promotion of entrepreneurship, and at least two

effects of this activity can be mentioned: basic research and applied research, which will enable advances in the scientific and transfer field. However, the promotion of entrepreneurship from the HEI should have another purpose, which is to contribute to adequate job placement of the students and university graduates. If the HEI promote entrepreneurship, they enable young people to have adequate training and motivation in order to face the business challenge creation (Vaqueiro-García et al., 2015). HEI should offer quality training to meet the market needs and reorient their lines and research projects in order for companies to use part of their funds for university activities. Therefore, the aim of HEI is to achieve useful knowledge which is demanded by the market, and in addition generate entrepreneurs (Vaqueiro-García et al., 2015).

In a situation of economic uncertainty as the one that can be observed nowadays, it is necessary to find new ways to improve the employment situation, and one solution is to encourage entrepreneurship in HEI. It is necessary for these institutions to respond to society demands, so as to meet students' expectations, including their future employment situation. In addition, the HEI should ensure adequate training to give solution to the problems to which the students will be faced by in the market. By achieving all the above, the creation of employment and wealth will be made possible (Vaqueiro-García et al., 2015).

10.2 Theoretical Background

10.2.1 *Analysis of the Current Situation to Promote Entrepreneurship Within Universities*

Efforts must be channeled to university as an active to take a leading role in the enrichment of science-society relationship, creating learning opportunities for the achievement of entrepreneurship and innovation, in order to raise levels of awareness of science and technology (Grau, 2014). Entrepreneurship education is an essential element in the ecosystem of innovation (Kagami, 2015). Libombo, Dinis, and Franco (2015) discuss two important dimensions to be taken into account in terms of a favorable environment for entrepreneurship: the human capital of the individuals and the business environment in which individuals operate.

On the one hand, the development of entrepreneurial skills leads the student to discover their entrepreneurial capacity to orient it towards entrepreneurship (ability to create and sustain their own business), taking into account factors both personal and ethical (development of entrepreneurship), contextual (perception of the environment) and technical (business plan, obtaining resources) (Reinoso-Lastra, 2008). Entrepreneurs should be identified in universities and educational centers and should be necessarily trained. For this reason, attention to entrepreneurship is one of the important concerns of institutions and different educational centers such as universities and technical and vocational centers throughout the world. It has been very vital to promote entrepreneurship capabilities to develop and reinforce competition

in national and global economy, particularly if all factors and elements involved in education such as goals, course content, teaching methods, teachers and students are selected carefully to design appropriate courses (Jamshidi et al., 2015). This could be organized around a network, on the principle of economic intelligence where people involved in business awareness from inside or outside the university could exchange their practices and share their knowledge and tips. This network could consider all subjects from the idea to the project such as financing, establishing the business plan, marketing, etc. (Albertini, Fabiani, Lameta, & Orsoni, 2014).

On the other hand, universities' educational culture must give a great weight to the business training, introducing changes in every instance of mediation (teachers, students, institutions, media content, context, and groups) to generate entrepreneurial skills and business competences and to give also meaning to the knowledge received to provide added value and professional performance for the students and graduates in a comprehensive and systematic way (Reinoso-Lastra, 2008). Entrepreneurial training must provide to graduates skills as strategic thinking, awareness of the need for innovation, preparedness to deal with change and uncertainty, communication skills, and ability to identify new needs, among others (Hidalgo, 2013). That learning should be taught at university level, resulting from a comprehensive education that meets the needs of society and the globalized world, involving the acquisition of theoretical concepts and practical application developed according to the culture and the environment (Ortiz-Riaga, Rodriguez-Gaitan, & Gutierrez-Rodriguez, 2013).

Once identified the social and educational needs to incorporate as entrepreneurial skills to promote the creation of business, universities must perform curricular transformation processes to encourage changes in undergraduate and graduate programs, incorporating pedagogical models. This will allow business development processes from the availability and regional needs, linking curricula with entrepreneurship and developing business plans. It is also important to train university teachers pedagogically into an entrepreneurship oriented education, setting academic events, professional networks and research projects (Reinoso-Lastra, 2008).

10.2.2 Examples of Entrepreneurial Programs and Initiatives in Universities

Higher education, through its commitment to entrepreneurship, can reassure, incite and stimulate young graduates to start up or take over a business activity (Albertini et al., 2014). Cantaragiu, Păunescu, and Hadad (2014) pointed in their study towards certain hypotheses about entrepreneurship at universities: the more the rhetoric of the initiative is decontextualized, the more the university will focus on its core abilities and will favor those social projects which are specifically in its domain of activity. And on the other hand, the more a university is linked with its local environment, the better the chances of getting involved in activities which do exceed its core competencies, such as environmental projects and initiatives related to local needs.

The type of communities the institution is targeting influences the partners the university seeks and its level of outreach (local, regional, national or international). There are also some institutional characteristics of the university which influence the way it chooses to act in a socially entrepreneurial way (type, location, capacity, resources).

According to Vaqueiro-García et al. (2015), there are some effective entrepreneurial initiatives and programs that can be developed and implemented in order to increase entrepreneurship within HEI: entrepreneurs program, entrepreneurial networks, professorships of entrepreneurs, clubs of entrepreneurs, workshops for entrepreneurs, contests of university student entrepreneurs, summer schools for lecturers and researchers in entrepreneurship, creation of multidisciplinary teams in entrepreneurship, graduate and postgraduate programs in entrepreneurship, mentoring, business Angels, business incubators, spin-offs, start-ups, etc. The authors cite some examples of these entrepreneurial programs, most of them located in Europe: *Center for Entrepreneurial Learning* of the University of Cambridge (United Kingdom), *Team Academy* of the Polytechnic University of Jamk (Finland), *Finpin*, a network composed of 14 Finnish Politechnic Universities (Finland), *International Center for Entrepreneurial Studies* of the University of Osijek (Croatia), *Kaospilots* (Denmark), *Tut Innovation and Business Center* of the Technological University of Tallinn (Croatia), *Tumentrepreneurship* of the Technological University of Munich (Germany), *Yes! Delft*, of the Technological University of Delft (the Netherlands), *Zentrum für Entrepreneurship* of the Technological University of Berlin (Germany), *Phd in Technological Change and Entrepreneurship* of the Center for Innovation, Technology and Policy Research IN+ (with partners in Portugal).

It must be also added that in countries with major weaknesses concerning entrepreneurial culture and human capital, collaborative partnerships with other international and national universities and organizations are fundamental to the generation and dissemination of knowledge and an entrepreneurial mindset. In fact, the literature review showed that university networks are considered one of the most important vehicles of knowledge transfer between universities and between universities, young entrepreneurs and other economic actors (Libombo et al., 2015).

10.2.3 Role of HEI in Colombia to Enhance Entrepreneurship

Educational policies in Colombia, as in other countries in the region, have been focused mainly on increasing education coverage, ignoring the quality of the educational experience for young people. The poor quality of education has a direct impact on the dropout rate, with negative consequences for the country's development and participation in global processes. Even personal and family environments impact students (Pineda-Baez et al., 2014).

In the Colombian legal framework, the 1286 Act of January 23, 2009 sets up COLCIENCIAS as an Administrative Department, and strengthens the National Science, Technology and Innovation areas in Colombia. From Chap. 1 in the general

provisions the general purpose of the Act defines “strengthen the National System of Science and Technology and COLCIENCIAS in order to achieve a productive model based on science, technology and innovation, to add value to the products and services of Colombian economy and promote productive development and a new national industry” (Cabrera-Otalora, Nieto-Gomez, & Giraldo-Diaz, 2014).

Gomez and Mitchell (2014) highlight three conclusions regarding entrepreneurship and innovation in Colombia: the first is the major role played by science, technology and innovation in the social and long-term economic development of nations. The second is the important role of government and local authorities to address market failures and promote an environment of knowledge generation, dynamic entrepreneurship and business innovation. And third, and perhaps most important, the strategy of science, technology and innovation must turn around businesses and entrepreneurs.

Despite a perceived high inclination towards entrepreneurship in Colombia, it is necessary to strengthen mechanisms to ensure that these intentions become planned and consistent behaviors. The task is to consolidate a true entrepreneur, formal, innovative and inclusive culture, result of a national project and not cyclical decisions in an uncertain social and economic context (Rodríguez & Prieto-Pinto, 2009). It will be a major responsibility of HEI to develop and promote entrepreneurship on the existing basis of the aspects of educational content, form and conditions and for a large number of entrepreneurial talents in order to provide the constant human resources for vital and sustainable development of the national economy and all aspects of social progress (Li-li & Lian-sen, 2015).

Colombian students clearly identify entrepreneurship with values of quality of working life. The entrepreneurship is seen as a very respectable way of exercising the profession. It is vital for all universities and public entities to continue cultivating this belief and professionalizing its promotion through specialized events and fairs, giving specific training and more exposure to entrepreneurial work in the media. In Colombia, entrepreneurship is considered as a valid way to achieve stability and safety in the working life. Although the enterprise carries certain risks economically, students perceive it as a safe option to achieve a stable income (Rodríguez & Prieto-Pinto, 2009).

In a recent study cited by García-Gonzalez (2008) performed on 55 institutions (28 in Bogotá, 18 in Medellín and 9 in Cali) it was found that some universities offer extracurricular courses on entrepreneurship only at the end of the studies, so the opportunity for the student to start a business process from the beginning is wasted. Few universities run a training process that covers all the degree, from the beginning until the graduation, or even that extends to the graduates. No formalized or centralized plans were found to promote entrepreneurship and there were not training programs for teachers or principals within the institution and outside. According to Cabrera-Otalora et al. (2014), one of the proposals that Colombian universities must develop is the incorporation of the different ecologies of knowledge, temporalities, acknowledgments and productivity, which will allow an understanding of the wider world, including new ways of being and thinking that lead to bridge the gap between scientific knowledge and society.

10.3 Methodology

10.3.1 *Factors and Requirements Needed to Enhance Entrepreneurship at Universities*

As a process, entrepreneurship can be analysed, understood, and taught. It is possible to increase the probability of success of those who embark on entrepreneurial careers by effectively teaching the process. There are three key components in entrepreneurship education, namely: creativity, project management and team building, and business basics (Kagami, 2015). Entrepreneurship concept must include the establishment of an enterprise (establishment of a new profit-making organization), creation of a cause (origination of a new non-profit organization), and starting of a business (entrepreneurship inside the organization, as for example new applications, improvement and creation of new products/services), going beyond from a course teaching and entrepreneurial plan competition to an entrepreneurship education chain comprised of atmosphere section, course section, experience section, and action section, from a single entrepreneurship of colleges and universities to the establishment of university-level and provincial entrepreneurship education platforms (Li-li & Lian-sen, 2015).

Cervilla et al. (2014) highlight some actions required to improve entrepreneurship in universities: establish institutional policies to foster the entrepreneurship spirit and a culture of innovation, support entrepreneurial and innovative initiatives through training and advice to entrepreneurs, promote partnerships and institutional cooperation agreements to enhance efforts and develop projects aimed at promoting entrepreneurship not only through internal networking but also externally, present and analyze models and experiences that highlight the importance of integrating the activities undertaken by various actors in the field of entrepreneurship, develop strategies for potential entrepreneurs projects within the university context implementing mechanisms to motivate and attract them to the incubation system, and improve the integration of the various agents through the creation of institutional bodies, among others.

Fatemeh, Jahangir, and Fatemeh (2014) establish a guidelines of actions to improve university entrepreneurship: pursue policies and supportive laws for entrepreneurship, increase university research budget and building risk, consider organizational infrastructures, make strategic programs which guarantee to achieve long term goals regarding university entrepreneurship, improve beyond organization communications and internal and external processes, attract other organizations and private sector support, design clear laws regarding intellectual property and rules to guarantee legal prosecution, establish entrepreneurial courses for board members in order to promote their abilities in entrepreneurship context, define mutual goals of university and industry, establish sessions and meetings in order to exchange opinions and identify mutual issues, and introducing university capabilities to industry in order to attract university forces.

Farsi, Modarresi, Motavaseli, and Salamzadeh (2014) define the institutional factors affecting academic entrepreneurship into two categories: Formal Factors (governmental policies and rules, marketing structure, rules-structures-governance of the university, academic entrepreneurship structures, entrepreneurship education programs, university-industry relationship, university research structure, and intellectual property laws) and Informal Factors (procedure of enforcing laws, academicians' attitudes toward entrepreneurship, role models and academic reward system, political considerations, and quality of educational system). According to the results of this study, the factor entitled rules-structure-governance of the university is identified as the most important formal institutional factor affecting academic entrepreneurship. Entrepreneurship and business education programs is another important element, as well as procedures of enforcing laws identified as the most important informal institutional factor affecting academic entrepreneurship. University-industry relationship has been identified as another important formal institutional factor in this study.

Nowadays, and according to Pineda-Baez et al. (2014), student engagement in all senses occurs when institutions work on the following five benchmarks: level of academic challenge (proposed activities should be designed to cognitively stimulate the student to learn), active and collaborative learning (students who are more active in the learning process will presumably have a greater possibility of academic success), interaction between students and faculty (process of the exchange of information, ideas, perspectives and views between the student and the faculty of the institution), enriching educational experiences (experiences are opportunities in and outside the classroom that allow the students to learn about themselves and others through a collaborative process that involves classmates and teachers) and supportive university environment (efforts by universities to contribute to students' social and academic integration, generally classified as academic, financial, psychological and administrative support programs).

Cornell (2014) adds to the idea described above that first-time entrepreneurs, particularly student entrepreneurs, have many inherent handicaps: lack of in-depth experience and knowledge of a market domain, no substantial track record, and no network (contacts) in the financing community. These all pose significant obstacles for nascent ventures seeking seed or startup funding for their ideas. For younger entrepreneurs, the funding gap is a proverbial chicken or egg problem: in order to attract seed capital, they must provide some evidence of a large market opportunity, customer traction (early sales), or demonstrate tangible product development in order to convince angel investors, but providing this kind of evidence often requires money for technology resources, development, marketing, or other activities that can prove this traction. For educators, crowdfunding platforms can be a powerful new training tool. By requiring students to transform their ideas into a live crowdfunding campaign, students not only get a chance at getting funding for their ideas, but they also have the opportunity to sharpen vital entrepreneurial skills such as business planning, product planning, pitching, and marketing and sales, among others, all while getting valuable feedback from the market. Crowdfunding is as essential a new teaching tool as it is an essential new skill set for entrepreneurs (Cornell, 2014).

10.3.2 Innovation, Entrepreneurship and Business Center: Sergio i+E

In Colombia, High Schools and HEI organize entrepreneurship fairs and other events related to creativity and innovation, but these initiatives do not work. Many students arrive without the necessary knowledge, skills and competences to succeed in an entrepreneurial environment and materialize their projects correctly. The existing general entrepreneurial ecosystem in Colombia consists of four main categories: educational institutions (including schools, colleges, technical and technological centers, universities and other HEI, etc), private enterprise (business accelerators and private support agencies as Wayra Telefonica Colombia, Bolivar Davivienda Foundation, Corona Foundation, Bavaria Foundation, etc.), government and public institutions (ministries and other state agencies such as Impulsa, Fondoemprender, SENA, Connect, BANCOLDEX, etc.) and multilateral agencies.

Sergio Arboleda University received in year 2015 the High-Quality Accreditation, a distinction that according to Pineda-Baez et al. (2014) is granted by the Ministry of Education in Colombia to institutions distinguished by their excellence, tradition, positive results, impact and social recognition. Within the institutions and bodies that integrate Sergio Arboleda University, it can be found the Innovation and Entrepreneurship Center of Sergio Arboleda University—Sergio i+E (hereinafter, Sergio i+E), an independent body that has been designed to transfer the innovative and scientific knowledge from the University to the Colombian industry and society, in order to promote a proactive entrepreneurial culture through awareness initiatives, education and support. Its services and activities serve as a catalyst for economic and social development in Bogota and Colombia, positioning the Sergio Arboleda University as an institution committed to talent development and progress. To achieve its mission, Sergio i+E focuses its goals on the promotion of innovative leaders inspired by strong values related to knowledge, talent, innovation, entrepreneurship, internationalization and leadership. This values have been established as key factors necessary for the generation of the process, based on networking, global actions, economic development in emerging sectors, new market opportunities and sustainable business models. The Sergio i+E center is located in Bogota, but it coordinates the other two sites of Sergio Arboleda University in the cities of Santa Marta and Barranquilla.

To achieve all its goals, Sergio i+E has established three main lines of action: innovation, entrepreneurship and internationalization. To perform its objectives in the first area of action, the innovation purpose, two initiatives have been taken to encourage this important space: innovation awareness acting on all degree programs of the Sergio Arboleda University and over all semesters on each program (through activities such as contests, challenges, workshops, competitions related to entrepreneurship, etc.) and the transfer and valorization, to transfer knowledge from the university research groups to the business based on a strategy of demand, initiating the process by the companies needs and promoting the knowledge transfer through an active advice and consultancy work by internal research groups seeking solutions for such companies, according to the Oslo model.

The second line of action performed by Sergio i+E is based on entrepreneurship, and it is developed in specific training initiatives through configurable elective classes, acting on the 23 programs of the Sergio Arboleda University, and offering four different areas of study: innovation, creativity, entrepreneurship (general entrepreneurship, female entrepreneurship, social entrepreneurship, and network-entrepreneurship) and teamwork. This program is focused on attaining knowledge related to the 25 business models that currently exist, in order to reach a comprehensive, disruptive vision that add value to their knowledge and serve the society by implementing technology as an applicable input into their business projects. Training programs are composed of these elective classes which last 16 weeks each, 3 h per week, formed by a theoretical part (knowledge) and an experimental part (know-how) in order to gradually acquire knowledge, skills and competences enabling students to realize a viable business plan when they reach their final semester. This final part of the training, the viable business plan, consists of an intensive 6-month training built over ten seminars, based on innovation and creativity, through the model of marketing, management and operation, and ending with the financial model and validation of results. The program has an accompanying by mentor experts and consultants, who are chosen and contacted from leading companies of the country and some important figures worldwide. It is very important to note that throughout all the training process until last semester it is all about business models, and it is at the end of the process when it comes to a business plan, execution and realization of entrepreneurial projects by those students.

The third line of action aforementioned is internationalization, which seeks to position the Sergio i+E center as a reference at a national and international level, taking advantage of the site located in Madrid (Spain), which aims to become a hub and nexus between the various university centers and a predominant and reference focus on knowledge development, technology transfer and best practices.

10.3.3 Results

As for example of the initiatives explained in the previous section, it has been implemented the *Innovation, Creativity and Entrepreneurship* course, that allows students to be immersed in a space of experimentation and self-reflection about the components that characterize the innovative spirit, culture of people and organizations, to recognize the individual and group qualities and abilities in order to implement the innovation process. In addition, the course aims for an attitude change through entailment, training and motivation, and provides tools to solve problems and challenges quickly, creatively and efficiently. *From an Idea to Action* is another elective course that allows students to develop and validate their business ideas through different theories and entrepreneurship models. This methodology allows them to continue the process of consolidation and validation of their business plans, in a process conducted by the Sergio Arboleda University through the Sergio i+E center. Finally, the *Creative Thinking Entrepreneur Lab* is another elective course

based on contemporary creativity theories that allow students to examine current innovation cases and relate them to humanities areas such as music, technology, art and therapy. Students learn how to turn a creative idea into a business model, and face great social problems, using techniques of design thinking. Tools to understand education as a pedagogy using the classroom as a laboratory are also addressed. The Sergio i+E also offers Sergio Arboleda University students the option to validate their final thesis with the *Transform Dreams into a Company* initiative, an innovative program that allow them to realize their professional dreams. The program consist on elective transversal classes to all schools and degrees, whose purpose is to develop competencies and skills in innovation through teamwork, creativity and the search for real problems solutions.

Another important project started is the *SUE* program, an initiative in collaboration with the Economic Development Department, setting 957 business plans from all universities in Bogota which received 4500 h of training. The top 100 projects were awarded with an initial capital of 8,000,000 COP and 95 of them ended up forming a real and operative business.

Sergio i+E has also established a *Female Entrepreneurship Program* that aims to increase the presence of women in the entrepreneurial ecosystem and promote their integration in the labor market on equal terms, through different initiatives and services, such as think tank analysis, opinion and lobby, dissemination and awareness of an entrepreneurial culture, specific education and training, best practices sharing, networking, internationalization support and entrepreneurial services for women. This separate and independent female entrepreneurship unit has the same organizational structure as Sergio i+E, but with self-governing functions, structure and operational activities as an exclusive female genre institution. The last remarkable project performed by this center was carried out by 20 women heads of family, some of them illiterate, with the challenge of receiving education in basic business concepts (accounting, marketing, costs, logistics, etc.) using their own children as interpreters in the process of learning through tailor-made educational tools: in the case of children the materials were designed with colors as games to enhance the knowledge transmission towards their parents, and for adults they were focused on the entrepreneurial needs. As a result of the project the company BRITT (dedicated to retail service in airports and coffee shops) was contacted so they could be considered as potential suppliers of textiles handicrafts for this company.

10.4 Conclusions and Future Research

Entrepreneurship should be regarded as one of the necessities of the new millennium which is known as information society and globalization era, including important outcomes such as learning of newly-emerging technologies and speedy changes in the field of human sciences, business and everyday life (Jamshidi et al., 2015). As Ajetunmobi and Ademola (2014) say, entrepreneurial universities operating in complex environments require complex differentiated solutions such as: stable

environment of funding and regulation for long-term strategic interdisciplinary connections, autonomy to operate effectively and link university and community knowledge, incentive schemes to encourage academics to take risk and hence initiate new practices to pursuit excellence by promoting culture of free discussion and inter-disciplinarity in research and teaching.

In the present work it was introduced the Innovation and Entrepreneurship Center of Sergio Arboleda University—Sergio i+E, an institution which pursues specific goals and objectives related to innovation, creativity, entrepreneurship and leadership in the same line and direction of the mission, vision, culture and values defended by the University and which served to achieve the High-Quality Accreditation in year 2015. To perform all its goals, Sergio i+E has established three main lines of action: innovation, entrepreneurship and internationalization, promoting innovative leaders inspired by strong values related to knowledge, talent, innovation, internationalization and leadership, and establishing key factors necessary for the generation of the process based on networking, global actions, economic development in emerging sectors, new market opportunities and sustainable business models. The Sergio i+E center is located in Bogota, but it coordinates the other two sites of Sergio Arboleda University in the cities of Santa Marta and Barranquilla.

Some examples of initiatives and current projects that have been implemented by Sergio i+E center in recent years are: *Innovation, Creativity and Entrepreneurship* course, *From an Idea to Action* elective, *Creative Thinking Entrepreneur Lab*, *Transform Dreams into a Company* initiative, *SUE* program and the *Female Entrepreneurship Program*. All these initiatives have been set up in order to show clearly the need of developing and strengthen own institutions inside the university to encourage and promote entrepreneurial attitudes and skills of the students, as well as provide them with consultancy and advisory mechanisms in their emerging business projects, while serving as a focus of development and realization of ideas within Colombian society.

References

- Ajetunmobi, A. O., & Ademola, E. O. (2014). Entrepreneurship education at the Afe Balalola University Ado-Ekiti, Ekiti State, Nigeria. *Computing, Information Systems, Development Informatics & Allied Research Journal*, 5(4), 45–54.
- Albertini, T., Fabiani, T., Lameta, N., & Orsoni, J. (2014). *Academics behaviors to foster students entrepreneurship in universities: The way of a little french university*. 21st Century Academic Forum Conference at Harvard—2014 Boston, pp. 175–197.
- Cabrera-Otalora, M. I., Nieto-Gomez, L. E., & Giraldo-Diaz, R. (2014). La universidad colombiana y la innovacion desde una Epistemologia del Sur. *Revista Entramado*, 10(1), 240–250.
- Cantaragiu, R., Păunescu, C., & Hadad, S. (2014). The social impact of university entrepreneurship in Romania: Is the institutional discourse replicated or adapted? *Management & Marketing: Challenges for the Knowledge Society*, 9(4), 403–422.
- Cervilla, M. A., de Pepe, M. R., & Gonzalez, O. (2014). Reflexiones acerca del emprendimiento universitario: El caso de la Universidad Simón Bolívar/Thoughts on university entrepreneurship—The case of Simon Bolivar University. *Informe de Investigaciones Educativas*, 27(1), 107–133.

- Cornell, C. J. (2014). *Crowdfunding. More than money jumpstarting university entrepreneurship*. National Collegiate Inventors and Innovators Alliance NCIIA2014, pp. 1–7.
- Farsi, J. Y., Modarresi, M., Motavasehi, M., & Salamzadeh, A. (2014). Institutional factors affecting academic entrepreneurship: The case of university of Tehran. *Economic Analysis*, 47(1–2), 139–159.
- Fatemeh, D., Jahangir, Y., & Fatemeh, K. (2014). Identifying ambidexterity components of University Entrepreneurship, case study: University of Tehran. *International Journal of Business and Technopreneurship*, 4(3), 385–398.
- García-Gonzalez, L. M. (2008). Condicionantes del emprendimiento en Colombia. *El Cuaderno. Escuela de Ciencias Estratégicas*, 2(4), 167–185.
- Gomez, H. J., & Mitchell, D. (2014). Innovación y emprendimiento en Colombia. Balance, Perspectivas y Recomendaciones de Política, 2014-2018. *Cuadernos de FEDEDESARROLLO*, 2014(50), 57–58.
- Grau, J. M. (2014). Representaciones sobre la gestión del conocimiento y el emprendimiento en espacios académicos: Una propuesta para fortalecer la cultura científica y de paz en la Universidad Tachireense. *Revista Digital de Historia de la Educación*, 2014(17), 67–77.
- Hidalgo, L. F. (2013). *Fundamentación de un proyecto educativo para la formación en emprendimiento: Caso de estudio carrera de emprendedores, Universidad Católica Santiago de Guayaquil. Congreso Internacional Educación 2013, La Habana, Cuba*.
- Jamshidi, M. H., Arad, O., & Poor, T. E. (2015). Indices of entrepreneurship among the students of Islamic Azad University Case Study: Kermanshah Branch. *International Journal of Research and Current Development—IJRCD*, 1(1), 22–29.
- Kagami, S. (2015). Innovation and university entrepreneurship: Challenges facing Japan today. In S. Oum, P. Intarakummerd, G. Abonyi, & S. Kagami (Eds.), *Innovation, technology transfers, finance and internationalization of SMEs' trade investment. ERIA Research Project Report, 2013–14* (pp. 97–121). Indonesia: ERIA.
- Libombo, D., Dinis, A., & Franco, M. (2015). *Promoting entrepreneurship education through university networks—A case study in Mozambique*. Entrepreneurship Education and Training INTECH, pp. 114–137.
- Li-li, H., & Lian-sen, W. (2015). Two-level, three-field, and four-section system: Expansion of entrepreneurship education for college and university students. *US-China Education Review B*, 5(3), 206–213.
- Ortiz-Riaga, M. C., Rodríguez-Gaitan, S. M., & Gutierrez-Rodríguez, J. E. (2013). El lugar del emprendimiento en la educación superior en Colombia. *Gestión Social*, 6(2), 159–174.
- Pineda-Baez, C., Jose-Javier, B. A., Rubiano-Bello, A., Pava-García, N., Suarez-García, R., & Cruz-Becerra, F. (2014). Student engagement and academic performance in the Colombian university context. *RELIEVE-Revista Electrónica de Investigación y Evaluación Educativa*, 20(2), 1–20.
- Reinoso-Lastra, J. F. (2008). *Experiencias de Emprendimiento en la Universidad del Tolima. Ponencia presentada en el Congreso latinoamericano de Administración de empresas, II Jornadas Nacionales de Innovación y Emprendimiento*. Cochabamba, Bolivia.
- Rodríguez, C. A., & Prieto-Pinto, F. P. (2009). La sensibilidad al emprendimiento en los estudiantes universitarios. Estudio comparativo Colombia-Francia. *Innovar, Especial en Educación*, 12, 73–90.
- Vaqueiro-García, A. V., Ferreiro-Seoane, F. J. F., & Alvarez-García, J. Á. (2015). *Entrepreneurship and university: How to create entrepreneurs from university institutions*. XXIX AEDEM Annual Meeting, San Sebastián, Spain, pp. 1–16.

Chapter 11

University Incubators May Be Socially Valuable, but How Effective Are They? A Case Study on Business Incubators at Universities

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Abstract To counter the high failure rate of small entrepreneurial start-up companies, many universities set up business incubators that nurture start-ups until they are prepared to stand on their own. There are many different types of incubator, and while the evidence of their success is inconsistent, some research suggests that they do succeed in one of their primary goals because start-ups that begin in incubators have a higher survival rate (c.f. *J Technol Transf* 48(5):692–710, 2004) compared to non-incubator companies.

Traditional definitions of incubators (*J Technol Transf* 29(1):55–82, 2004) generally include: (a) Shared office space rented at favourable rates, (b) Shared support services that reduce overhead costs, (c) Professional business support, advice and mentoring, and (d) Professional and trade networking. While each of these aspects has been studied by academics, the general consensus is that the most important factor for start-up success is the final factor—organized networking (*Int J Entrepreneur Innovat Manage* 4(2–3):248–270, 2004). Recent work has shifted the focus of research on the role played by incubators as a mechanism for embedding a company within networks, recognizing that much of the entrepreneurial literature stresses that access to networks plays a crucial role for start-ups and small companies.

In recent years, the business world has seen major changes in the way that organizations manage their network interactions and interactions with customers. One of the main factors in this change is new technology and data transmission capabilities. However little research has yet looked at networking and cooperation activities within incubators or how entrepreneurs use these technology-enabled networks to support development and growth.

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The aim of this chapter is to examine non-profit university-based incubators focusing on their role in business networking and cooperative activities. The study is exploratory and focuses on incubators at two large public universities in Spain and the UK. The main contribution of this chapter is to confirm that effectiveness assessment of incubators is so far un-systematic. This is dangerous because the lack of rigorous assessment tools and methodologies feeds the uncertainty surrounding business incubator effectiveness and ultimately threatens their ability to make meaningful contributions to the success of the companies they nurture.

Keywords Business incubators • Entrepreneurs • Entrepreneurship • Incubators • International Business Incubation Association • Key incubator performance statistics • Networking • Spain • Spin-off • Start-up • United Kingdom • University • University entrepreneurship support

11.1 Background—Why Incubate?

The International Business Incubation Association (NBIA), the world's largest association of business incubators, says "Business incubators nurture the development of entrepreneurial companies, helping them survive and grow during the start-up period, when they are most vulnerable. These programs provide their client companies with business support services and resources tailored to young firms. The most common goals of incubation programs are creating jobs in a community, enhancing a community's entrepreneurial climate, retaining businesses in a community, building or accelerating growth in a local industry, and diversifying local economies." (NBIA, corporate mission statement, 2016).

Business incubators attract public money because they are seen to have the potential to create jobs, revitalize economies or regions, diversify or modernize local economies, commercialize new technology, e.g. based on university research or the private sector. Given the diversity of goals, there are also many different types of business incubator, but the largest groups are the public non-profit-oriented incubators, and university incubators. As of 2012, there were about 7000 incubators worldwide, and 850 in Western Europe (NBIA, FAQs, 2016).

Yet despite their popularity, the evidence for business incubator effectiveness is mixed and some researchers such as Tavoletti (2013) call for more theoretically sound and methodologically robust means of assessing incubator results. Tavoletti questions the continued investment of public money in business incubators, arguing that there must be some doubt that they meaningfully meet their goals of supporting innovation, entrepreneurship or regional development and therefore do not satisfy public policy objectives (Tamàsy, 2007). While there is an abundance of literature about incubators, much of it claiming to evaluate effectiveness, most of it is only very loosely quantified, and much is methodologically questionable, with very few attempts to compare the measured effects against unintended ones, and few attempts

at replicating effectiveness studies across time or place. For example, an analysis of the Israeli Technology Incubator Program (TIP) (Roper, 1999) points to some individual successes but concludes there is little firm proof that it adds value or is cost-effective. A later study of 43 Italian new technology firms showed that input and output measures of innovative activities are only marginally different between incubated and non-incubated firms (Colombo & Delmastro, 2002). On the other hand, some studies have found higher survival and success rates among the graduates of business incubators (Allen, 1985; Campbell, 1989).

In this paper, incubators are conceptualized as an evolving innovative organizational form of vehicle for enterprise development. This study is confined to European incubators and recognizes that the role of the incubator in the entrepreneurial process has evolved from being an affordable business centre with office facilities to one offering support, training, and networking to start-up firms. Although past studies have looked at different incubator types, including for-profit, and not-for-profit, this study is concerned only with not-for-profit incubators based at universities. This type typically prioritizes encouraging entrepreneurial activity amongst students and also to involve an enterprise component for university staff, that is sometimes focused on research-derived commercialization projects.

11.2 Research Question

Given the unresolved empirical evidence of incubator effectiveness, and the fact that they remain popular at universities, especially those with a new technology focus, this paper aims to make a contribution in the form of new insights on the evaluation of effective business incubator functions. It also aims to identify further avenues for research to address issues of effectiveness evaluation.

11.2.1 Method

This research begins by identifying the main issues in university-based incubators. This is accomplished through a literature review that builds on an extensive previous review by Tavoletti (2013) who was concerned with establishing a theoretical framework for evaluating business incubator effectiveness. He also laid out four main guidelines from a theoretical perspective about the primary principles under which incubators should operate. Briefly, the main functions of incubators should be to:

1. Protect weak-but-promising ventures from the market and do not emulate the market in the incubator.
2. Take the region fully into account: when deciding about establishing the incubator, when selecting ventures, when providing business support to the selected ventures.

3. Consider business incubation as a process, option-driven, relational and network-based, not as a tangible investment.
4. Take advantage of new technologies and a 'virtual incubation' approach to bring public supported business incubation into regions that cannot support a business incubator.

Taking these principles further, the main focus in this research is on the role of networking. We explore this with in depth interviews with managers of two university business incubators, specifically addressing the nature of their networking activities, and tying those to evaluations of incubator success. The interviews are to be seen as exploratory and confirmatory of the current state of affairs for most incubators. With this, it is possible to lay out avenues for future research.

11.3 Conceptual Framework

From a resource-based perspective of the firm, one of the main challenges to start-ups is to create or access the best (most valuable) resources and build barriers to their mobility and inimitability (Barney, 1991). If an incubator offers such resources, each tenant gains by having access to the most valuable resources in their industries. The implied question here, however, is that if each firm has access to the most valuable resources, how does an individual firm differentiate itself from its competitors?

In contrast, social network theory suggests that start-ups draw upon networks (social and professional) and construct new ones to obtain knowledge and resources for their firm (Aldrich, 1999). In this scenario, incubators may fill in for an entrepreneur's lack of networks. Burt (1992) argued that when it comes to information access, the strength of ties within a network is less important than the number of non-redundant ties. This implies that a varied, broad based, loosely connected network is of great importance to entrepreneurs. In social network terms, brokers are actors who facilitate links between persons who are not directly connected. In this sense it is also possible to view incubators as brokers, with emphasis on the role of incubators as an intermediary to a much larger set of networks.

In sum, it is possible to view the entire incubation process as one that fosters community, or the theory of "community of practice," (Wenger, 1998). In this way of thinking, the interaction among the tenants and owners of an incubator may help in shaping the learning of each entity in that group due to a shared sense of understanding of overall community objectives.

11.3.1 *The Functions of Incubators*

Incubators serve a variety of purposes, but these days are often developed to serve technology-based firms. By providing a variety of services and support to start-ups the incubator seeks to effectively link talent, technology, capital and know-how to

accelerate the commercialization of technology (Smilor, 1987). This is based on the idea that over 90 % of the new business start-ups fail within the first 5 years, often because of lack of management skills and/or capital. New ventures typically lack many of the necessary resources required for success. In addition all the elements or resources that will be needed cannot be known at the outset but are revealed as the venture evolves. Therefore incubators can directly provide some of the resources as well as indirectly provide access to resources via formal and informal networking to sources beyond the incubator.

Higher education institutions provide fertile environments for entrepreneurship and many universities have developed incubators with programmes to help educate future entrepreneurs and to help them to take their first steps to start up a business. This has also been a learning process for universities that have found that they too need to be entrepreneurial in order to promote entrepreneurship. Many are therefore developing new linkages between education, research, and business communities to foster social and economic development, and also to expand the broader impact of their core activities in education and research.

At the core of these activities is the recognition that by surrounding students with proper and meaningful support, many of them can flourish in the modern economy. Higher-level policy makers also recognize this: “University graduates have enormous potential for innovation and economic development. Mobilising them for entrepreneurial careers, enhancing their entrepreneurial skills, and providing support for business start-up are important, and often new, tasks for higher education institutions that are only now being fully recognised. In OECD countries public policy has an important role in stimulating innovative and good practice approaches by universities and supporting the exchange of lessons learned” (OECD, 2009).

University entrepreneurship support, considered on its own, has its limits. It prepares students for future entrepreneurial careers and promotes the commercialisation of research results. However, success depends upon the close co-operation and integration of the university internal support with the external entrepreneurship support system.

Assisting the establishment of new firms is a key objective of university entrepreneurship support, but not its only one. The co-existence of tangible outputs (e.g. the number of assisted new ventures) and intangible outcomes, such as the spread of entrepreneurial culture and the creation of entrepreneurial mind-sets, renders assessing the impact of university entrepreneurship support a challenge that requires tailored approaches and systematic, long-term evaluation efforts.

Entrepreneurship education can play at least three legitimate roles in the development of an entrepreneurial society. First, it can present entrepreneurship to students as a possible career choice as well as acting as a general advocate for the mind-set and type of creativity employed in entrepreneurial endeavours. Second, it can assist students in developing the technical and business skill-set essential to having a successful entrepreneurial career. Third, professional educators can assume the responsibility of advancing the body of knowledge associated with the entrepreneurial phenomenon. Their findings should not only be disseminated to students but also to policy-makers and the public at large (Redford, 2006).

11.3.2 Fostering Entrepreneurship in Universities

At the most basic level, education and training can lay out for potential entrepreneurs frameworks for thinking about how to start a business. There are many structured ways of thinking through business issues—e.g. commercial banks can provide a business start-up guide that asks important questions such as: What will the business do? Who are the customers? What will they pay? and so on. When focusing on the entrepreneur, another simple structural framework involves a budding start-up being clear about three things: (a) who they are, (b) what they know, and (c) whom they know. They should also be aware of their own traits, tastes, and abilities, their intellectual capital, and the social networks they are a part of. And because start-ups have limited means (which is why incubators are important) they are less likely to use traditional market research, formal business plans, or comprehensive contracts, and are more likely to use “seat-of-the-pants marketing” and selling alliances. They are also more likely to take a short-term view, and eschew formal hierarchical structures for participatory cultures based on the start-up’s relational capital.

It is the final point on relational capital that is of most interest. This is because while university incubators have traditionally emphasized their roles in providing shared office space at favourable rates, shared support services, professional business support, advice and mentoring, and professional and trade networking, the consensus is growing that the most important factor for start-up success is organized networking (Haapasalo & Ekholm, 2004).

11.3.3 Networks and Networking

Networks play a critical role in many aspects of entrepreneurial activity. Research suggests that they can enhance entrepreneurs’ responses to changes in technologies and the competitive environment (Volberda, 1996). Networks have also been found to ease the transfer of complex knowledge, e.g. technology knowledge, in such a way that is understandable to the entrepreneur (Cohen & Levinthal, 1990; Reagans & McEvily, 2003). In addition, since technology changes rapidly, entrepreneurs must continually keep up with the changes that affect their product/service. Because of the challenges associated with managing change, network reliance for technology knowledge is likely to be particularly important when it comes to developing innovations. Networks should also be especially effective in helping entrepreneurs keep up with the changing technologies that will impact the development of their firm’s offerings.

While entrepreneurs are in the process of developing their business model, market knowledge is critical to shaping an offering that fits with the market’s needs. As with technology, change in markets is continuous and since new ventures are unknown in the market, they face the additional challenge of attracting new customers and generating sales (Freeman, Carroll, & Hannan, 1983). Fortunately, the

acquisition of market knowledge through networking may ameliorate these challenges (Danneels, 2002; Hoskisson & Busenitz, 2002; Wiklund & Shepherd, 2003).

Networks can be especially useful during early stages of venture development, where market knowledge is likely to be equivocal and customer preferences are unclear or evolving and the entrepreneur needs up-to-date marketing intelligence for successful commercialization. By sourcing knowledge from customers and/or other external resource providers like suppliers and manufacturers, the entrepreneur is able to develop a more accurate understanding of how customers can effectively be reached. Further, because markets are dynamic, entrepreneurs who rely more on external sources, like networks, for market knowledge may be better equipped to understand and act on the knowledge acquired. This is because networks can help communicate market knowledge in such a way that is logical and useful to the entrepreneur, which is essential to achieving outcomes, like sales. Moreover, in conditions of rapid environmental change, the ability of entrepreneurs to accurately assess market intelligence may be undermined by a lack of time to make decisions. Networks that supply market knowledge can also provide the entrepreneur with multiple evaluations of such knowledge, thereby improving the match between market needs and the supply of technology (Liebeskind, Oliver, Zucker, & Brewer, 1996). In essence, networks allow for rapid access to knowledge, more accurate knowledge regarding market preferences, and a higher likelihood of finding novel ways that market needs may be met.

11.3.4 Networks and Universities

Given that many universities view themselves as a nexus that connects entrepreneurs, research and relevant knowledge bases, it is not surprising that they have developed business incubators to exploit networking opportunities. Indeed, business schools especially see the encouragement of start-ups and entrepreneurial activity as not just a priority, but as an opportunity to put research and theory to real-world test.

David J. Miller, a researcher at George Mason University's School of Public Policy discusses entrepreneurial ecosystems, saying, "The culture on campus is definitely changing, to be a real player as a university today. You have to engage students and faculty who are increasingly interested in starting companies." Students and researchers often choose to establish their own businesses outside the university environment (Stagars, 2014), but in recent years interest in entrepreneurship has surged, both inside and outside universities. Entrepreneurs are increasingly realizing that the higher education environment has much to offer, and students are beginning to launch projects while doing their degrees (Stagars, 2014). Facebook and Snapchat were both started within universities, and provide inspiration to current students.

On the other hand, Frank Rimalovski, Managing Director of the NYU Innovation Venture Fund, notes that *The University has always been a supplier of both technol-*

ogy and talent, and it's our job to foster and support that. There's definitely been a groundswell of entrepreneurial interest from students and if there's another Zuckerberg (Founder of Facebook) walking around our hallways, we want to be as supportive as we would of a faculty member working on a new cancer therapy.

This chapter deals with how universities are transforming their organization to deliver the key components that college entrepreneurs need to succeed. How do the universities deal with start-ups and how do they organize resources so that they are effectively employed to encourage entrepreneurship? What are the main obstacles that universities face in creating effective programs to support university entrepreneurs?

As Manuel Stagars explains in “University Start-ups and Spin-Offs,” (2014), “The use of the university’s assets in the marketplace is not their strength, and unfortunately, the impact of scientific research on the lives of people outside of academia is small. This is unnecessary, because universities occupy an important space at the intersection between science, business, and public policy.” With proper design and strategy, universities could set up robust ecosystems for start-ups to the advantage of students and researchers. In short, a university with a strong entrepreneurial ecosystem is the ideal launch pad for start-ups. Most universities have all the components to build one right in their backyard. They just need to remove the blockages that prevent the ecosystem from growing (Stagars, 2014).

11.3.5 Enabling Transformation

As new technologies make businesses, including the business of education more global, it is essential for the university to adapt to modern business thinking in ways that help them to manage their core business of education and research and also to move into new fields such as the promotion of entrepreneurship. Such change requires a shift of mind-set. In fact many staff in universities could learn a lot about risk taking and opportunity tackling from entrepreneurs. Thus, in order to be better at encouraging entrepreneurial activity, universities may well need to train themselves and develop incentives to implement entrepreneurial processes of all sorts.

Efforts in this area could logically focus on:

1. Motivation and freedom: Universities must convey to students the motivation to start new entrepreneurial projects and be supported to carry them out (Stagars, 2014).
2. An ecosystem: universities should eliminate obstacles and barriers that hinder the creation of a university business ecosystem that enables new projects to emerge.
3. The university must itself be a network, one that allows students, teachers and researchers to establish ties and launch projects (Stagars, 2014).
4. Entrepreneurial activity should extend to the classroom, as an ethos for business activity itself (Knoop, 2006). Universities and their business incubators should also adopt transformative business philosophies focused on evolving their business models in line with real-world practices.

5. Creating an atmosphere of entrepreneurship at University: In general, most university staff and teachers have never launched their own company, so at best, they have only theoretical knowledge of entrepreneurship. This is where mentoring in business incubators at universities adds value (Zack, 2015).
6. The feedback loop should extend to the development of meaningful metrics that can enable the rigorous assessment of the effectiveness of all aspects of incubator operations.

11.3.6 Performance Assessment

Some efforts at benchmarking for performance assessment have been made by the OECD (2002), summarized in the Table 11.1 below. This provides a key set of averages, ranges and benchmarks that can be quantified. The values are based on an analysis of survey data and discussions with incubator managers on best practice

Table 11.1 Summary of key incubator performance statistics and suggested benchmarks

Setting up and operating	Average	Range	Benchmark
Average capital investment cost	€3.7 million	€1.5 to €22 million	NA
Average operating costs	€480,000 p.a.	€50,000 to €1.8 million	NA
% of revenue from public subsidies	37 %	0–100 %	25 %
Incubator space	3000 m ²	90–41,000 m ²	2000–4000 m ²
Number of incubator tenants	27 firms	1–120 firms	20–30
<i>Incubator functions</i>	<i>Average</i>	<i>Range</i>	<i>Benchmark</i>
Incubator occupancy rates	85 %	9–100 %	85 %
Length of tenancy	35 months	6 months to no max.	3 years
Number of management staff	2.3 managers	1–9 managers	2 managers min.
Ratio of incubator staff:tenants	1:14	1:2–1:64	1:10–1:20
% of managers' time advising clients	39 %	5–80 %	50 %
<i>Evaluating services and impacts</i>	<i>Average</i>	<i>Range</i>	<i>Benchmark</i>
Survival rates of tenant firms	85 %	65–100 %	85 %
Average growth in client turnover	20 % p.a. (2001)	5–100 % p.a.	25 %
Average jobs per tenant company	6.2 jobs per firm	1–120	NA
New graduate jobs per incubator p.a.	41 jobs	7–197	NA
Cost per job (gross)	€4400	€124 to €29,600	€4000 to €8000

standards. It should be stressed that given the diversity of incubator operations and objectives, the benchmarks will not apply universally. Similarly, it is not possible to quantify benchmarks for many aspects of incubator operations (OECD, 2002).

Rothaermel and Thursby (2005) looked at business incubators that were linked to a university over the period 1998–2003. Their results showed a trade-off in that incubated firms with no university ties were ‘more likely to fail but also more likely to successfully graduate within a timely manner.’ Aernoudt (2004) claimed that the importance of the links between universities and incubators is greatly overestimated: ‘good-quality houses, four-star hotels, good restaurants, and proximity to an international airport are much more important than proximity to the university.’ He asserts that even the best and most noted university business incubators demonstrate little or no connection to the university. Rather, it is a city/university reputation as a seat of learning that encourages people to start-up nearby, many of which have no connection to the university.

Slightly outside the scope of university incubators is the ‘networked incubator’, studied by Bøllingtoft and Ulhøi (2005) in their work on social capital. The networked incubator is of interest here because it is a hybrid form that provides preferential access for tenants to a network of companies. The main contribution is to show that such incubators help to correct market failures and the overweening problem of ‘newness.’ This is a marketing-based view that borrows from the new product literature to address issues related to firm age and lack of visibility in the market and also not being a fully-fledged member of a business ‘community.’ They show that networking is key to building market-based assets and that nurturing social capital through social networks (in the broad sense) is increasingly important. Singh and Jain (2003) take a similar tack and assert that cluster development and ‘facilitation of social network-building activities’ are key to incubator success. Their idea of the ‘networked incubator’ is that incubators will perform better when based solidly in a region, social community and single industry.

11.4 Conclusion and Discussion

In the last decade, there have been changes in the practice of launching and managing business. Advances in computer technology, automation, rapid prototyping, and digitization have made it easier to market the university world projects. Entrepreneurship is a skill that is becoming increasingly important. Students and researchers must learn this ability to compete in a global world. However, despite the great efforts of universities to adapt to the needs of new generations and new technologies, high investment costs and years of design and optimization are barriers to success for incubators.

More importantly, the effort to establish meaningful performance assessment systems for incubators is just beginning. At this point in time it seems incubator managers perceive the incubation process to be one of fulfilling broadly stated policy objectives such as nurturing start-ups, helping to commercialize research and

aiding the transfer of knowledge to society from universities, i.e. focusing on the traditional notions of how business and entrepreneurship work. Universities may want to boost the possibilities of creating new companies, creating a more entrepreneurial culture and helping students and researchers with the know-how to start a start-up. However these goals will remain dreamlike if they do not pay more attention to what works and what doesn't, to what is effective and efficient instead of what is traditional. While business incubation is widely seen as an effective support infrastructure for SME and entrepreneurship in many countries, systematic evaluations are needed to understand whether business incubation is an effective and efficient policy tool in those countries.

In this chapter we have taken an entrepreneur-centered perspective of the creation of value, and are therefore adding to the growing body of literature that undertakes this view (Aaboen, 2009; Clausen & Korneliussen, 2012; Hughes, Ireland, & Morgan, 2007). Secondly, by exploring the networking processes, as well as outcomes, underlying motivations, and key factors that condition the effectiveness of those processes, we contribute to a more granular and network-based view of the business incubator's internal dynamics (Ahmad & Ingle, 2011; Hackett & Dilts, 2004).

This chapter examined non-profit university-based incubators focusing on their role in business networking and cooperative activities. The main contribution of this chapter is to confirm that effectiveness assessment of incubators is so far un-systematic and sporadic, and much work needs to be done in this area. This is a pressing need because as business incubators and their tenants lay more emphasis on networking, networking technology, and social networking, a more detailed and nuanced knowledge of how these developments affect start-up and incubator performance will be essential. Without better understanding and rigorous assessment tools the effectiveness of university incubators will remain a matter for conjecture, and this could ultimately threaten their ability to make meaningful contributions to the success of the companies they nurture.

References

- Aaboen, L. (2009). Explaining incubators using firm analogy. *Technovation*, 29(1), 657–670.
- Aernoudt, R. (2004). Incubators: Tool for entrepreneurship? *Small Business Economics*, 23(2), 127–135.
- Ahmad, A. J., & Ingle, S. (2011). Relationships matter: Case study of a university campus incubator. *International Journal of Entrepreneurial Behavior & Research*, 17(6), 626–644.
- Aldrich, H. (1999). *Organizations evolving*. London: Sage.
- Allen, D. (1985). Small business incubators and enterprise development. Reports prepared for the U.S. Department of Commerce, Pennsylvania State University. *International Journal of Entrepreneurial Behaviour & Research*, 17(6), 626–644.
- Barney, J. (1991). Learning activities, exploration, and the performance of strategic initiatives. *Journal of Management*, 1(42), 769–802.
- Bøllingtoft, A., & Ulhøi, J. (2005). The networked business incubator—Leveraging entrepreneurial agency? *Journal of Business Venturing*, 20(2), 265–290.

- Burt, R. (1992). *Structural holes: The social structure of competition*. Cambridge, MA: Harvard University Press.
- Campbell, C. (1989). Change agents in the new economy: Business incubators and economic development. *Economic Development Review*, 7(2), 56–66.
- Clausen, T., & Korneliussen, T. (2012). The relationship between entrepreneurial orientation and speed to the market: The case of incubator firms in Norway. *Technovation*, 32(9–10), 560–567.
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35, 128–152.
- Colombo, M. G., & Delmastro, M. (2002). How effective are technology incubators? Evidence from Italy. *Research Policy*, 31(7), 1103–1122.
- Danneels, E. (2002). The dynamics of product innovation and firm competences. *Strategic Management Journal*, 23(12), 1095–1121.
- Freeman, J., Carroll, G. R., & Hannan, M. T. (1983). The liability of newness: Age dependence in organizational death rates. *American Sociological Review*, 48, 692–710.
- Haapasalo, H., & Ekholm, T. (2004). A profile of European incubators: A framework for commercialising innovations. *International Journal of Entrepreneurship and Innovation Management*, 4(2–3), 248–270.
- Hackett, S. M., & Dilts, D. M. (2004). A systematic review of business incubation research. *Journal of Technology Transfer*, 29(1), 55–82.
- Hoskisson, R. E., & Busenitz, L. W. (2002). Market uncertainty and learning distance in corporate entrepreneurship entry mode choice. In M. A. Hitt, R. D. Ireland, S. M. Camp, & D. L. Sexton (Eds.), *Strategic entrepreneurship: Creating a new mindset* (pp. 151–172). Oxford, UK: Blackwell Publishers.
- Hughes, M., Ireland, R. D., & Morgan, R. E. (2007). Stimulating dynamic value: Social capital and business incubation as a pathway to competitive success. *Long Range Planning*, 40(2), 154–177.
- Knoop, L. (2006). *State of the Business Incubation Industry (National Business Incubation Agency [NBIA], 2008)*. Retrieved from http://www2.nbia.org/resource_library/review_archive/0807_02.php
- Liebesskind, J. P., Oliver, A. L., Zucker, L., & Brewer, M. (1996). Social networks, learning, and flexibility: Sourcing scientific knowledge in new biotechnology firms. *Organization Science*, 7(4), 428–443.
- NBIA. (2016). *Corporate reports*. Retrieved from <https://www.inbia.org/resources/business-incubation-faq.html>
- OECD. (2002). *Annual Report 2002: Organisation for economic co-operation and development*. OECD Publishing. Retrieved from <https://www.oecd.org/about/2080175.pdf>
- OECD LEED Programme. (2009). *Universities, innovation and entrepreneurship criteria and examples of good practice*. Retrieved from <https://www.oecd.org/cfe/leed/43201452.pdf>
- Reagans, R., & McEvily, B. (2003). Network structure and knowledge transfer: The effects of cohesion and range. *Administrative Science Quarterly*, 48(2), 240–267.
- Redford, D. T. (2006). Entrepreneurship education in Portugal: 2004/2005 national survey. *Comportamento Organizacional e Gestão*, 12(1), 19–41. Special Issue: New Challenges in Entrepreneurship.
- Roper, S. (1999). Israel's technology incubators: Repeatable success or costly failure. *Regional Studies*, 33(2), 175–180.
- Rothaermel, F., & Thursby, M. (2005). Incubator firm failure or graduation? The role of university linkages. *Research Policy*, 34(7), 1076–1090.
- Singh, R., & Jain, R. K. (2003). Improving local economies through technology transfer: Utilizing incubators to facilitate cluster development. *International Journal of Technology Transfer and Commercialisation*, 2(3), 249–262.
- Smilor, R. W. (1987). Managing the incubator system: Critical success factors to accelerate new company development. *IEEE Transactions on Engineering Management*, 34(4), 146–156.

- Stagars, M. (2014). *University startups and spin-offs: Guide for entrepreneurs in academia*. New York: Apress.
- Tamàs, C. (2007). Rethinking technology-oriented business incubators: Developing a robust policy instrument for entrepreneurship, innovation, and regional development? *Growth and Change*, 6(3), 460–473.
- Tavoletti, E. (2013). Business incubators: Effective infrastructures or waste of public money? Looking for a theoretical framework, guidelines and criteria. *Journal of the Knowledge Economy*, 4, 423–443.
- Volberda, H. W. (1996). Toward the flexible form: How to remain vital in hypercompetitive environments. *Organization Science*, 7(4), 359–374.
- Wenger, E. (1998). Communities of practice: Learning as a social system. *Systems Thinker*, 9(5), 2–3.
- Wiklund, J., & Shepherd, D. (2003). Knowledge-based resources, entrepreneurial orientation and the performance of small and medium-sized businesses. *Strategic Management Journal*, 24(13), 1307–1314.
- Zack, D. (2015). *Networking for people who hate networking*. Sebastopol, CA: O'Reilly Media, Inc.

Chapter 12

Transversal Competences Acquisition by Assigning Collaborative Work Group Roles

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Abstract Valencia Polytechnic University (UPV) is innovative as far as its training and evaluation considerations are concerned. It has introduced the project “Incorporating transversal competences into UPV graduates’ curriculum” as a strategic challenge, which promotes the training and assessment of transversal competences in several UPV degrees. This work presents an innovative group work experience by assigning roles in preparing a portfolio. Students participate in team work by playing a role whose tasks and competences are previously determined by the teacher, who also describes the role and its competency profile. Students participate in the portfolio by playing the role that they are committed to and co-assess it by a performance assessment system designed in the group. The main work conclusions drawn are that this innovative classroom-based strategy motivates students, helps organise group work and encourages collaborative learning.

Keywords Assessment • Attitudes • Collaborative learning • Competence profile • Competency level • Degree • Graduates • Group work • Higher education • Human Resources • Innovation • Knowledge • Learning commitment • Motivation • Performance • Portfolio • Roles • Skills • Tasks • Transversal competencies

12.1 Introduction

The process of incorporating the Spanish University into the European Higher Education Area (EHEA) implies re-organising university teaching at all levels: Degree, Master Degree and Ph.D. courses. Nowadays, the main objective of designing new degrees is for students to acquire a series of competences, defined for several performance levels following Bloom’s taxonomy (for further information, see

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(Armstrong, 2015; Bloom, Hastings, & Madaus, 1973; López García, 2014)). Competences are defined in the syllabus, and are acquired as a result of the learning process by means of modules and subjects. When degree courses finish, the European Supplement is incorporated into the qualification, as set out by Royal Decree RD 1044/2003, of 1 August 2003, which provides details of the competences acquired so that graduates can access Master Degrees, and later Ph.D. courses, at any university in the EHEA (Ministerio de Educación, Cultura, y Deporte, 2003).

The competence concept has been considerably developed in recent decades and has an increasing impact on different occupational and educational contexts. Boyatzis (1982) defines it as a set of conduct patterns that people must complete to efficiently perform their tasks and work. Spencer and Spencer (1993) consider a competence to be an individual's underlying characteristic, which is causally related to effective and superior performance in a given situation or at work, and defined in criterion terms. According to Yániz and Villardón (2006), a competence is a series of knowledge, skills and attitudes needed to perform a given occupation, and the capacity to mobilise and apply these resources in a given environment to produce a definite result. Lasnier (2000) defines competences as a complex "know how" that results from integrating, mobilising and adapting knowledge, attitudes and skills (cognitive, affective, psychomotor and social) which are efficaciously employed to perform specific tasks in similar situations. In short, competences encompass the knowledge, skills, attitudes and aptitudes, etc., that enable certain tasks and activities, and the achievement of certain results, to be outstanding. Evidently, the competences acquired in Spanish University Degree courses have to respond to graduates' real demand; some examples of these matches can be found in Santandreu and Canós (2014) and in Santandreu, Canós, and Pons (2012).

There are three types of competences in the higher education domain: general, specific and transversal. The first two types mainly refer to knowledge in a study area, and the peculiarity of the knowledge and procedures of a given profession (Corominas et al., 2006). Generic competences identify the elements shared in a professional area, can be applied to a wide range of occupations and occupational situations, and favour job placements as an added value that contributes employment and motivates development and professional progress. In parallel, generic competences can be classified as being instrumental (cognitive, methodological, technological and linguistic), interpersonal or systemic (Tuning, 2003). Specific competences are typical of each profession, that is, of each qualification, and they confer an occupation identity (Tobón, 2006). Transversal competences are key and transferable throughout one's life. They include cognitive and metacognitive skills, and instrumental and attitudinal knowledge. Their main characteristics make them integrative, transferable, interdependent, multipurpose and assessable (ICE, 2015).

It is a fact that society demands that, professionals and citizens in general, acquire new competences, which implies mastering specific skills and abilities. Thus universities hold a twofold position: training in these competences in the professional domain or developing them in an academic environment prior to an occupational one (Villa & Poblete, 2007). Many universities in different countries are redesign-

ing their degree courses by using new academic-professional profiles, which include the acquisition of training different competences as a training paradigm. Valencia Polytechnic University, henceforth referred as the UPV, is innovative as far as its training and evaluation considerations are concerned. Indeed as one of its main strategic challenges, and as set out in the UPV2020 Strategic Plan, one of its purposes is to guide training towards models so that graduates can acquire the necessary competences to successfully find work through the institutional project “Incorporating transversal competences into UPV graduates’ curriculum”. This it does through two main objectives; on the one hand, establishing a systematic strategy to assess transversal competences; on the other hand, the evidence-based accreditation of these competences. The UPV defines 13 transversal competences that all its students must have acquired by the time they finish their degree courses. The challenge for UPV teachers consists in designing training strategies that guide students to acquire these competences, and which also relate them with the knowledge area and/or subject of their degree.

This chapter presents an innovative strategy done as team work in a compulsory subject of year 3 of the Degree of Public Administration and Management (PAM) taught at the UPV Faculty of Business Administration and Management (FBAM), known as Human Resources Management. In this subject, part of the assessment consists in studying case studies as a work team, known as a work portfolio, playing the roles defined at the beginning of the course and using a contract that commits students’ performance. This is done for each role or post by the teacher previously defining the tasks that must be performed and the transversal competences that the students, who play each role as part of the portfolio, will work on. The first step to implement this strategy is to define the Competences Dictionary (Guijarro, Babiloni, Canós, & Santandreu, 2015). In this case, the definition of the transversal competences set out by the UPV performs the Competences Dictionary tasks. With this dictionary, all the group posts are described: Leader, Secretary, Spokesperson and Member. After defining the tasks and responsibilities of each post, its competency profile is defined, and reflects which competences each post has to develop and at what level. Throughout the course, students who play each role work on the transversal competences related to their given role in the portfolio. The objective of this innovative experience is to make students participate in the transversal competences that they must work on throughout the course, and how their acquisition will be evidenced through the group self-assessments made by means of a performance measurement system that group members themselves design.

This chapter is arranged as follows: after the Introduction, the transversal competences that the UPV establishes for its graduates are reviewed. Next the area where the innovation is applied is described: the Degree of Public Administration and Management and the subject of Human Resources Management. The next section dedicates to the methodology: the teaching portfolio technique, the description of the roles and the definition of the competency profiles. Then how the innovation is put into practice is explained. Finally, the last section provides the main conclusions drawn from the innovation presented in this paper.

12.2 Transversal Competences at the UPV

The institutional project “Incorporating transversal competences into UPV graduates’ curriculum” (<http://competenciast.webs.upv.es/>) is an initiative by the Vice-Rector of Studies, Quality and Accreditation, currently backed by the UPV2020 Strategic Plan which, for the first of its strategic challenges, assumes that: *The Valencia Polytechnic University’s objective is to progress to training models that enable its students to acquire the competences they need to find work. This training must be viewed from a broad perspective, linked to a training cycle that includes people, and covers both undergraduate and post-graduate courses.* In this project, transversal competences are understood as the capacities that must be exercised in all syllabi because they are important for good performance in any profession as they sustain the capacity to innovate and to swiftly and efficiently adapt to changes.

The number of transversal competences that can be worked on in Higher Education is considerable. However, if we bear in mind the reference framework for some degrees with specific regulations or recommendations, the UPV has defined 13 such competences. For all 13, three levels of command are established, as are the performances associated with each level, where Level 1 is the initial level and Level 3 denotes the highest degree of competence acquisition. Below the 13 transversal competences defined by the UPV and their achievement levels are described.

CT-01: COMPREHENSION AND INTEGRATION→ This competence involves demonstrating having understood and integrated knowledge of both specialisation and in much broader contexts.

- Level 1: write, list and interpret simple situations and considerations
- Level 2: continue logically, and list and include concepts in complex situations
- Level 3: identify knowledge gaps and use knowledge by a comprehensive approach

CT-02: APPLICATION AND PRACTICAL THINKING→ Applying knowledge to practice, paying attention to available information, and establishing the process to follow to meet objectives efficiently and efficaciously.

- Level 1: apply to practice one’s capacity and the resources that one has to meet objectives in the usual situations following instructions
- Level 2: design a coherent plan with specific actions to deal with new situations
- Level 3: design a coherent plan with specific actions to deal with complex situations either individually or by collaborating with others

CT-03: ANALYSING PROBLEMS AND SOLVING THEM→ Analyse and solve problems effectively by identifying and defining the meaningful elements that constitute them.

- Level 1: analyse a problem by applying learnt methods

- Level 2: develop own criteria to solve problems efficiently through reflection and experience
- Level 3: solve problems individually and/or as a team in depth in different contexts by different approaches

CT-04: INNOVATION, CREATIVITY AND ENTREPRENEURSHIP→ Innovate in order to respond in a satisfactory and original manner to personal, organisational and social requirements and demands by taking an entrepreneurial attitude.

- Level 1: question reality by identifying improvement requirements and ideas that may generate value
- Level 2: provide original ideas and considerations that contribute value through creativity strategies and techniques
- Level 3: propose an action plan that includes an overall analysis of the innovation value

CT-05: DESIGN AND PROJECT→ Design, direct and evaluate an idea efficiently to specify it in a project

- Level 1: design a draft work project (without carrying it out)
- Level 2: plan projects by collaborating with others in situations with poorly defined structures, and forecast incidences and risks (planning but not carrying out)
- Level 3: design projects in situations in which structures are poorly defined by the teacher about global environments by contemplating undertaking the project

CT-06: TEAM WORK AND LEADERSHIP→ Work and lead teams efficiently to meet shared objectives by contributing to their personal and professional development.

- Level 1: participate and collaborate actively in team tasks that involve sharing work
- Level 2: participate in work group, and being committed to and participating actively in meeting the work objectives
- Level 3: contribute to the development and consolidation of a team by encouraging it to achieve high performance

CT-07: ETHICAL, ENVIRONMENTAL AND PROFESSIONAL RESPONSIBILITY→ Act by being ethically, environmentally and professionally responsible with oneself and with others.

- Level 1: question reality and be aware of the concepts and values with which it is built on
- Level 2: critically analyse one's own judgements and those of others about reality, and be aware of their consequences and implications
- Level 3: show and argue about the relevance of conducts and judgements made, supported by ethical and deontological concepts

CT-08: EFFECTIVE COMMUNICATION→ Orally communicate efficiently, and also in writing, by properly using the necessary resources and adapting to the characteristics of each situation and audience.

- Level 1: express well-defined and intelligible ideas in brief oral presentations or in sporadic speeches
- Level 2: transmit conviction and confidence, illustrate discourse to make it easier to understand and adapt it to the formal conditions expected in medium oral presentations (about 10–15 min)
- Level 3: be persuasive in the discourse, adapt your message and the means to the characteristics of each situation and audience in long presentations (about 30 min), and include possible subsequent debate

CT-09: CRITICAL THINKING→ Develop critical thinking and become interested in the foundations on which ideas, actions and judgements are based, regardless of them being your own or belonging to others.

- Level 1: show a critical attitude to reality, be able to analyse and question information, results, conclusions and other points of view
- Level 2: analyse if there is any coherence between your own judgements and those of others, and value their practical implications
- Level 3: argue about the relevance of judgements made and act coherently

CT-10: KNOWLEDGE OF CONTEMPORARY ISSUES→ suitably plan the time available and schedule the activities needed to meet academic-professional and personal objectives.

- Level 1: recognise the contemporary issues that affect your professional field
- Level 2: analyse the contemporary issues that affect your professional field
- Level 3: evaluate and be aware of the contemporary issues that affect your professional field and similar ones

CT-11: LIFE-LONG LEARNING→ Use life-long learning strategically, autonomously and flexibly according to an objective pursued.

- Level 1: incorporate the learning strategies provided by experts and take an active attitude during the process
- Level 2: include the learning strategies acquired by decision making that adapt to each context
- Level 3: develop your own learning strategies to extend what you have learnt according to personal and professional requirements

CT-12: PLANNING AND MANAGING TIME→ Identify and interpret the contemporary issues in your specialisation field, and in other knowledge fields.

- Level 1: develop the planning your teacher suggests in the short term
- Level 2: plan the activities to be done in the short and mid-term
- Level 3: plan and manage individual or group projects in time terms

CT-13: SPECIFIC INSTRUMENTS→ Capacity to use the up-to-date techniques, skills and tools required to practice a profession.

- Level 1: correctly use basic tools from a professional setting in a guided manner
- Level 2: correctly include basic tools from a professional setting autonomously
- Level 3: correctly include advanced tools from a professional setting

The 13 competences, along with their respective levels, constitute the Transversal Competences Dictionary on which the work done in the teaching innovation presented herein was based.

12.3 Area Where the Innovation Was Applied

12.3.1 The UPV Degree of Public Administration and Management

The origin of the of UPV Public Administration and Management Degree course studies lies in covering a need that appears in Law 30/1984, of 2 August, on measures to reform Civil Service. This law foresees the existence of a body in charge of performing tasks related to the administrative and financing management of Public Administrations (PA). Implementing this body requires training the intermediate groups of professionals who have been especially trained to comply in PA.

During academic year 2010/2011 the UPV Degree of Public Administration and Management (PAM) was set up at the Faculty of Business Administration and Management (FBAM) according to EHEA guidelines. The overall objective of this degree is for students to acquire the competences required to occupy the technical management and management job posts related to PA by either undertaking their professional activity in PA themselves or in private organisations that closely collaborate with PA. Thus the intention is to provide PA with qualified employees so they can undertake management tasks, and to provide private companies that work with and for PA as agents who know their casuistry and who facilitate the relation with it. The Degree of PAM is authorised by the Council of Universities and is implemented following the procedure published for this purpose according to Order 86/2010, of 15 November, of the Regional Valencian Ministry of Education (Document DOGV, dated 25/11/2010). The definition of PAM graduates' competences are based on the White Book of the Degree in Political Sciences and Administration, Sociology and Public Administration, and also on the proposed CIGAP Guidelines (Interuniversity Conference on Public Administration Management) in Spain. Nowadays, PAM degree course studies provide students with comprehensive training in theoretical and practical aspects that confer PAM graduates with knowledge about the legal, administrative, political, financial and socio-economic settings in which PA are restricted to.

12.3.2 The Subject Matter of Human Resources Management

Human Resources Management is a compulsory subject in the “Human Resources” subject area, which is taught during the first 4-month period of year 3 of the PAM Degree. Its teaching load comprises 6 ECTS credits, of which 3.6 are theoretical (classroom theory and seminars) and 2.4 are practical (practical classroom sessions and computer science practice sessions). The objective of this subject is to learn about and go deeply into the human resources management system into public and private organisations. This system is made up of subsystems: (1) strategic human resources planning; (2) work organisation, where the work position is analysed and designed; (3) employment management, about recruitment, selection and contracting; (4) managing development, promotion and the professional career; (5) managing the performance, compensation and assessment of performance in the workplace.

12.4 Methodology

12.4.1 The Teaching Portfolio: Group Work, Roles and Learning Commitment

In education, the term portfolio is related with the Anglo-Saxon terms Portfolio Assessment (an assessment folder) or Portfolio Process (a folder with learning), and consists in collecting documents that demonstrate the tasks and results of learning a given subject. Hence a portfolio fulfils a threefold function: it is a teaching method; it is a learning technique for students; it integrates the evidence-based assessment of student learning in terms of both the result and process or the work undertaken, and any evidence of it.

In the innovation experience presented herein, the portfolio is employed as the main axis of the work group, which is made up of four students who play differently defined roles from the very beginning: Leader, Secretary, Spokesperson and Member. The portfolio covers solving cases and tasks that are done throughout the course and which form a relevant part of the subject assessment (20% of it). In general terms, group work activity consists in a supervised session during which students work as a group and receive assistance and guidance, if and whenever necessary. The main purpose of the work group is to make students learn with each other. Thus this methodology is linked to collaborative learning because it is a teaching strategy in which students work as small groups on learning activities cooperatively, and are assessed according to the group’s level of productivity as a whole. This offers a series of advantages that are undisputed and difficult to achieve by other methodologies; e.g., solidarity, negotiated conflict solving, the capacity to pay attention to and respect other points of view, the way to include individual contributions in a collective project, or having to be responsible for tasks, among others (Fernández, 2008).

12.4.2 *Analysing and Describing Work Roles*

One of the areas of Human Resources Management consists in analysing and describing occupying work positions. To go about this, the same methodology used in the typical posts and roles that students were to occupy when designing the portfolio was employed. The information found in Tables 12.1, 12.2, 12.3 and 12.4 corresponds to the description of the roles of Leader, Secretary, Spokesperson and Member, respectively. These tables include the necessary and relevant information for students to clearly identify which tasks are to be done in the group, the responsibilities and any of those aspects required for them to satisfactorily perform the role they play in the portfolio.

12.4.3 *Assigning Competency Profiles to Portfolio Roles*

After describing the roles of the portfolio posts, it is necessary to assign the transversal competences and their competency levels to the four roles in accordance with the Competences Dictionary which, in our case, includes the 13 transversal competences defined by the UPV. This provides a basic competency profile of each role, which

Table 12.1 Description of the Leader role in the Portfolio

LEADER	
DESCRIPTION OF THE POST	The most responsible person for the portfolio to correctly function, be planned, organised and coordinated
Type of organisation	Work group made up of four people
Receives orders from	Teacher of the Human Resources Management subject
Gives orders to	Secretary, Spokesperson and Member
ACTIVITIES AND TASKS	
Organise and coordinate the group so that all group members actively participate in order to satisfactorily undertake the assigned practices	
Coordinate the work team by assigning tasks and responsibilities according to the work to be done	
Inform the work team, design the plan to be followed to solve the task, and clear up any doubts about the activities that have to be performed. Inform the whole group about progressing in planning the task	
Follow-up and supervision. Make sure that the rate of group work is suitable so that all the actions will be satisfactorily carried out	
Provide correct feedback about what each member contributes according to the work objective to be worked on	
Lead the human team and ensure it is always motivated by putting its capacities to best use	
Analyse the execution of the designed action plan and its practice, and ensure that all team members are playing their role correctly	
Jointly assess the group's and members' performance	

Source: Authors

Table 12.2 Description of the Secretary role in the Portfolio

SECRETARY	
DESCRIPTION OF THE POST	Collaborate with and support the leader, who is in charge of the group's documents and of solving any administrative setback that may arise (not attending, personnel problems, etc.)
Type of organisation	Work group made up of four people
Receives orders from	Leader
Gives orders to	Spokesperson and Member
ACTIVITIES AND TASKS	
Organise and maintain the flow of generated documents while performing activities, provide administrative support to the Leader in order to maintain the quality of the tasks performed by the group according to how they were distributed at the beginning	
Make notes of the indications you receive from the Leader. Collect all the contributions made by other team members in an orderly fashion	
Request and control the material used to perform the tasks in order to resort to the resources required to undertake activities	
Ensure that the portfolio is up-to-date and organised	
Perform the tasks assigned by the Leader to finish the different practices and cases that make up the portfolio	
Inform about possible errors in any portfolio document so that the person in charge can correctly rectify them in good time	
Prepare and diffuse the minutes of each group activity. Minutes should contain information about the task: group members; attendance, the tasks that each group member performs, problems that may arise, etc. All minutes (one for each case or activity done) must be signed by all the group members and by the teacher	

Source: Authors

Table 12.3 Description of the Spokesperson role in the Portfolio

SPOKESPERSON	
DESCRIPTION OF THE JOB POST	Present the work done in the portfolio and transfer ideas/opinions/group strategies to other group members
Type of organisation	Work group made up of four people
Receives orders from	Leader and Secretary
Gives orders to	Member
ACTIVITIES AND TASKS	
Carry out the completed shared practice. To do this, sound knowledge of the practice performed and of the strategies followed by the group to manage this is needed	
Coordinate and diffuse the information produced in the group	
Perform the tasks assigned by the Leader to perform the different practices and cases that make up the portfolio	
Clearly present the activity related with the subject's theoretical content in such a way that all classmates and the teacher can understand the rationale that underlies undertaking the activity	
Defend the group's position and argue why several conclusions have been reached	

Source: Authors

Table 12.4 Description of the Member role in the Portfolio

MEMBER	
DESCRIPTION OF THE JOB POST	Collaborate in performing portfolio activities, and more specifically, seek the information needed to undertake portfolio practices. Support the Spokesperson in sharing practices
Type of organisation	Work group made up of four people
Receives orders from	Leader, Secretary and Spokesperson
Gives orders to	–
ACTIVITIES AND TASKS	
Collaborate with all team members in performing all portfolio activities and support the Spokesperson and stand in for this person if (s)he is absent	
Perform the tasks assigned by the Leader to complete the various practices and cases that make up the portfolio	
Seek, analyse and process the information required to perform the various portfolio activities	
Collaborate in aspects of the writing, order and style of the portfolio. Stand in for the Secretary if (s)he is absent	
Acquire profound knowledge about the theoretical theme which each portfolio activity deals with	

Source: Authors

also includes the performances associated with each competence and level so that the student can easily identify by oneself and by classmates if the competence in question is developing. The competency profiles of the Leader, Secretary, Spokesperson and Member are found in Tables 12.5, 12.6, 12.7, and 12.8, respectively.

12.5 Implementation of the Innovation and Assessment of the Results

During the first class session of the subject at the start of the course, apart from the theoretical content that the subject actually covers, students are shown how they will work with its practical content as a work group by means of the portfolio. In this case, the portfolio is physical and the group is responsible for bringing it to each session and for keeping it up-to-date. During the same session, they are provided with an explanation about how work will be done in the portfolio group, formed by four members. Students are explained the system of roles in the portfolio, and how each group member will perform a specific task depending on whether (s)he is the Leader, Secretary, Spokesperson or Member. This is done using the UPV's training platform (known as PoliformaT), where the description of each portfolio post is provided along with its competency profile. The teacher asks students to form groups and to decide who will play each role. After 1 week, the new groups have to provide the teacher with information about their group: the group's name, the group members and the roles of each group member. During class session 3, the group and

Table 12.5 The Leader's competency profile

Transversal competences LEADER		Level	Associated performances
CT-01	Comprehension and integration	3	<ul style="list-style-type: none"> –Identify information gaps or lack of coherence in arguments –Determine generalisations or cause-effect relations –Express and draw conclusions using different data and their relations
CT-02	Application and practical thinking	2	<ul style="list-style-type: none"> –Set specific objectives in relation to the situations considered –Obtain information and assess it –Devise a plan to solve the situations being considered and carry out follow-up and control
CT-03	Analysing and solving problems	2	<ul style="list-style-type: none"> –Identify a complex problem and transform it into simpler situations to solve it –Employ the most suitable methodology to solve the problem efficiently and provide reasons –Select an optimal solution by means of justified criteria
CT-04	Innovation, creativity and entrepreneurship	2	<ul style="list-style-type: none"> –Identify improvement opportunities and/or aspects –Contribute with original ideas and considerations
CT-06	Group work and leadership	3	<ul style="list-style-type: none"> –Propose ambitious objectives and help assign tasks in a balanced manner –Carry out follow-up and monitor tasks, deliveries and the quality of the results
CT-07	Ethical, environmental and professional responsibility	2	<ul style="list-style-type: none"> –Back and argue own judgements –Accept your own limitations and consider others' judgements –Incorporate and critically assess the ethical concepts of the profession
CT-08	Effective communication	1	<ul style="list-style-type: none"> –Transmit relevant information and know how to answer the questions raised –Use language that is grammatically correct
CT-09	Critical thinking	2	<ul style="list-style-type: none"> –Make own judgements and assessments –Assess others' judgements –Identify the practical, personal and social implications of a proposal
CT-10	Knowledge of contemporary issues	1	<ul style="list-style-type: none"> –Identify which subject contents are related to a contemporary issue –Identify solutions to the problem according to the information available
CT-11	Life-long learning	1	<ul style="list-style-type: none"> –Ask in order to learn and show an interest in clearing up your doubts –Always show an active and responsible attitude during the learning process –Efficiently access various available sources of information and resources
CT-12	Planning and managing time	3	<ul style="list-style-type: none"> –Define the overall and specific project objectives to be undertaken –Assign times to perform the activities in order to meet the objective and stick to planning
CT-13	Specific instruments	1	<ul style="list-style-type: none"> –Identify basic tools and their usefulness –Handle tools according to instructions

Source: Authors

Table 12.6 The Secretary's competency profile

Transversal competences SECRETARY		Level	Associated performances
CT-01	Comprehension and integration	2	<ul style="list-style-type: none"> -Confer sense to the considerations proposed to be able to interpret them -Transfer contents to practice -Differentiate the factors that cause a fact
CT-02	Application and practical thinking	1	<ul style="list-style-type: none"> -Identify specific objectives -Assess the quality of provided information to apply it -Propose specific solutions and/or actions
CT-03	Analysing and solving problems	1	<ul style="list-style-type: none"> -Define the problem by clearly and concisely describing its most relevant aspects -Use suitable sources of information and select correct data -Analyse the coherence of the adopted solutions
CT-04	Innovation, creativity and entrepreneurship	1	<ul style="list-style-type: none"> -Contribute ideas and express them formally -Identify results
CT-06	Group work and leadership	3	<ul style="list-style-type: none"> -Communicate and relate with others by contributing to the team's cohesion -Be committed to team management and operation
CT-07	Ethical, environmental and professional responsibility	2	<ul style="list-style-type: none"> -Back your own judgements and argue in their favour -Recognise your own limitations and consider others' judgements -Incorporate and critically assess the ethical concepts of the profession
CT-08	Effective communication	2	<ul style="list-style-type: none"> -Be willing and positive with communication -Provide interesting and convincing presentations -Respect linguistic rules and express yourself correctly
CT-09	Critical thinking	1	<ul style="list-style-type: none"> -Show a critical attitude to reality: ask why things are as they are -Go into themes in detail and logically, show impartiality, and compare information with reliable sources -Differentiate facts of opinions, interpretations or assessments, and predict the consequences of the decisions made
CT-10	Knowledge of contemporary issues	1	<ul style="list-style-type: none"> -Identify which subject contents are related with a contemporary issue -Identify solutions to the problem according to the information available
CT-11	Life-long learning	1	<ul style="list-style-type: none"> -Ask in order to learn and show interest in clearing up your doubts -Always show an active and responsible attitude during the learning process -Efficiently access various available sources of information and resources
CT-12	Planning and managing time	1	<ul style="list-style-type: none"> -Identify the activities to be performed in the short term -Perform the activities correctly and in good time -Analyse the development of activities with the suggestions made
CT-13	Specific instruments	1	<ul style="list-style-type: none"> -Identify basic tools and their usefulness -Handle tools according to instructions

Source: Authors

Table 12.7 The Spokesperson's competency profile

Transversal competences SPOKESPERSON		Level	Associated performances
CT-01	Comprehension and integration	2	<ul style="list-style-type: none"> -Confer sense to the considerations proposed to be able to interpret them -Transfer contents to practice -Differentiate the factors that cause or result from a fact
CT-02	Application and practical thinking	1	<ul style="list-style-type: none"> -Identify specific objectives following instructions -Assess the quality of provided information to apply it -Propose specific solutions and/or actions after analysing the situation
CT-03	Analysing and solving problems	1	<ul style="list-style-type: none"> -Define the problem by clearly and concisely describing its most relevant aspects -Use suitable sources of information and select correct data -Analyse the coherence of the adopted solutions
CT-04	Innovation, creativity and entrepreneurship	1	<ul style="list-style-type: none"> -Contribute ideas and express them formally -Identify results
CT-06	Group work and leadership	2	<ul style="list-style-type: none"> -Participate in the team's planning -Be committed to performing collective tasks
CT-07	Ethical, environmental and professional responsibility	2	<ul style="list-style-type: none"> -Back your own judgements and argue in their favour -Recognise your own limitations and consider others' judgements -Incorporate and critically assess the ethical concepts of the profession
CT-08	Effective communication	3	<ul style="list-style-type: none"> -Master the theme being presented and include questions in your talks to encourage debate -Adapt the organisation of the contents and formal aspects of the message to different audiences and situations -Use the support means that have been adapted to the situation
CT-09	Critical thinking	1	<ul style="list-style-type: none"> -Show a critical attitude to reality: ask why things are as they are -Go into themes in detail and logically, show impartiality, and compare information with reliable sources -Differentiate facts of opinions, interpretations or assessments, and predict the consequences of the decisions made
CT-10	Knowledge of contemporary issues	1	<ul style="list-style-type: none"> -Identify which subject contents are related with a contemporary issue -Identify solutions to the problem according to the information available
CT-11	Life-long learning	1	<ul style="list-style-type: none"> -Ask in order to learn and show interest in clearing up your doubts -Always show an active and responsible attitude during the learning process -Efficiently access various available sources of information and resources
CT-12	Planning and managing time	1	<ul style="list-style-type: none"> -Identify the activities to be performed in the short term -Perform the activities correctly and in good time -Analyse the development of activities with the suggestions made
CT-13	Specific instruments	1	<ul style="list-style-type: none"> -Identify basic tools and their usefulness -Handle tools according to instructions

Source: Authors

Table 12.8 The Member's competency profile

Transversal competences MEMBER		Level	Associated performances
CT-01	Comprehension and integration	2	<ul style="list-style-type: none"> –Confer sense to the considerations proposed to be able to interpret them –Transfer contents to practice –Differentiate the factors that cause a fact
CT-02	Application and practical thinking	1	<ul style="list-style-type: none"> –Identify specific objectives –Assess the quality of provided information to apply it –Propose specific solutions and/or actions
CT-03	Analysing and solving problems	1	<ul style="list-style-type: none"> –Define the problem by clearly and concisely describing its most relevant aspects –Use suitable sources of information and select correct data –Analyse the coherence of the adopted solutions
CT-04	Innovation, creativity and entrepreneurship	1	<ul style="list-style-type: none"> –Contribute ideas and express them formally –Identify results
CT-06	Group work and leadership	3	<ul style="list-style-type: none"> –Communicate and relate with others by contributing to the team's cohesion –Be committed to team management and operation
CT-07	Ethical, environmental and professional responsibility	2	<ul style="list-style-type: none"> –Back your own judgements and argue in their favour –Recognise your own limitations and consider others' judgements –Incorporate and critically assess the ethical concepts of the profession
CT-08	Effective communication	3	<ul style="list-style-type: none"> –Master the theme being presented and include questions in your talks to encourage debate –Adapt the organisation of the contents and formal aspects of the message to different audiences and situations –Use the support means that have been adapted to the situation
CT-09	Critical thinking	1	<ul style="list-style-type: none"> –Show a critical attitude to reality: ask why things are as they are –Go into themes in detail and logically, show impartiality, and compare information with reliable sources –Differentiate facts of opinions, interpretations or assessments, and predict the consequences of the decisions made
CT-10	Knowledge of contemporary issues	1	<ul style="list-style-type: none"> –Identify which subject contents are related with a contemporary issue –Identify solutions to the problem according to the information available
CT-11	Life-long learning	1	<ul style="list-style-type: none"> –Ask in order to learn and show interest in clearing up your doubts –Always show an active and responsible attitude during the learning process –Efficiently access available various sources of information and resources
CT-12	Planning and managing time	1	<ul style="list-style-type: none"> –Identify the activities to be performed in the short term –Perform the activities correctly and in good time –Analyse the development of activities with the suggestions made
CT-13	Specific instruments	1	<ul style="list-style-type: none"> –Identify basic tools and their usefulness –Handle tools according to instructions

Source: Authors

the teacher sign a contract in which all the group members are committed to carry out the tasks that correspond to their specific role. This strategy allows: (1) all the students to know beforehand what tasks they have to perform in their group; (2) students to be committed to their group, to the teacher and to themselves; (3) collaborative work is to be encouraged because the group will not work if one of the roles in it does not work.

It is important to point out that the Human Resources Management subject has many theoretical aspects of management that can help to understand and support this innovation. Competences are being used in organisations to determine, among others, personnel selection, development management, professional careers, performance measurement systems and income management. Therefore, the reason for combining this innovation in this subject is twofold. On the one hand, it allows an innovative collaborative work innovation to be introduced; on the other hand, work is done with the theoretical contents of the subject as each student, in his/her own group, can combine all the different areas of human resources management, and extrapolate what he/she is undertaking in the subject in practice to the professional domain.

The portfolio assessment is made from two perspectives. One involves the teacher assessing the quality of the cases and activities carried out during the course as a whole, and all the portfolio members obtain the same mark. With the other perspective, how the roles were played by each group member is assessed. This latter assessment is also innovative as students make these assessments by designing a performance measurement system. The last didactic unit of the subject is used to explain the performance measurement system in organisations. One fundamental part here is to refer to the importance for human resources of knowing what they will be expected to do in their respective job posts, and how their performance and the results of their work will be measured. For this purpose, performance management systems are designed whose results will influence the professional career and/or income directly or indirectly so that it motivates the worker. A performance management system is developed during the two practical laboratory sessions that the subject includes, is supervised by the teacher, and starts by describing the tasks and the competency profile of each role. The designed system must contain at least one measuring tool of those explained in the subject, and has to be presented as if it were an organisation, and must answer these questions: (1) has the student satisfactorily played his/her role as it was identified at the beginning of the course?; (2) were the results obtained from playing the role the expected results? By means of (1), the process is assessed, while (2) is used to assess the result. Consequently, the group must inform the teacher about the quantitative and reasoned assessment of each group member.

The end result of this innovation and the mark each team members receives through the co-assessment are used by the teacher to provide the final portfolio mark. After finishing the innovation, it was possible to verify how the group was totally committed to its work, and more specifically to the assessment. The designed assessment systems match the set requirements and help the teacher understand how the work has been conducted at the heart of the group during the course. Students stressed the importance of knowing beforehand what tasks and competences (with their cor-

responding levels and associated performances) that each group member must perform and acquire, which encourages working properly and very positive performance. Students also very positively assessed that they were the ones who chose the roles to be played, which did not limit each student's mark beforehand; in other words, the Leader did not obtain a higher marker than the Member, or vice versa, instead each student played the role that best matched his/her profile.

12.6 Conclusions

This work presents an innovative group work experience, set out by means of a portfolio in a subject taught in year 3 of the UPV Degree of Public Administration and Management, called Human Resources Management. The UPV is characterised by its innovative considerations, and accordingly, an institutional project entitled "Incorporating of transversal competences into UPV graduate's curriculum" was implemented as one of its strategic challenges.

The portfolio comprises four students, who play four different roles: Leader, Secretary, Spokesperson and Member. At the beginning of the course, the teacher presents the work to be done, as well as the tasks and competency profiles that each portfolio role requires. Students form groups of four and freely choose the role they are willing to play in the portfolio. The learning contract is in charge of "sealing" this commitment. The teacher must also play the role of a driver and stimulus of portfolio activities. Let's not forget that team work allows the teacher to stand some way back from constant class management, which allows him/her observe students in a collaboration situation. Such knowledge is extremely valuable to obtain a better idea about the competences that students acquire and how to deal with them in a diversified fashion; it is in this order of ideas that teachers frequently learn interesting strategies about the interactions students maintain with one another. As the Villa and Poblete (2007) points out, competences are effective on a personal level as everyone sets a basis and a reference to excel him/herself. Thus we become competent as we manage effective accomplishments. The origin of these achievements lies in perfecting our personal qualities, regardless of them being individual or social.

Having put the innovation into practice, the following conclusions were reached: (1) the design of teaching-learning strategies in which students are the epicentre of the process itself is very important; (2) students feel motivated when they have a clearly defined role and responsibility, and they also feel committed to carry it not only for the good of work team, but also for their own good; (3) the teacher must make efforts to define what (s)he expects of students, what group work is, what part of such group work will be assessed, how the group's and the individual's satisfactory performance will be identified in the group; (4) the teacher must know about what and how (s)he will assess when the activity begins, and the purpose of the assessment, and must inform the students about all this effectively; (5) co-assessment and collaborative work are motivating elements and prevent student passiveness during the teaching-learning process. For all these reasons, the final conclusion

drawn from the innovation presented in this paper is that despite the work the teacher must do beforehand, it proves extremely positive from three main perspectives: (1) it motivates students to seek the possibility of acquiring the transversal competences needed for their graduate profile (and, therefore, for finding a job); (2) it motivates commitment with collaborative learning; (3) it motivates cohesion, as well as organised and well-defined group work.

References

- Armstrong, P. (2015). *Bloom's taxonomy*. Vanderbilt University. Center for Teaching. Retrieved from <http://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/>.
- Bloom, B., Hastings, J., & Madaus, G. (1973). *Taxonomía de los Objetivos de la Educación*. Alcoy: Marfil.
- Boyatzis, R. E. (1982). *The competent manager. A model for effective performance*. New York: Wiley.
- Corominas, E., Tesouro, M., Capell, D., Teixidó, J., Pèlach, J., & Cortada, R. (2006). Percepciones del profesorado ante la incorporación de las competencias genéricas en la formación universitaria. *Revista de Educación*, 341, 301–336.
- Ministerio de Educación, Cultura y Deporte. (2003). *La integración del sistema universitario español en el espacio europeo de enseñanza superior*. Documento-Marco.
- Fernández, A. (2008). *Nuevas Metodologías docentes*. Instituto de Ciencias de la Educación, ICE. UPV.
- Guijarro, E., Babiloni, E., Canós, L., & Santandreu, C. (2015). *Diseño y elaboración de un Diccionario de Competencias para la Gestión de Recursos Humanos en una Administración Pública*. XXIX Congreso Anual de la Academia Europea de Dirección y Economía de la Empresa (AEDEM 2015), Proceedings ISBN 978-84-15986-85-0.
- ICE. (2015). *Proyecto Competencias Transversales UPV*. Rúbricas. Documento de trabajo, Universitat Politècnica de València.
- Lasnier, F. (2000). *Réussir la formation par compétences*. Montreal: Guérin.
- López García, J. C. (2014). *La taxonomía de Bloom y sus actualizaciones*. Eduteka. Retrieved from <http://www.eduteka.org/TaxonomiaBloomCuadro.php3>.
- Santandreu, C., & Canós, L. (2014). Adapting Higher Education through skills to the professional needs. *International Review of Management and Business Research*, 3, 1645–1659.
- Santandreu, C., Canós, L., & Pons, C. (2012). Competencies and skills for future Industrial Engineers defined in Spanish degrees. *Journal of Industrial Engineering and Management*, 4(1), 13–30.
- Spencer, L. M., & Spencer, S. M. (1993). *Competences at work: Models for superior performance*. New York: Wiley.
- Tobón, S. (2006). *Aspectos básicos de la formación basada en competencias*. Talca: Proyecto Mesesup.
- Tuning. (2003). *Tuning educational structures in Europe*. Informe final. Proyecto Piloto-Fase 1. Universidad de Deusto.
- Villa, A., & Poblete, M. (2007). *Aprendizaje basado en Competencias. Una propuesta para la evaluación de competencias genéricas*. Universidad de Deusto. Ed. Mensajero.
- Yániz, C., & Villardón, L. (2006). *Planificar desde competencias para promover el aprendizaje*. Cuadernos Monográficos del ICE, UP Vasco.

Chapter 13

Assessment of Autonomous Learning Skill Through Multi-criteria Analysis for Online ADE Students in Moodle

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Abstract Quality and innovation are two key aspects in today's higher educational systems. The rapid rise of online education in the European Higher Education Area context creates a challenge to maintain quality levels in learning processes and creates the need to develop new methodologies adapted to this type of education, in order to assess skills acquisition in a rigorous and participatory way. Quality guidelines from the European Model of Higher Education recommend the consideration of two key issues: Information management for decision-making processes and evaluation system capable of compiling student's participation as well as autonomous learning processes. This research presents a methodology that evaluates the autonomous and online learning, using two statistical analyses: Analytical Hierarchy Process (AHP) and Goal Programming. To validate this evaluation methodology, we have used seven tools provided by Moodle. The research is conducted on a group of 71 students participating in an online higher education degree in two subjects related to quantitative studies. The "Tutorials" and "Solved Exercises" have been the best-valued tools for the acquisition of this competition, followed by the "Tasks". The joint assessments have been validated according to the degree of agreement of the students, using an index of closeness. The results suggest that the multi-criteria analysis can be very useful for the evaluation of competences in the European Higher Education Area.

Keywords Analytic hierarchy process • Autonomous learning • Business administration degree • Consistency in pairwise comparison matrices • e-Learning assessment • European Higher Education Area (EHEA) • Goal programming • Higher education

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• Information management • Innovation • Institutional self-evaluation • Management sciences techniques • Moodle • Multi-criteria analysis • Participation • Public university • Rey Juan Carlos University • Scientific research • Skill • Teaching of economics

13.1 Introduction

The European Higher Education Area (EHEA) is based on a learning model adapted to professional reality and focuses the evaluation of higher learning in the acquisition of skills and abilities, which essentially means grounding the learning process not only in the acquisition of contents but also in the development of abilities. This same objective has been backed by international benchmark organizations in the education sector such as the Organization for Economic Cooperation and Development (OECD, 2014) or the United Nations (UN, 2016). Likewise, the Spanish Quality Agencies, both national and regional, consider the learning by skills in their evaluations (ANECA, 2015). In recent years, this has meant reorienting the traditional evaluation systems from knowledge as reference, towards the acquisition of skills and abilities.

Within the 30 generic skills indicated by the Tuning Report which the students of higher education must acquire, González and Wagenaar (2003) identified five key skills: Analysis and synthesis skill, ability to solve problems, ability to learn, ability in information management and the ability to work autonomously. With regard to the latter skill, “autonomous learning”, it is essential to properly employ it in the online teaching, given the growing role which this modality has acquired in recent years and the non-classroom nature of e-learning. In this type of teaching, it is necessary to pay special attention to evaluate and improve the learning strategies to ensure the achievement of the academic objectives of the students (Broadbent & Poon, 2015); and in the European context, to ensure the achievement in the acquisition of skills.

The quality of education is increasingly more important in the innovative and changing environment such as on-line learning. The new technologies provide positive aspects to the educational process, however their quick and massive transformation in the educational sector represents a challenge to maintain the quality levels (Collins & Halverson, 2009). Martínez-Caro, Cegarra-Navarro, and Cepeda-Carrión (2014) emphasize the urgent importance to implement systems to measure the quality of e-learning and in fact, the concern for the evaluation of this teaching modality has increased in recent years.

On the other hand, the quality directives of the European Model of Higher Education recommend considering two key issues: pay attention to the information management for decision-making and develop evaluation systems which permit compilation of the participation and autonomy of the students in the learning process (European Commission, 2015a, 2015b). This paper uses this approach to propose a

methodology which makes it possible to compile the evaluation in a rigorous and structured way about the acquisition of a skill which measures the autonomous learning of the students and which permits achieving two objectives: one, it facilitates the evaluation of the participation and autonomy of the e-learning students in the learning process and two, it permits the compilation of the individual and group information in a rigorous and structured way. This information can be very useful for decision-making in the design of the educational policies focused on improving the quality of the e-learning degrees.

The aim of this research is to evaluate the effect of the different tools used in the Moodle platform on the development of the “Autonomous learning” skill in students of Business Administration and Management (ADE) in the online modality. The evaluated tools are: “Forums”, “Messages”, “Activities”, “Test”, “Tutorials”, “Topics” and “Solved Exercises”, which are organized into four groups: “Collaborative tools”, “Evaluation tools”, “Tutorials” and “Contents”.

The study was carried out in a group of 71 students from the subjects of Financial Management I and Financial Management II, taught in the third of the Online Business Administration and Management of Rey Juan Carlos University.

These subjects were selected because they are core subject modules, essential for the Business Administration and Management, where finances are one of the functional areas of a company. They are studied in the second section of the degree and are representative, applied and complete. Accordingly, the analytical contents and practices have a very important weight and provide complexity to the subject. In the on-line degrees, this complexity is accentuated, since there is no teacher present in the classroom.

First, the relative importance has been quantified for each of the different tools used through the Moodle platform in the acquisition of the Autonomous Learning skill. For this purpose, the students have individually evaluated the importance of each of the tools in the acquisition of the skill and afterwards they have aggregated the individual assessments obtaining a joint assessment.

For the data evaluation and processing, two multi-criteria analysis techniques have been used: the analytical hierarchies method and the goal programming. The multi-criteria analysis permits compiling subjective assessments in a collaborative way providing rigor and objectivity to the information management. This type of analysis has proven to be an efficient tool to include the participation in the planning and evaluation of complex projects and for the design of public policies, where it is necessary to insert assessments with multiple decision-makers (Gregory & Keeney, 2001). Finally, the degree of agreement has been analyzed about the joint results using an index of closeness.

The paper is outlined in four sections. The first describes the theoretical framework in which the study was developed, specifically, the evaluation of the skills acquisition in the online higher education teaching, including the students' evaluations by means of multi-criteria analysis techniques. The second section develops the proposed methodology. The third explains and analyzes the results. Finally, the fourth section details the paper's conclusions and suggests future lines of research.

13.2 Theoretical Framework

13.2.1 *e-Learning Evaluation*

The evaluation of e-learning has acquired growing importance and has been the focus of attention of numerous studies in recent years (Deschacht & Goeman, 2015; Herrera & Casado, 2015; Nazarenko, 2015; Zacharis, 2015). In the environment of the European Higher Education Area, studies have been recently conducted which evaluate the quality of the teaching based on the achievement of the skills (Bergsmann, Schultes, Winter, Schober, & Spiel, 2015; Guerrero, Palma, & La Rosa, 2014; Iglesias-Pradas, Ruiz-de-Azcárate, & Agudo-Peregrina, 2015; Khlaisang & Likhitdamrongkiat, 2015, San Martín, Jiménez, & Jerónimo, 2015). On the other hand, several research projects, also recent, have evaluated the e-learning teaching in Business Management degrees. Escobar-Rodriguez and Monge-Lozano (2012) analyze the acceptance of the Moodle technology by the Business Administration students in an overall way, creating a Technology Acceptance Model (TAM). Martínez-Caro et al. (2014) emphasizes the urgent importance to implement systems to measure the quality of the e-learning systems and they propose a performance evaluation model which is based on the principles of Total Quality Management (TQM), based on the evaluations of the business students.

These investigations highlight the growing importance of quality evaluation in the EHEA framework and illustrate the existing gap in the adapted models for Business degrees.

13.2.2 *Participative Evaluation and Multi-criteria Analysis*

Simultaneously with the rise of e-learning, the concern for the participative evaluation systems has increased in recent years. In the University context, numerous papers highlight the importance of including the student assessments in the evaluation of the teaching (Alfalla-Luque, Medina-López, & Arenas-Márquez, 2011; Douglas, McClelland, & Davies, 2008; Hill, 1995). In particular, in the last decade, research projects have proliferated focused on improving the e-learning systems, considering the students' satisfaction (Hung & Chou, 2015; Ozkan & Koseler, 2009; Parkes, Stein, & Reading, 2015; Selim, 2007; Wu, Tennyson, & Hsia, 2010). The majority of these papers have analyzed aspects related to the autonomous work (Broadbent & Poon, 2015; Cukusic, Garaca, & Jadric, 2014) or the interactivity and team work (Domagk, Schwartz, & Plass 2010; Fidalgo-Blanco, Sein-Echaluce, García-Peñalvo, & Conde, 2015; Gress & Hadwin, 2010; Nugaras & Istrazivanja, 2015), although none have used a skills evaluation approach.

In this sense, the multi-criteria decision analysis (MCDA) can fit very well in this context. Belton and Stewart (Belton & Stewart, 2000) define it as “a term which combines a set of formal approaches which explicitly consider multiple criteria and which help to make individual or group decisions”. Two of the main advantages of these techniques are: one, its applicability in problems for making very different

decisions (Figueira, Greco, & Ehrgott, 2005) and two, they have proven to be a useful tool to include the participation of multiple agents in the evaluation processes (Belton & Stewart, 2000; Figueira et al., 2005). For this reason, these techniques seem to adapt very well to an complex educational model, in which it is necessary to include the participation in the decision making and structure a large volume of qualitative information with rigor.

In the last decade, several papers have been done about the evaluation of e-learning systems which use several of these techniques: in particular, AHP and Fuzzy. Several papers have used Fuzzy methods to develop collaborative evaluation models in a University context (Chao & Chen, 2009; Dias & Diniz, 2013; Kwok, Ma, Vogel, & Zhou, 2001). Other investigations such as Shee and Yang (2008) and Lin, Ho, and Chang (2014) use the analytical hierarchies method to evaluate the users' satisfaction of an e-learning platform. The first consider the "Learner Interface, Learning Community, System Content and Personalization" as the main dimensions of the problem. The second evaluate the applicability of an e-learning system in a computer course, obtaining the aggregate preferences with Goal Programming. Chao and Chen (2009) also propose an evaluation model based on AHP and Fuzzy methods.

Although these techniques have shown to be efficient in the e-learning evaluation, to date, the participative multi-criteria analysis has not been used in the evaluation of teaching systems based on skills acquisition by the student, and consequently adapted to the European Higher Education model.

13.2.3 The Analytical Hierarchy Process (AHP)

AHP is a solid multi-criteria analysis method which permits analyzing complex decisions with multiple attributes (Saaty, 2005). This method makes it possible to compile subjective assessments and quantify the trade-offs between pairs of intangible criteria, considering the individual preferences through the value judgements about the relative importance of the criteria and the alternatives used by the pairs.

One of the main advantages of this method is its ability to integrate and quantify perceptions and value judgements in the decision-making processes and their application to a wide variety of decision-making problems in companies and public administrations. In particular, It has been frequently used in the education sector (Vaidya & Kumar, 2006) and has proven to be efficient to integrate the students' perceptions in the evaluation of the e-learning systems (Shee & Yang, 2008).

13.2.4 The Problem of the Inconsistencies of Individual Assessments and Goal Programming

The fact that the evaluation of the quality evaluation systems in EHEA requires increasingly more participation from students, reinforces the democratic focus of the European evaluations systems. However, the low qualified participants or with

little interest in the evaluation process can show inconsistent, circular or poorly defined preferences (Eyvindson, Hujala, Kangas, & Kurttila, 2012). In some cases, the participants are not able to clearly define their preferences until the end of the process (Beshears, Choi, Laibson, & Madrian, 2008). These inconsistencies in the agents' preferences represent a problem when applying AHP. The paired matrices must comply with the properties of reciprocity, homogeneity and consistency (Saaty, 2005). However, it is common that the majority of the primary results are inconsistent due to the innate subjectivity of the decision-maker (Szczypiriska & Piotrowski, 2009) and in a context of inexpert agents with reduced involvement in the process, such as students, the problem is accentuated.

The degree of consistency can be measured by means of the Consistency Index Calculation, which represents the cumulative average or inconsistency of the matrix. The Inconsistency Index (II) is the quotient between the Consistency Index and the Random Consistency Index (RI), calculated based on the dimension of the matrix. The consistency of a matrix is considered acceptable when its Inconsistency index is equal to or lower than 0.10 (Saaty, 2005).

To correct this problem, the most common way is to discard the inconsistent results (Shee & Yang, 2008) or repeat each process several times until obtaining a sufficiently consistent result (Li & Ma, 2007). The first alternative, discarding the inconsistent answers, produces a data loss in important occasions, by leaving the assessments of several participants outside the process. In addition, the reduction of the sample size can affect the reliability of the results. The second, the iterativity on the inconsistent results, increase the complexity of the process and requires a large amount of resources. Several papers show the positive performance of iterativity in the participative processes in order to reduce conflicts and consensus approach. However these techniques can prove to be tedious and increase the complexity of the process (Klein, 2002), in addition to requiring a major amount of time and resources. This option can only function well in groups with a small size, easily controllable, with continuity in time and a close link with the evaluation process (Marttunen & Hamalainen, 2008; Proctor & Dreschler, 2003). The evaluation models which include the students' assessments must be versatile processes in order to be applicable.

The Goal Programming (GP) is a linear programming technique which includes multiple objectives in a conflict between each other. GP pursues compromise solutions which may not fully satisfy all the objectives, however they do permit achieving specific satisfaction levels for the decision-maker (Romero, 1991). In particular, the weighted Goal Programming minimizes the average sum of the deviations for each of the goals.

GP is one of the multi-criteria techniques with the highest applicability and makes it possible to solve decision-making problems with a high number of criteria. Likewise, it has proven to be efficient working with other Management methodologies (Tamiz, Jones, & Romero, 1998). In particular, GP has been shown to be efficient for the correction of the inconsistencies of paired matrices (González-Pachón & Romero, 2004) although it has not been used in this context to date.

13.3 Methodology

The proposed Methodology has the aim to evaluate the effect of the different tools used in the Moodle platform on the development of the “Autonomous learning” skill in students of Business Administration and Management (ADE) in the online modality. The process is outlined in four stages: modelling, individual evaluation and inconsistency processing, assessment aggregation and consensus analysis.

13.3.1 Modelling

The proposed model follows a hierarchical structure in three levels. In the first level, the objective is defined, which is the achievement of the skill to analyze. In the second level, four dimensions are defined: collaborative tools, tutorials, evaluation and contents. In the third level, the criteria are defined, which are the specific e-learning tools which belong to each dimension.

Once the structure of the problem has been defined, a Saaty type questionnaire (2005) is designed, comparing the defined criteria and dimensions two by two based on the achievement of the skill.

Finally, the students’ group is defined which will prepare the evaluation and the survey step is planned.

13.3.2 Individual Evaluation and Inconsistencies Processing

The Saaty type questionnaire (2005) compiles the individual assessments of the students about the relative importance of each e-learning tool for the acquisition of the Autonomous Learning skill.

The student has the option to express his/her intensity of preference in a nine point scale. If the two e-learning tools possess the same importance, a score of 1 is assigned to this comparison, while a score of 9 indicates the absolute importance of one criterion over another one (Saaty, 2005).

The data pair comparison is carried out by using the Eigenvectors technique, which uses the paired comparisons to construct reciprocal matrices, based on which, the relative weights of the attributes are calculated. These weight factors determine the relative importance of each e-learning tool in relation to the remainder for the acquisition of the analyzed skill.

The proposed method to correct the inconsistencies is the Archimedean GP method proposed by González-Pachón and Romero (2004) when $\lambda = 1$, so that in the case of matrices of $n = 4$, there remains:

$$\text{Min} \sum_{l=1}^{12} \left(n_l^{(1)} + p_l^{(1)} \right) + \sum_{s=1}^6 \left(n_s^{(2)} + p_s^{(2)} \right) + \sum_{t=1}^{24} \left(n_t^{(3)} + p_t^{(3)} \right) \quad (20.1)$$

s.t.

$$w_{12} - m_{ij} + n_1^{(1)} - p_1^{(1)} = 0, w_{13} - m_{ij} + n_2^{(1)} - p_2^{(1)} = 0, w_{14} - m_{ij} + n_3^{(1)} - p_3^{(1)} = 0,$$

$$w_{21} - m_{ij} + n_4^{(1)} - p_4^{(1)} = 0, w_{23} - m_{ij} + n_5^{(1)} - p_5^{(1)} = 0, w_{24} - m_{ij} + n_6^{(1)} - p_6^{(1)} = 0,$$

$$w_{31} - m_{ij} + n_7^{(1)} - p_7^{(1)} = 0, w_{32} - m_{ij} + n_8^{(1)} - p_8^{(1)} = 0, w_{34} - m_{ij} + n_9^{(1)} - p_9^{(1)} = 0,$$

$$w_{41} - m_{ij} + n_{10}^{(1)} - p_{10}^{(1)} = 0, w_{42} - m_{ij} + n_{11}^{(1)} - p_{11}^{(1)} = 0, w_{43} - m_{ij} + n_{12}^{(1)} - p_{12}^{(1)} = 0,$$

$$w_{12}w_{21} + n_1^{(2)} - p_1^{(2)} = 1, w_{13}w_{31} + n_2^{(2)} - p_2^{(2)} = 1, w_{14}w_{41} + n_3^{(2)} - p_3^{(2)} = 1,$$

$$w_{23}w_{32} + n_4^{(2)} - p_4^{(2)} = 1, w_{24}w_{42} + n_5^{(2)} - p_5^{(2)} = 1, w_{34}w_{43} + n_6^{(2)} - p_6^{(2)} = 1,$$

$$w_{13}w_{32} - w_{12} + n_1^{(3)} - p_1^{(3)} = 0, w_{14}w_{42} - w_{12} + n_2^{(3)} - p_2^{(3)} = 0,$$

$$w_{12}w_{23} - w_{13} + n_3^{(3)} - p_3^{(3)} = 0, w_{14}w_{43} - w_{13} + n_4^{(3)} - p_4^{(3)} = 0,$$

$$w_{12}w_{24} - w_{14} + n_5^{(3)} - p_5^{(3)} = 0, w_{13}w_{34} - w_{14} + n_6^{(3)} - p_6^{(3)} = 0,$$

$$w_{23}w_{31} - w_{21} + n_7^{(3)} - p_7^{(3)} = 0, w_{24}w_{41} - w_{21} + n_8^{(3)} - p_8^{(3)} = 0,$$

$$w_{21}w_{13} - w_{23} + n_9^{(3)} - p_9^{(3)} = 0, w_{24}w_{43} - w_{23} + n_{10}^{(3)} - p_{10}^{(3)} = 0,$$

$$w_{21}w_{14} - w_{24} + n_{11}^{(3)} - p_{11}^{(3)} = 0, w_{23}w_{34} - w_{24} + n_{12}^{(3)} - p_{12}^{(3)} = 0,$$

$$w_{32}w_{21} - w_{31} + n_{13}^{(3)} - p_{13}^{(3)} = 0, w_{34}w_{41} - w_{31} + n_{14}^{(3)} - p_{14}^{(3)} = 0,$$

$$w_{31}w_{12} - w_{32} + n_{15}^{(3)} - p_{15}^{(3)} = 0, w_{34}w_{42} - w_{32} + n_{16}^{(3)} - p_{16}^{(3)} = 0,$$

$$w_{31}w_{14} - w_{34} + n_{17}^{(3)} - p_{17}^{(3)} = 0, w_{32}w_{24} - w_{34} + n_{18}^{(3)} - p_{18}^{(3)} = 0,$$

$$w_{42}w_{21} - w_{41} + n_{19}^{(3)} - p_{19}^{(3)} = 0, w_{43}w_{31} - w_{41} + n_{20}^{(3)} - p_{20}^{(3)} = 0,$$

$$w_{41}w_{12} - w_{42} + n_{21}^{(3)} - p_{21}^{(3)} = 0, w_{43}w_{32} - w_{42} + n_{22}^{(3)} - p_{22}^{(3)} = 0,$$

$$w_{41}w_{13} - w_{43} + n_{23}^{(3)} - p_{23}^{(3)} = 0, w_{42}w_{23} - w_{43} + n_{24}^{(3)} - p_{24}^{(3)} = 0,$$

$$0.11 \leq w_{ij} \leq 9 \quad \forall i, j$$

Where:

n_{ij} and p_{ij} are the negative and positive deviations, respectively in relation to the goal.

w_{ij} are the weights or the weight factors of the transformed matrix

m_{ij} are the weights of the untransformed matrix.

This method uses a focus based on the distance to process the inconsistencies of the paired matrices, so a matrix is obtained as similar as possible to the original matrix, which in turn, fulfils the restrictions of similarity, reciprocity and consistency required by Saaty (González-Pachón & Romero, 2004).

13.3.3 Assessment Aggregation and Results Validation

Once the inconsistency of the primary matrices is corrected, the individual assessments are aggregated using the geometric mean and a joint matrix is obtained which represents the group assessment. Based on the aggregate matrix, the weights matrix is obtained which indicates the relative importance of each e-learning tool on the acquisition of the analyzed skill.

The results validation is done by means of the consensus analysis on the group results, which measures the degree of the students' agreement about the joint results. To analyze the degree of consensus, two methodologies are proposed:

1. A Likert type survey to evaluate the degree of agreement on the joint results. The survey compiles the assessments from 0 to 5, in which the joint results are shown and a single question is asked about the degree of agreement with this result.
2. An Index of Closeness, based on the approach proposed by Pang and Liang (2012) to evaluate the results in the multi-attribute decision making.

This methodology is based on the concept of distance between each individual paired assessment, in relation to each paired joint assessment.

The "closeness" of the assessment of each student C^k in relation to the joint assessment is quantified using the expression:

$$C^k = \frac{\sqrt{\sum_{i=1}^n (\Delta_i^k - N)^2}}{\sqrt{\sum_{i=1}^n (\Delta_i^k - N)^2} + \sqrt{\sum_{i=1}^n (\Delta_i^k)^2}} \quad (20.2)$$

Where Δ_i^k represents the absolute difference between α_i^k and α_i so that $\Delta_i^k = |\alpha_i^k - \alpha_i|$
and

α_i^k is the value of the individual preference of student k for each pair

α_i is the value of the group preference for each pair

$0 \leq \Delta_i^k \leq N$, when the values of N are $S = \{s_\alpha \mid \alpha = 0, 1, \dots, l\}$, then $N=l$.

The value of the closeness will always be $0 \leq C^k \leq 1$, when $C^k = 0$ the individual assessments will be more distant from the aggregates and when $C^k = 1$, the individual assessments will coincide with the aggregate assessments.

13.4 Results

The proposed methodology has been empirically validated in a group of 71 students of a semi-classroom ADE degree for the subjects of Financial Management I and Financial Management II, both of a quantitative nature.

13.4.1 Modelling

The objective of the problem is the evaluation of the achievement of the Autonomous Learning skill in an on-line business degree by the students from a course of one subject of a quantitative nature, based on seven e-learning tools.

The hierarchical structure for the evaluation of the Autonomous Learning skill is defined based on four dimensions and seven criteria and is shown in Fig. 13.1.

To define the dimensions and the criteria, the main tools were selected which have been used in the virtual classroom during the 2014–2015 course, identifying four dimensions and seven criteria. The dimensions are: Collaborative, Contents, Tutorials and Evaluation. And the criteria: Forums, Messages, Topics, Solved Exercises, Tutorials, Tasks and Tests. Table 13.1 describes the dimensions and criteria.

The criteria selection has been done considering the minimum criteria recommendations in order not to increase the complexity of the problem (Roy, 1996). For this reason, only the tools with frequent use were selected in the subjects with a quantitative nature.

13.4.2 Individual Assessment and Inconsistencies Processing

To compile the individual assessments of the students, a Saaty type questionnaire was designed with a scale from 1 to 9 and it was given to 71 students of the Financial Management I and Financial Management II subjects for a semi-classroom Business Degree.

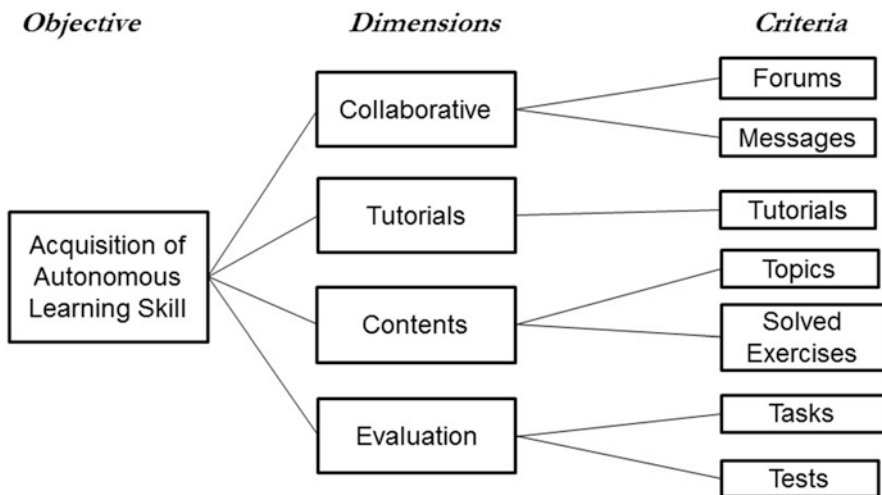


Fig. 13.1 Hierarchical structure for the objective: “Acquisition of the Autonomous Learning skill”

Table 13.1 Dimensions and criteria

Dimensions	Description	Criteria	Description
1. Collaborative	Tools which permit the participation between the student–professor and/or between the students	1.1. Forums	“Forum” tool of the virtual classroom
		1.2. Messages	Exchange of e-mails between students and professor
2. Contents	Material available for the students about the theoretical and practical contents of the subject	2.1. Topics	Essentially theoretical contents of the assignment in the form of notes
		2.2. Solved Exercises	Approach and explained solution of the exercises
3. On-site or distance tutorials	On-site or distance tutorials to explain the concepts in a summary and doubt resolution mode	3.1. Tutorials	Group tutorials in the form of seminars or intensive classes
4. Evaluation	Tools which permit the continual evaluation by the students	4.1. Tasks	Exercises, problems or questions raised for their solution by the students
		4.2. Tests	Test type exams which permit partial evaluations of the subject’s contents

Of the 71 primary matrices, only 8 were consistent, where the rest obtain an Inconsistency Index above a 0.10.

The inconsistent matrices have been corrected with the goals programming method weighted by means of LINGO software. As a result of the correction, the consistency has improved for 57 matrices, obtaining a total of 65 matrices of $n=4$ with an inconsistency level below 0.10. The application of this methodology has permitted the recovery of 90.47% of the lost information, without impairing the agility of the evaluation and consequently improving its applicability.

13.4.3 Assessment Aggregation and Results Validation

Once the inconsistency was corrected, the individual priorities were obtained and subsequently aggregated using the geometric mean (Saaty, 2005), obtaining the aggregate weights of each e-learning tool on the acquisition of the Autonomous Learning skill.

The weight factors which were obtained once the inconsistency was corrected are: 32.53% for the contents, 26.66% for the tutorials, 21.89% for the evaluation tools and 18.91% for the collaborative tools.

The weight factors of each criteria were: 26.66 % for the Seminars, 26.35 % for the Solved exercises, 13.13 % for the Tasks, 10.40 % for the Forums, 8.75 % for the Tests, 8.32 % for the Messages and 6.18 % for the Topics.

These results suggest that a good measure to improve the acquisition of Autonomous Learning skill would be to focus the effort in the development of examples and solved exercises. This seems to make sense in a subject with a quantitative nature and with a certain degree of complexity. However, the tools with a participative nature such as the forums and messages did not especially contribute in the development of the Autonomous Learning in the subjects with these characteristics. A suitable institutional policy focused on promoting Autonomous Learning of the e-learning business teaching for quantitative subjects should place special importance on improving the contents with an applied nature and the development of tutorials as opposed to development, assistance and work by means of forums. Given that the Topics have obtained the worst weight factor, it would be recommendable to complement the contents with a more theoretical nature, with a complementary bibliography, which permits the students to develop this work in an autonomous way.

Finally, the students were asked about the degree of agreement on the results obtained after the correction of the inconsistencies, using an on-line survey of a Likert type with a scale from 1 to 5, where 1 is Completely disagree 5 is Completely agree. As a result of the survey, 87.5 % of the answers were obtained with a high or very high agreement about the corrected joint assessments.

On the other hand, the indexes of closeness show a high degree of agreement among the individual assessments and the joint assessments. The Index of Closeness which obtained the lowest score was 0.68. In fact, 69.23 % of the individual evaluations obtained an index of closeness above 0.80. These results show that the proposed methodology has permitted achieving a high consensus in the group evaluation.

The results of the Indexes of Closeness for the 65 evaluations included in the analysis are shown in Table 13.2.

13.5 Conclusions

The students who have participated in this research have individually evaluated the importance of the seven tools used in the Moodle platform on the development of the “Autonomous Learning” skill, specifically, “Forums”, “Messages”, “Activities”, “Test”, “Tutorials”, “Topics” and “Solved Exercises”. These tools were organized into four groups: “Collaborative tools”, “Evaluation tools”, “Tutorials” and “Contents”. These individual assessments have been aggregated in a single joint assessment with a high group consensus using the AHP method. On occasions, this methodology can show inconsistent, circular or poorly defined preferences. To correct the inconsistencies of the paired assessments, we have used Goal Programming, given that this method permits the recovery of a major amount of original information, facilitating the applicability of these processes in this way.

Table 13.2 Indexes of closeness per students

Student (k)	Index of closeness	Student (k)	Index of closeness
1	0.82	37	0.97
2	0.79	38	0.74
3	0.97	39	0.82
4	0.74	40	0.68
5	0.97	41	0.75
6	0.71	42	0.83
7	0.97	43	0.96
8	0.82	44	0.77
9	0.79	45	0.71
10	0.93	46	0.79
11	0.71	47	0.79
12	0.94	48	0.9
13	0.82	49	0.82
14	0.91	50	0.87
15	0.8	51	0.88
16	0.73	52	0.76
17	0.78	53	0.8
18	0.92	54	0.91
19	0.97	55	-
20	0.86	56	0.86
21	0.82	57	0.8
22	0.9	58	0.89
23	0.97	59	-
24	0.77	60	-
25	0.79	61	0.82
26	0.87	62	0.71
27	0.82	63	0.8
28	0.97	64	0.83
29	-	65	0.79
30	-	66	0.76
31	0.82	67	0.87
32	0.71	68	0.82
33	0.89	69	-
34	0.82	70	0.82
35	0.82	71	0.71
36	0.86		

The Moodle tools best evaluated by these Financial Management students for the achievement of the Autonomous Learning skill in the e-learning modality were the Tutorials and Solved Exercises, obtaining weight factors of 26.66% and 26.35% respectively. The students' degree of agreement with these results obtained from the corrected joint assessments, through a Likert type survey with a scale from 1 to 5,

amounts to 87.5 % with a high or very high agreement. The indexes of closeness also show a high degree of agreement among the individual assessments and the joint assessments, specifically, 68.23 % of the individual evaluations have obtained an index of closeness above 80 %. From these results, we can conclude that a good measure to improve the autonomous learning of the student would consist in focusing the effort in the development of examples and solved exercises and in the programming of tutorials throughout the course.

This information can prove very useful for the design of training actions and educational policies in on-line business degrees, paying attention to the development of the best evaluated tools, in this case, regarding the development of Solved Examples and Tutorials, in order to improve the achievement of the Autonomous Learning skill.

The proposed methodology permits evaluating the effect of the different tools used in Moodle on the acquisition of skills in the EHEA framework in quantitative business subjects, which could be the object of future research projects.

The multi-criteria analysis techniques can be an efficient tool to integrate the students' assessments in a organized and objective way in the e-learning evaluation processes in the higher education studies, encouraging the participation and improving the transparency. This model can be adapted to Universities with different educational styles, since it permits the analysis of any skill and obtain useful information for the design of their own educational strategy in the EHEA framework.

This proposal can become the basis of future research for the development of teaching evaluation methods based on multi-criteria methods, which permit improving the rigor and transparency in the decision making processes for the design of educational policies, creating value and improving the quality of the European Higher Education Institutions.

References

- Alfala-Luque, R., Medina-López, C., & Arenas-Márquez, F. J. (2011). A step forward in operations management training: Student visions and their response to different learning environments. *Cuadernos de Economía y Dirección de la Empresa*, 14, 40–52.
- ANECA. (2015). *Libro Blanco del título de grado en economía y empresa* de Retrieved November 10, 2015, from http://www.aneca.es/var/media/150292/libroblanco_economia_def.pdf.
- Belton, V., & Stewart, E. (2000). *Multiple criteria decision analysis. An integrated approach*. Norwell, MA: Kluwer Academic Publishers.
- Bergsmann, E., Schultes, M. T., Winter, P., Schober, B., & Spiel, C. (2015). Evaluation of competence-based teaching in higher education: From theory to practice. *Evaluation and Program Planning*, 52, 1–9.
- Beshears, J., Choi, J. J., Laibson, D., & Madrian, B. C. (2008). How are preferences revealed? *Journal of Public Economics*, 92, 1787–1794.
- Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *Internet and Higher Education*, 27, 1–13.
- Chao, R., & Chen, Y. (2009). Evaluation of the criteria and effectiveness of distance e-learning with consistent fuzzy preference relations. *Expert Systems with Applications*, 36, 10657–10662.

- Collins, A., & Halverson, R. (2009). *Rethinking education in the age of technology: The digital revolution and the schools*. New York: Teachers College Press.
- Cukusic, M., Garaca, Z., & Jadric, M. (2014). On line self-assessment and students' success in higher education institutions. *Computers & Education*, 71, 100–109.
- Deschacht, N., & Goeman, K. (2015). The effect of blended learning on course persistence and performance of adult learners: A difference-in-differences analysis. *Computers & Education*, 87, 83–89.
- Dias, J. M., & Diniz, J. A. (2013). FuzzyQoI model: A fuzzy logic-based modelling of users' quality of interaction with a learning management system under blended learning. *Computers & Education*, 69, 38–59.
- Domagk, S., Schwartz, R. N., & Plass, J. L. (2010). Interactivity in multimedia learning: An integrated model. *Computers in Human Behavior*, 26, 1024–1033.
- Douglas, J., McClelland, R., & Davies, J. (2008). The development of a conceptual model of student satisfaction with their experience in higher education. *Quality Assurance in Education*, 16, 19–35.
- Escobar-Rodriguez, T., & Monge-Lozano, P. (2012). The acceptance of Moodle technology by business administration students. *Computers & Education*, 58, 1085–1093.
- European Commission. (2015a). *The Bologna process and the European higher education area*. Retrieved November 10, 2015, from http://ec.europa.eu/education/policy/higher-education/bologna-process_en.htm.
- European Commission. (2015b). *Standards and guidelines for quality assurance in the European Higher Education Area (ESG)*.
- Eyvindson, K., Hujala, T., Kangas, A., & Kurttila, M. (2012). Selecting a forest plan among alternatives: Consistency of preferences within decision support frameworks. *Forest Policy and Economics*, 15, 114–122.
- Fidalgo-Blanco, A., Sein-Echaluce, M. L., García-Peñalvo, F. J., & Conde, M. A. (2015). Using learning analytics to improve teamwork assessment. *Computers in Human Behavior*, 47, 149–156.
- Figueira, J., Greco, S., & Ehrgott, M. (2005). *Multiple criteria decision analysis. State of the survey*. New York: Springer.
- González, J., & Wagenaar, R. (2003). *Tuning educational structures in Europe*. Final report, phase 1. Bilbao: University of Deusto.
- González-Pachón, J., & Romero, C. (2004). A method for dealing with inconsistencies in pairwise comparisons. *European Journal of Operational Research*, 158, 351–361.
- Gregory, R., & Keeney, R. L. (2001). Creating policy alternatives using stakeholders values. *Management Science*, 40, 1035–1048.
- Gress, C. L. Z., & Hadwin, A. F. (2010). Advancing educational research on collaboration through the use of gStudy computer-supported collaborative learning (CSCL) tools: Introduction to special issue. *Computers in Human Behavior*, 26, 785–786.
- Guerrero, D., Palma, M., & La Rosa, G. (2014). Developing competences in engineering students. The case of project management course. *Procedia-Social and Behavioral Sciences*, 112, 832–841.
- Herrera, M. A., & Casado, J. (2015). Interaction analysis of a blog/journal in teaching practice. *Internet and Higher Education*, 27, 22–43.
- Hill, F. M. (1995). Managing service quality in higher education: The role of the student as primary consumer. *Quality Assurance in Education*, 3, 10–21.
- Hung, M., & Chou, C. (2015). Students' perceptions of instructors' roles in blended and online learning environments: A comparative study. *Computers & Education*, 81, 315–325.
- Iglesias-Pradas, S., Ruiz-de-Azcárate, C., & Agudo-Peregrina, A. F. (2015). Assessing the suitability of student interactions from Moodle data logs as predictors of cross-curricular competencies. *Computers in Human Behavior*, 47, 81–89.
- Khlaisang, J., & Likhitdamrongkiat, M. (2015). E-learning system in blended learning environment to enhance cognitive skills for learners in higher education. *Procedia-Social and Behavioral Sciences*, 174, 759–767.
- Klein, J. (2002). The failure of a decision support system: Inconsistency in test grading by teachers. *Teaching and Education*, 18, 1023–1033.

- Kwok, R. C. W., Ma, J., Vogel, D., & Zhou, D. (2001). Collaborative assessment in education: An application of a fuzzy GSS. *Information & Management*, *39*, 243–253.
- Li, H. L., & Ma, L. C. (2007). Detecting and adjusting ordinal and cardinal inconsistencies through a graphical and optimal approach in AHP models. *Computers and Operations Research*, *34*, 780–798.
- Lin, T. C., Ho, H. P., & Chang, C. T. (2014). Evaluation model for applying an e-learning system in a course: An analytic hierarchy process-Multi-Choice Goal programming approach. *Journal of Educational Computing Research*, *50*(1), 135–157.
- Martínez-Caro, E., Cegarra-Navarro, J. C., & Cepeda-Carrión, G. (2014). An application on the performance-evaluation model for e-learning quality in higher education. *Total Quality Management and Business Excellence*, *26*, 1–16.
- Marttunen, M., & Hamalainen, P. (2008). The decision analysis interview approach in the collaborative management of a large regulated water course. *Environmental Management*, *42*, 1026–1042.
- Nazarenko, A. (2015). Blended learning vs traditional learning: What works? (a case study research). *Procedia - Social and Behavior Sciences*, *200*, 77–82.
- Nugaras, J., & Istrazivanja, E. (2015). The strategic assessment of networking of a higher education institution. *Economic Research*, *28*, 31–44.
- OECD. (2014). *Skills beyond school*. Synthesis Report. OCDE Reviews of Vocational Education and Training.
- Ozkan, S., & Koseler, R. (2009). Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation. *Computers & Education*, *53*, 1285–1296.
- Pang, J., & Liang, J. (2012). Evaluation of the results of multi-attribute group decision-making with linguistic information. *Omega*, *40*, 294–301.
- Parkes, M., Stein, S., & Reading, C. (2015). Student preparedness for university e-learning environments. *Internet and Higher Education*, *25*, 1–10.
- Proctor, W., & Dreschler, M. (2003, February 11–15). Deliberative multi-criteria evaluation: A case study of recreation and tourism options in Victoria Australia. *European Society for Ecological Economics*, Frontiers 2 Conference, Tenerife.
- Romero, C. (1991). *Handbook of critical issues in Goal Programming*. Oxford: Pergamon Press.
- Roy, B. (1996). *Multicriteria methodology for decision aiding*. Norwell, MA: Kluwer Academic Publishers.
- Saaty, T. (2005). The analytic hierarchy and analytic network process for the measurement of intangible criteria and for decision-making. In J. Figueira, S. Greco, & M. Ehrgott (Eds.), *Multiple criteria decision analysis. State of the survey*. Berlin: Springer.
- San Martín, S., Jiménez, N., & Jerónimo, E. (2015). The evaluation of the university students in the European Higher Education Area. *Aula Abierta*, *44*(1), 7–14.
- Selim, H. M. (2007). Critical success factors for e-learning acceptance: Confirmatory factor models. *Computers and Education*, *49*, 396–413.
- Shee, D. Y., & Yang, Y. S. (2008). Multi-criteria evaluation of the web-based e-learning system: A methodology based on learner satisfaction and its applications. *Computers & Education*, *50*, 894–905.
- Szczypiriska, A., & Piotrowski, E. W. (2009). Inconsistency of the judgement matrix in AHP method and the decision maker's knowledge. *Physica A*, *388*, 907–915.
- Tamiz, M., Jones, D., & Romero, C. (1998). Goal programming for decision making: An overview of the current state-of-the-art. *European Journal of Operational Research*, *V-111*(3), 569–581.
- Thune, C. (2005). *Standards and guidelines for quality assurance in the European Higher Education Area*. Report, European Association for Quality Assurance in the European Higher Education.
- United Nations. (2016). *Competencies for the future*. Retrieved February 21, 2016, from https://careers.un.org/lbw/attachments/competencies_booklet_en.pdf.
- Vaidya, O. S., & Kumar, S. (2006). Analytic hierarchy process: An overview of applications. *European Journal of Operational Research*, *169*, 1–29.

- Wu, J., Tennyson, R., & Hsia, T. (2010). A study of student satisfaction in a blended e-learning system environment. *Computers & Education*, 55, 155–164.
- Zacharis, N. Z. (2015). A multivariate approach to predicting students outcomes in web-enabled blended learning courses. *Internet and Higher Education*, 27, 44–53.

Chapter 14

Development Motivation of Student Abilities and Skills Through a Business Activity

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Abstract This paper is to analyze the adequacy of the methodological strategies that must be developed in University degrees due to the implementation of the EEES. Hence, we proceeded to the implementation and evaluation of a practical nature activity aimed at the business sector as a tool for the training of students of university degrees. Thus, it was shown that the realization of a business practice activity allows students to train more fully, but has allowed them to develop skills inherent to university degrees, such as teamwork, proper management of human resources available or develop their analytical skills.

Keywords Business practice • Business sector • Discussion • Education tool • Finance • Human resources • Implementation of the EEES • Innovation education • Marketing • Methodological strategies • Motivation • Practical nature activity • Signature valuation • Skills • Stock market • Student involvement • Teacher valuation • Teamwork • Training of students • University degrees

14.1 Introduction

In recent years, the educational sector has been the object of major reforms in the teaching system with the aim to better adapt to the educational and training requirements of the students. This is due to the fact that the changes in the social, cultural and economic sectors directly affect the design of the educational offer (Tejada, 2002).

Thus, the Bologna process is identified as the motor of change in the current educational system. The Bologna process is the process which began with the so-called Bologna Declaration in 1999 and which consequently led to the creation of the European Higher Education Area (EHEA), in Spanish, EEES. The EHEA objective is to implement new teaching methodologies which replace the teacher-based classes. In this way,

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a teaching system was implemented based on the continual evaluation of the student's work and in the teaching of activities and works with a practical nature. This means, that this new methodological system is based on the student's learning, subtracting relevance from the teaching process of the professor staff (Camiña, Ballester, Coll, & García, 2003). This does not imply that the professor role is not relevant but that teaching task must be complemented with the student's work to implement the knowledge which they acquire in the classes. In this sense, it identifies that the teacher's work is essential so that the student can adapt the knowledge transmitted by the teacher in the business sector which awaits the student after their University learning period.

The current educational model is based on the skills which the student develops through their study program, which understands skills as the harmonious set of qualities (which could be problem solving or team work), attitudes (responsibility or team spirit) and knowledge acquired by the student (Camiña et al., 2003). Accordingly, the student will be required to show more active behavior in the course of the academic year, since the student must search for, select and organize the information can be truly useful to him/her in their academic development (Cuadrado & Fernández, 2008). Thus, the student must not only study the knowledge covered during the academic year, but he/she must understand and compare them with the business practices which are carried out in the job market where to a large extent, it is the student's responsibility to take advantage of the teaching period provided by the University where the students pursue their studies.

The objective of this new educational model is to prevent and surpass the problems which were detected in the student academic training through an educational model based on teaching. These problems, among other reasons, are due to apathy which the student showed during their training process, the continual lack of attention and the minimum learning interest in the taught knowledge (Fidalgo, 2011). Hence, until the implementation of the new educational system, we can observe how the University teaching was characterized by its eminently theoretical nature (Michavila, 2009).

Despite the identification that an educational model based on skills which the student develops can be suitable for the student's training; we must identify which activities will prove to be most suitable for said student. This is due to the fact that the student, depending on the University studies which he/she pursues, understands that a type of activity will be more convenient for him/her than others with the aim to prepare themselves in the best way possible for the job market.

Thus, this research aims to analyze the degree of the design adaptation of an activity with a practical nature oriented to the business sector and its acceptance by the students who are pursuing their degree studies in the social science and legal sectors.

14.2 Theoretical Framework

The implementation of a new educational system has not only constituted the adaptation to the changing needs of the students but has caused a set of changes in the academic system offered by higher education institutions up to date. The main changes which affect the design of the current academic offer are (Salinas, 2004):

- Variation in the organization process of the University teaching promoted by the European Higher Education Area.
- Change in the organization process of the University teaching promoted by the implementation of educational approaches based on a skills system.
- Variation in the organization process of the University teaching motivated by the implementation of the so-called ECTS credits.
- Modification of the academic system motivated by the rise of Information and Communication Technologies (ICT) use by society.
- Variation of the skills acquisitions system by the students, such as the reduction of the relevance of teacher-based classes and the increased relevance of the student's active participation.
- Modification of the understanding, by society, of the characteristics which a trained and qualified person must meet for their entry into the job market.

Hence, in order for a student to adapt to the characteristics which the job market demands of their future participants and their present conditions, the current educational model is based on a skills system. In this way, the student will carry out the academic process developing a set of attitudes and qualities which will complement the knowledge acquired in the classes and will benefit their adaptation to the job market. Accordingly, the student will be required a high degree of commitment during their academic development, preventing the focus of all the responsibility in the teacher through the teaching of teacher-based classes.

Consequently, it is identified that the main quality of the current educational model is its orientation towards the student body. However, we must consider the orientation towards the student which will take place through the teacher. Thus, the teacher must meet a specific set of skills which permit them to adapt to this new educational paradigm. In spite of this, we must take into account that the teaching of teacher-based classes will possess a very relevant value in the current educational system (Michavila, 2009).

With the aim that the teacher can train their students better, they must meet a series of skills which allow them to perform their academic task. These skills are based on the student's need to train themselves in the most suitable way to adapt to the job market and the teacher's responsibility to assume the tasks of orientation, mediation, guidance and tutorial role in the training process of the student body (Gallego, 2007; Ortega, 2007). Hence, Cuadrado and Fernández (2008) identify a set of skills which the teacher must acquire and develop: personal contextualization, knowledge of the learning procedure of the student body, planning of both the teaching and the didactic interaction, use of suitable methodology and didactic procedures, management of the didactic interaction process as well as the relations with the student body, evaluation, control and subsequent regularization of the teaching and learning system, and finally, management of the development at the professional level as teacher.

With regard to the personal contextualization, the teacher must understand all the aspects which define the job environment which their students must face, as well as the requirements which define and motivate them in order to be able to orient them in a suitable way. The knowledge of the student body's learning procedure makes reference

to the teacher's analytical ability of the learning system which each student follows. In this way, the teacher must make an effort to understand the mental and emotional process which characterizes each student when they face specific problems and/or decision-making, with the aim to adapt the teaching mechanisms to each student. The planning of both the teaching and the didactic interaction defend the position that the teacher must design the academic planning in a personalized way. Thus, the teacher must not consider their students as a unit but as a set of persons who must be treated in a unique and personal way. This means that an academic strategy is designed which benefits the attainment of the planned objectives by both the professor and the student during the development of the academic offer. The use of suitable methodology and didactic procedures arises from the need to adopt the mechanisms and the tools which the teacher possess to promote the academic development of each student on a personal basis. With regard to the management of the didactic interaction process as well as the relations with the student, the current educational systems means that the teacher carries out the orientation and follow-up tasks of the student's academic progress. For this purpose, it is necessary to establish a well-defined communication policy between the teacher and the professor which ensures a close contact between the parties.

Accordingly, this ensures that the teacher will carry out the tutorial tasks of the student body and that the student can maximize their academic potential. The evaluation, control and subsequent regularization of the teaching and learning system make reference to the need which the teacher is able to update the academic methodology with the aim to adapt it to the current situation. Thus the teacher not only must provide the student with updated procedures and tools which permit his/her academic development based on the current political, economic and social conditions, but they must also continue investigating to adapt the academic system to future conditions which could influence the student. Finally, the development management at the professional and teacher level defend that not only the teacher must be subject to continual training with the aim to adapt to the different generations of students but also must be able to coordinate with other teachers to improve the academic offer. The teacher must plan their academic methodology with other teachers, facilitating the improvement of their abilities through cooperative work.

Based on that explained above, the need has been identified that the teacher is not only able to design an updated academic strategy adapted to the different generations of students, but also must be able to implement in a suitable way. This aspect acquires utmost importance, since it will affect both the decision making ability of the students when pursuing their studies in a specific University as well as their ability to communicate its benefits (Imrie, Durde, & Cadogan, 2000). This is due to the fact that the quality service which the teachers provide to their students is a relevant strategy for them, since they aim to differentiate the academic offers depending on the creation of value for each student and the potential satisfaction of their needs (Ozment & Morash, 1994).

Thus, the service which the teachers provide to their students is identified as one of the most relevant elements in the establishment of beneficial relations between the parties. We must take into account that in this relation, the student will not only assess the final attainment of the graduate degree, but will assess all the aspects which have defined his/her academic career, such as the adaptation of the teacher to

the academic requirements of the student, the personal treatment shown, the teacher's ability to manage the problems of an academic type, etc. Accordingly, it is understood that the final result, the attainment of the academic degree will be important, however the commencement (the first impression by the student) and the course of the academic offer will be crucial to identify the success in the implementation of the current educational system by the teacher. Along this line is López (1999), who argues that the educational research results have demonstrated the relevance of an academic system based on the understanding and attendance of the learning process, with the aim to define an academic method which benefits the learning of the material by the student body.

Thus, the new academic methods must not be solely governed to increase the interaction capability between the student and the teacher but they must be characterized by authentically stimulating skills as relevant as team work or the use of ICT.

In the professional sector, a high demand has been identified for future employees who have developed the team work skill (Fidalgo, 2011). However the student only completely develops this skill if the team work entails a high involvement level by the teacher in the development of the activity. In this sense, Fidalgo (2011) indicates that frequently, the teacher does not participate in the development of the work, but they only participate in the proposal and reception of the team work. Hence, if the students work in teams in which only they participate, although they will be learning skills derived from the activity, they cannot obtain the maximum academic performance from the same. Due to this, the teacher must be involved in the development of the team work so that the student can achieve the skill derived from this activity in an integral way.

However, we must understand that an excess participation of the teacher in the preparation of the team work could be counter-productive for both the teacher and the student. If the teacher acts an additional member of the team, this can cause the lack of the student's participation in the activity and major work load and responsibility for the teacher. In this way, the student would not learn one of the most relevant aspects of this skill, such as to assume the responsibilities derived from the preparation of a project among various persons and the management of the difficulties which can arise during its development.

Team work permits the student to increase and manage the previously acquired knowledge, improve communication skills and human resource management, develop their analytical and synthesis ability, among other skills. Thus the team work is not only an optimum skill to promote the implementation of the acquired knowledge but is also useful to simulate a scenario in which the students will find themselves when they begin to work in a company.

14.3 Research Methodology

The research has been carried out in the following phases:

1. Preparation of the questionnaires, they were answered in an anonymous way by the students who had participated in the activities of the following subjects:

- (a) Company Assessment and Acquisition from the Business Administration and Management (ADE) Degree: Assessment of a real company listed in the stock market applying the company assessment methods studied in the subject with the objective to issue an investment recommendation.
- (b) Product Policy from the Marketing Degree: Design of a product with the aim to satisfy the requirements of an target market identified by the student, in this case, the design and development of a thematic amusement park. This task required the knowledge obtained during the development of the subject.
- (c) Industrial Marketing and Services from the Marketing Degree: Design of a specific service strategy, design and development of a cafeteria. This task required the knowledge obtained during the development of the subject.
- (d) Introduction to Marketing and Corporate Communication from Double Degree in Computer Engineering and Business Administration and Management and a degree in Business Administration and Management: Analysis of the real marketing strategy and their implications in their target market. This task required the knowledge obtained during the development of the subject.

The distributed questionnaire is inspired by the one previously used by Escobar and Lobo (2005), to which an additional group of questions has been added about the student with the objective to segment the survey by student groups.

1. Collection of questionnaires, by compiling them when they are completed online.
2. Data analysis which will permit us to fulfil the objective proposed in the paper which is to assess the added-value which is contributed by inserting an activity based on the study of a real practical case in the Marketing and Finances subjects.

The structure followed in the final questionnaire designed and distributed to the students is compiled in Table 14.1.

On each of the questions, the responding student will provide a score from 1 to 10. The higher the scores compiled in the survey, the greater the added-value will be perceived by the student and consequently more useful as a tool in the educational context which we are describing.

14.3.1 Data

The survey was distributed to six student groups in which this activity was developed throughout the 2015–2016 academic year, a total of approx. 651 students (Table 14.2).

Table 14.1 Questionnaire structure

Thematic questions	Presented questions
General assessment of the activity	• I believe that the experience was worth the time which I have devoted to the works
	• I think that the generalization of these types of activities to other subjects would improve the quality of the University teaching
	• The group interventions made the classes more interesting
Motivational aspects	• The group interventions made the classes more interesting
	• The activity has motivated me to work more in this subject
	• The activity has improved my opinion about the contents of the subject (practical vision)
	• I feel more involved in this subject than if I had worked in a more theoretical way (useful vision)
	• The activity has increased my assessment of the career
	• This activity has changed my vision about the role of the University student as a passive recipient of information
	• The activity has helped me to develop abilities such as analysis, synthesis, criticism, etc.
Skills development	• The activity has helped me to develop abilities such as handling computers, documentation search, use of the library, etc.
	• The activity has improved my ability to work in a group
	• I have improved my ability to explain, defend and debate opinions in public
	• The exhibitions facilitated the class participation
	• The activity has helped me to relate the new information or problem to what I have previously learned
Knowledge improvement	• The activity has provided me with the use of ideas and information which I know in order to understand something new
	• The activity has helped me to understand, improve, expand and relate my ideas
	• The activity has encouraged me to present questions and debate
	• The activity is useful to learn what other students think about a problem and consider their points of view
	• The debate about the differences of opinion have enriched my knowledge with alternative perspectives
	• The reports presented in class by classmates were interesting
Activity features	• In general, I think that this type of activities show the professor's interest in teaching
	• In the development of the activity, we discussed alternative solutions to different types of problems
	• What is your campus?
Questions about the respondent	• Are you (male/female)?
	• Generally assess the subject in which this activity was framed
	• Generally assess the professor who taught this subject
	• Did you pass (if the grades have already been published) or do you think that you will pass the subject in the next summons

Source: Own preparation

Table 14.2 Student distribution according to groups

Knowledge area	Group	Number of students
ADE DEGREE	GROUP 1	57
	GROUP 2	74
MARKETING DEGREE	GROUP 3	115
	GROUP 4	96
	GROUP 5	43
	GROUP 6	55

Source: Own preparation

Table 14.3 Technical data file

Population universe	651
Sampling unit	208
Response index	31.95 %
Geographical scope	Spain
Information collection method	By convenience
Study type	Survey
Collection method	E-mail
Number of surveys	A survey with new thematic blocks of questions
Information collection period	November 2015 up to January 2016

Source: Own preparation

The survey was open during the months of November 2015, December 2015 and January 2016. The opinions of 208 respondents were compiled, more than 31 % of the respondent population (Table 14.3).

14.4 Data Analysis

The results which are shown below correspond to the test done by the students of the subjects belonging to the different groups:

- Company Assessment and Acquisition from the Business Administration and Management Degree:
- Product Policy of the Marketing Degree:
- Industrial Marketing and Services of the Marketing Degree:
- Introduction to Marketing and Corporate Communication from Double Degree in Computer Engineering and Business Administration and Management and a degree in Business Administration and Management:

The results of the performed survey show that this activity was well-liked by the students since the average scores of all the questions were above 6 and 7. If we approach this assessment from a quantitative perspective based on the compiled

data, we observe that the general assessment of the activity has been positive on average with a score around 7 in the compiled surveys (Table 14.4).

The scores on the motivational aspects are also around 7, a result which indicates the greater involvement of the student (Table 14.5).

Likewise, it involves an experience close to the professional activity carried out by an analyst. The development of professional abilities has been perceived in a lesser degree by the student in relation to the survey results, however it continues to receive a positive assessment above 6 out of 10 in the questions, as shown in Table 14.6.

With regard to the improvement of knowledge, in general, the students view the activity in a positive way with scores around 7 (Table 14.7).

The activity was highly assessed from the perspective of the professor staff's interest in the subject, although not so much value was observed in the reports and the debate (Table 14.8).

If we apply filters on the executed statistics, we observe that 17 of the respondents (8.2% of the sample) replied to the question: "Generally assess the subject in which this activity was framed" with a score below 5. These students' assessment of the activity is well below the general assessment average of the activity (Table 14.9).

Table 14.4 Results on the general assessment of the activity

Questions about the general assessment of the activity	Average	Dev. Est.	Median
I believe that the experience was worth the time which I have devoted to the works	6.95	2.34	7
I think that the generalization of these types of activities to other subjects would improve the quality of the University teaching	7.17	2.26	8
The group interventions made the classes more interesting	6.67	2.26	7

Source: Own preparation

Table 14.5 Results on the motivational aspects of the activity

Questions about the motivational aspects	Average	Dev. Est.	Median
The activity has motivated me to work more in this subject	6.97	2.28	7
The activity has improved my opinion about the contents of the subject (practical vision)	7.32	2.37	8
I feel more involved in this subject than if I had worked in a more theoretical way (useful vision)	7.55	2.27	8
The activity has increased my assessment of the career	6.72	2.47	7
This activity has changed my vision about the role of the University student as a passive recipient of information	6.65	2.26	7

Source: Own preparation

Table 14.6 Results on the skills development

Questions on the skills development	Average	Dev. Est.	Median
The activity has helped me to develop abilities such as analysis, synthesis, criticism, etc.	6.85	2.17	7
The activity has helped me to develop abilities such as handling computers, documentation search, use of the library, etc.	6.02	2.35	6
The activity has improved my ability to work in a group	6.64	2.32	7
I have improved my ability to explain, defend and debate opinions in public	6.61	2.50	7
The exhibitions facilitated the class participation	6.71	2.43	7

Source: Own preparation

Table 14.7 Results on the improvement of knowledge which the activity has supposed

Questions on the improvement of knowledge	Average	Dev. Est.	Median
The activity has helped me to relate the new information or problem to what I have previously learned	6.88	2.18	7
The activity has provided me with the use of ideas and information which I know in order to understand something new	6.92	2.22	7
The activity has helped me to understand, improve, expand and relate my ideas	7.13	2.09	7
The activity has encouraged me to present questions and debate	6.57	2.22	7
The activity is useful to learn what other students think about a problem and consider their points of view	6.83	2.13	7
The debate about the differences of opinion have enriched my knowledge with alternative perspectives	6.71	2.24	7

Source: Own preparation

Table 14.8 Results on the activity features

Questions on the activity features	Average	Dev. Est.	Median
The reports presented in class by classmates were interesting	6.75	2.08	7
In general, I think that this type of activities show the professor's interest in teaching	7.19	2.28	8
In the development of the activity, we discussed alternative solutions to different types of problems	5.88	2.65	6

Source: Own preparation

Table 14.9 Results on how they assessed the activity according to how they assessed the subject

Questions on the general assessment of the activity according to how they assessed the subject	Average (<5)	Average (<5)
I believe that the experience was worth the time which I have devoted to the works	2.64	7.34
I think that the generalization of these types of activities to other subjects would improve the quality of the University teaching	4.00	7.00
The group interventions made the classes more interesting	4.59	6.86

Source: Own preparation

The same is observed if the student's assessment is about the professor. 20 responding students scored the professor of the subject below 5 (9.6% of the sample) and the assessments from these students was significantly lower than that obtained with the overall sample (Table 14.10).

If we discriminate between the students who have passed or failed, we also see there is a deviation on the statistics of the overall sample (Table 14.11).

If we discriminate by the student's gender hardly any significant differences were observed in the assessment of the subject, however several differences were observed of some campuses with others which we can interpret as a difference of attitude which is frequently observed in some groups with others (Table 14.12).

Table 14.10 Results on how they assessed the activity according to how they assessed the professor

Questions on the general assessment of the activity according to how they assessed the professor	Average (<5)	Average (<5)
I believe that the experience was worth the time which I have devoted to the works	3.02	7.37
I think that the generalization of these types of activities to other subjects would improve the quality of the University teaching	4.00	7.00
The group interventions made the classes more interesting	4.45	6.91

Source: Own preparation

Table 14.11 Results on how the activity is assessed according to the result obtained in the subject

Questions about the general assessment of the activity according to the pass/fail	Average (fail)	Average (pass)
I believe that the experience was worth the time which I have devoted to the works	4.67	7.02
I think that the generalization of these types of activities to other subjects would improve the quality of the University teaching	6.00	7.00
The group interventions made the classes more interesting	5.33	6.71

Source: Own preparation

Table 14.12 Results on how they assessed the activity according to who they assessed the subject discriminating according to the campus

Questions about the general assessment of the activity according to the pass/fail	Average (Vic)	Average (Mos)	Average (Fuenla)
I believe that the experience was worth the time which I have devoted to the works	6.99	6.56	7.32
I think that the generalization of these types of activities to other subjects would improve the quality of the University teaching	7.00	7.00	8.00
The group interventions made the classes more interesting	6.73	6.30	7.00

Source: Own preparation

14.5 Conclusions About the Results

The activity carried out by the students in each of the degree programs (ADE and MARKETING) has generally been assessed in a very positive way, with regard to the conclusions derived in each of the thematic blocks of the question:

- In general, the activity has been considered with a score between 6 and 7 considering the experience and the group interventions as positive and positively assessing the transfer to the remaining subjects.
- In relation to the motivation, the activity provides results between 6 and 7 managing to improve the opinion which the student has about the subject thus making him/her feel better and even changing the student's perception as a passive element in the classes.
- Specifying the activity carried out by the students, what students have valued most is the development of abilities in said activity such as analysis, synthesis, criticism, etc., with a lower assessment of the abilities related to the specific search for information. Also receiving a good score of over 6 was the improvement of abilities such as team work and the defence of ideas in public.
- With regard to the improvement of knowledge, the activity is very well assessed (above 7) in relation to the consideration of the same as vehicle which facilitates the understanding and relation of ideas. Also highly assessed was the consideration of the activity as an instrument which facilitates the use of previous information and the consideration of what their classmates' opinions about other points of views.
- Specifically in the assessment which the students make about the activity, they consider that it reflects the professor's interest toward teaching (above 7) although they do not agree as much when the discuss alternative solutions to the raised problem.
- However with regard to the questions, there are 8.2% of the sample who assess the activity according to the subject below 5, while the remainder made an assessment close to 7, surpassing this score when it involved assessing if the time invested in the activity was worth it and the potential generalization of these activities to other subjects of the degree. Something similar occurred when assessing the activity according to how they assessed the professor, hence 9.6% of the sample assessed below 5, while the remainder assessed with a score above the pass were closer to and even reached 7. If we continue with the assessment of the subject, however in this case, if the students passed or failed, there was a deviation on the statistics of the overall sample, influencing whether they had passed or failed when making a positive or negative assessment.
- If we discriminate according to genders when considering the assessment which the students made of the subject, hardly any significant differences were noted, differences do take place if the assessments are discriminated according to the campus where the student was studying.

14.6 Conclusions of the Study, Limitations and Future Lines of Research

The implementation of the Bologna process in 1999 brought about the implementation of new teaching methodologies based on continual evaluation of the student body's work and the inclusion of more practical teaching and thus achieve teaching in which the professor's work is a complement to the student's work with the aim to adapt what is learned to the subsequent insertion into the job market. The student's task will demand greater involvement in the development of the subjects. This paper has analyzed the degree of adaptation of a practical activity with the aim to orient it to the business sector, for this purpose, a survey has been prepared which consisted of 28 questions divided into different thematic blocks: general assessment of the activity, motivational aspects, skills development, knowledge improvement, activity features and questions about the respondent.

Broadly speaking, the activity has been assessed in a positive way by the students, where the score ranged between 6 and 7, what was highest valued is the possibility to generalize the activity to other subjects given that this helped the students to possess a more practical view of the subject and to feel more involved, hence they have considered it as an instrument which helped them to understand, improve, expand and relate the ideas. With regard to the teacher who planned the activity, the image which the students had of them improved since they consider that they possess and show interest in the subject, within all that was least valued by the students was the lack of development of alternatives for the solution planned in the activity.

The limitations which we detected in this study are focused on what approximately 30% of the students responded; it would be preferable to involve the students in the responses to the questionnaires in order to suitably assess the impact of the practical activity in the students and improve it at a future date. As future lines of research and due to the positive interest which it has generated in the students, the execution of this practical activity can be transferred to other subjects and degrees in order to view their assessment in the students who study the degree and the implications which can be achieved attempting to obtain the highest possible number of responses.

References

- Camíña, C., Ballester E., Coll C., & García E. (2003). *Mitos y realidades de la innovación educativa. XI Congreso Universitario de Innovación Educativa en las Enseñanzas Técnicas, Vilanova i la Geltrú, Julio.*
- Cuadrado, G. I., & Fernández, A. I. (2008). Nuevas Competencias del Profesor en el EEES: Una Experiencia de Innovación Docente. *Revista Electrónica Teoría de la Educación Educación y Cultura en la Sociedad de la Información*, 9(1), 97–211.
- Escobar Pérez, B., & Lobo Gallardo, A. (2005). Juegos de simulación empresarial como herramienta docente para la adaptación al Espacio Europeo de Educación Superior. *Cuadernos de Turismo, ISSN 1139–7861*(16), 85–104.

- Fidalgo, A. (2011). La Innovación Docente y los Estudiantes. *La Cuestión Universitaria*, 7, 84–91.
- Gallego, M. J. (2007). Las funciones docentes presenciales y virtuales del profesora-do universitario. *Revista Electrónica de Teoría de la Educación Educación y Cultura en la Sociedad de la Información*, 8(2), 137–161.
- Imrie, B. C., Durde, J., & Cadogan, J. W. (2000). Towards a conceptualization of service quality in the global market arena. *Advances in International Marketing*, 10(1), 143–162.
- López, R. J. I. (1999). *Conocimiento docente y práctica educativa. El cambio hacia una enseñanza centrada en el aprendizaje*. In Aljibe (Ed.). Málaga.
- Michavila, F. (2009). La Innovación Educativa. *Oportunidades y Barreras, ARBOR Ciencia, Pensamiento y Cultura, CLXXXV(EXTRA)*, 3–8.
- Ortega, I. (2007). El tutor virtual: Aportaciones a los nuevos entornos de aprendizaje. *Revista Electrónica de Teoría de la Educación Educación y Cultura en la Sociedad de la Información*, 8(2), 100–115.
- Ozment, J., & Morash, E. A. (1994). The augmented service offering for perceived and actual service quality. *Journal of the Academy of Marketing Science*, 4(22), 352–363.
- Salinas, J. (2004). Innovación docente y uso de las TIC en la enseñanza universitaria. *RU&SC Revista de Universidad y Sociedad del Conocimiento*, 1(1), 1–16.
- Tejada, F. J. (2002). El Docente Universitario ante los Nuevos Escenarios: Implicaciones para la Innovación Docente. *Acción Pedagógica*, 11(2), 30–42.

Chapter 15

A Study on Entrepreneurship at the University of Valencia

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Abstract In the last few decades, there has been growing interest in the so-called third mission of universities, one of which, the question of entrepreneurship, will be highlighted in this paper. Hence, universities have been configured as institutions to proactively motivate their alumnae, and there, students will find an ideal environment in which to familiarize themselves with the skills and expertise that entrepreneurs require. Furthermore, universities provide advisory services as well as technical support, which are essential elements of sowing the seed of business startups. This chapter sets out, from a qualitative perspective, the policies, strategies and actions undertaken by the University of Valencia to encourage university entrepreneurship. It also includes the outcomes from the past year. We based our approach on the Comprehensive Model for University Entrepreneurship Encouragement, proposed by, with which we were able to describe the entire entrepreneurial process carried out by the University of Valencia in a logical order. This chapter contributes to existing literature by adding to the repertoire of papers to outline the entrepreneurial experiences of other universities. At the same time, it provides a guide for other academic institutions whose procedures are still in the early stages of design and implementation.

Keywords Business creation • Business development • Entrepreneurship • Higher education • Research • University of Valencia

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15.1 Introduction

Universities have traditionally been set up as institutions to serve a twofold purpose—higher education and research (Ortega y Gasset, 1930). Nevertheless, the concept has one major shortfall in that it does not fully respond to the needs of present day society, which ultimately benefits from university activities.

To alleviate for this shortfall, a new school of thought emerged, which, based on social demand, deals with the inadequacies of the traditional university system. In this regard, Sheen (1992), Gibbons, Limoges, Nowotny, Schwartzman, and Scott (1994), Ziman (1994), Slaughter and Leslie (1997) and Clark (1998); published the first papers on what would come to be known as the third mission of these institutions.

Currently, universities, as they adapt to the real needs of society, have incorporated this third mission, which is structured, in turn, into three parts: innovation, social commitment and entrepreneurship (Arocena & Sutz, 2001; Sánchez, Caggiano, & Hernández, 2011; Sutz, 2000).

As far as innovation is concerned, Etzkowitz (2002) points out, by way of the Triple Helix Model based on the reciprocal relationship between university, industry and government, that innovation must bolster the scientific advances made at universities, allowing, as such, for the development of new technologies that promote improvements to the economic system.

As far as social commitment is concerned, Stiles (2002) highlights the university and its relation to the social needs of its immediate environment. As for Corti and Riviezzo (2008), they understand this commitment to be a part of a strategy for organizational learning, and highlight the active relationships between the university and pertinent social agents.

And with regards to the third and final part of the third mission of universities, Clark (2004) describes the entrepreneurial university as a flexible organization that interacts with its social and economic environment, adapts to change and then looks for sources of funding to source and develop new innovations, until it reaches the stage where the marketing and exploiting of ideas occurs, and lastly, creates value in society.

According to Etzkowitz (2003), entrepreneurship is one of the fundamental missions of present-day universities, to such a degree that the author considers university entrepreneurship a “second academic revolution” following the unification of teaching and research. Similarly, Bueno (2007) points out that the approach that has had the greatest impact is that of the entrepreneurial university.

And it is precisely for this reason that this chapter focuses on the duality of the university and entrepreneurship. More specifically, the lines developed by the University of Valencia in its entrepreneurial approach.

The university dates back to 1499, and is one of the first to be founded in Europe. Since its inception, when only medicine, humanities, theology and law were taught, it has gradually increased the number of courses offered and currently boasts 20 faculty buildings providing more than 50 degree courses.

The University of Valencia is one of the most prestigious Spanish universities, and is ranked 4th out of a total of 60 universities in the ISSUE ranking of Spanish

public universities. At the same time, it is considered one of the top 500 universities in the world according to the top three international rankings, Shanghai, THE and QS. And lastly, it is also part of the EHEA (European Higher Education Area).

Against this backdrop, this chapter aims to describe and analyse the different lines developed by the University of Valencia in the field of entrepreneurship. To do this, we start from the Comprehensive Model to Encourage Entrepreneurship in Universities, proposed by Arroyo and Van der Sijde (2008), which provides a comprehensive perspective of the entrepreneurial process.

This chapter contributes by broadening the scope of the studies carried out on university entrepreneurship in general, and more specifically, and to the entrepreneurial policies of a particular university. In this paper, our intention is to disseminate the results based on the entrepreneurial initiatives implemented by the University of Valencia, so that, where possible, these can be of some use to other universities.

This chapter is structured as follows: the next section contains a comprehensive literature review, followed by a description and analysis of the mechanisms used by the University of Valencia to encourage and support entrepreneurship. Afterwards come the results and, lastly, the general outcomes, including the mechanisms to successfully overcome the challenges that entrepreneurship in the university environment implies.

15.2 The University of Valencia and Entrepreneurship

According to Salamzadeh, Salamzadeh, and Daraei (2011), “an entrepreneurial university is a dynamic system, which includes special inputs (Resources, Rules and regulations, Structure, Mission, Entrepreneurial capabilities, and Expectations of the society, industry, government and market), processes (Teaching, Research, Managerial processes, Logistical processes, Commercialization, Selection, Funding and financial processes, Networking, Multilateral interaction, and Innovation, research and development activities), outputs (Entrepreneur human resources, Effective researches in line with the market needs, Innovations and inventions, Entrepreneurial networks, and Entrepreneurial centers) and aims to mobilize all of its resources, abilities and capabilities in order to fulfill its Third Mission”

Etzkowitz (2004), for example, states that the entrepreneurial university has a “proactive stance in putting knowledge to use and in broadening the input into the creation of academic knowledge”.

In this section, therefore, we are going to examine to what extent the entrepreneurial culture at the University of Valencia, manifesting itself through policies and strategies, complies with the aforementioned definitions. To do so, we are going to follow the Comprehensive Model to Encourage Entrepreneurship in Universities, put forward by Arroyo and Van der Sijde (2008), which provides a comprehensive perspective of the entrepreneurial process.

Table 15.1 Stages of the entrepreneurial process in universities

Stage	Action
Stage 1	Promote entrepreneurship
Stage 2	Support entrepreneurs
Stage 3	Support business creation
Stage 4	Support business development

Source: Created by the authors based on the paper by Arroyo and Van der Sijde (2008)

Table 15.2 Agents from the University of Valencia involved in the entrepreneurial process

<i>Agents from the University of Valencia</i>
Research Results Transfer Office (OTRI)
Professional Insertion and Work Assessment Observatory (OPAL)
University Business Foundation (Adeit)
Information and Consumer Services for Students (SEDI)
University of Valencia Chairs
University of Valencia Science Park

Source: Compiled by the authors

According to the Model, the entrepreneurial process in universities comprises the following correlating stages, as seen below in Table 15.1.

Before examining the three support activities for entrepreneurial initiative at the University of Valencia, Table 15.2 contains the agents involved in each of the stages.

In the following section, and on the basis of the stages proposed by the Model put forward by Arroyo and Van der Sijde (2008), we are going to describe the main activities and objectives that are set for each of the agents within the University of Valencia that are involved.

15.2.1 Stage 1: Promote Entrepreneurship

The first policy involved with this stage of the process is raising awareness about entrepreneurship among academic staff, so that later, they are able to instil an entrepreneurial spirit and instruct students enrolled on the different University of Valencia degree courses.

With this in mind, the University of Valencia, through the University Business Foundation (Adeit), organizes a variety of different courses, summer school programmes, conferences and congresses to train teaching staff how to stimulate entrepreneurship in the classroom.

For example, at the last conference to be held, attendees debated the question of how best to generate entrepreneurial ideas, how to communicate and understand the entrepreneurial spirit and how to maximize creativity in the classroom environment.

Parallel to this, research is another of the factors taken into consideration in this stage and, in this regard, the University of Valencia boasts is held in high regard for its research activities, attested to by its 6th position (out of 59) in the ISSUE-P Research Ranking of Spanish Universities.

The last part of this stage is the teaching. In this regard, the University of Valencia provides three levels of entrepreneurial training: graduates, postgraduates and extra-curricular courses.

With regard to the degrees, one of the optional subjects is entitled Business Start-up (Creación de Empresas in Spanish), although not all degree courses have this option open to them, and furthermore, the subject has somewhat limited content and only accounts for six ECTS credits. We believe it would be in the interest of the University of Valencia to roll out this subject to more disciplines that might be of interest to the entrepreneur, while at the same time offering the subject to all graduates.

Nevertheless, the University of Valencia has a concentrated training provision for entrepreneurs, especially in its postgraduate courses. More specifically, it offers eleven Master's programmes, three diplomas and even specialized doctorate programmes in entrepreneurship and business creation.

Further to the entrepreneurial training, the different Chairs of the University of Valencia provide, via Adeit (University Business Foundation) extracurricular courses aimed at university students interested in entrepreneurship, and these have had an enthusiastic reception. Furthermore, the SEDI (Information and Consumer Services for Students) organizes workshops for non-university students interested in entrepreneurial pursuits.

15.2.2 Stage 2: Support Entrepreneurs

Arroyo and Van der Sijde (2008) define the start of this stage as the search for opportunities and as such, the University of Valencia acts as a Centre for the YUZZ—Young People with Ideas Programme. The programme, boasting the patronage of the Santander Bank, enjoys the collaboration of both public and private entities, and aims to encourage young people with an entrepreneurial spirit to enter their innovative ideas into a competition that is held.

On the whole, the University of Valencia participates in the organization of a variety of different competitions, the winners of which receive endowments, and as such promotes entrepreneurial opportunities and collaborates in the carrying out of the winning ideas.

The second part of this stage focuses on the Business Plan. OTRI (the Research Results Transfer Office) is the organization given the task of providing advice and tutoring the drafting of the Business Plan, accompanying the entrepreneur throughout the whole process.

This stage draws to a close with specific programmes that are aimed at providing entrepreneurs with a comprehensive understanding of all activities required to make a viable business based on a preconceived idea. In short, to come up with an idea that has a certain guarantee of success.

Along these lines, the University of Valencia organizes, takes part and administers a variety of different entrepreneurship programmes, such as the VLC/Campus Start-up Programme, aimed at supporting the creation of innovative knowledge-based start-ups; the Patent Pool Programme, the aim of which is to facilitate meetings between entrepreneurs, business owners and innovative knowledge generation centres; or the Young Entrepreneur Erasmus Programme, which provides transnational exchanges for fledgling entrepreneurs to learn from participating business owners in other countries.

15.2.3 Stage 3: Support Business Creation

This stage covers support activities for businesses during set up and adaptation to the market, and starts with the start-ups in the business incubators. In the case of the University of Valencia, these incubators are located in its Science Park, which is home to innovative, knowledge-based start-up companies.

The second part of this second stage contemplates access to commercial networks to build relationships between entrepreneurs, partners, clients and suppliers. To help deal with this particular activity, the University of Valencia, together with other universities, is part of the RedEmprendia network. This network boasts the patronage of the Santander Bank, and acts as a community of mentors and entrepreneurs.

Simultaneously, the OTRI boasts a major network of contacts, both domestic and international, such as the Transfer Network, OTRI Network, the European ASTP-Proton Network and the American AUTM Network; to name but a few.

And lastly, this stage includes access to funding. This is an essential question, as without proper funding, a business is unable to get started. OTRI therefore has, as one of its functions, the role of providing entrepreneurs with advice and guidance in their search for sources of funding so that spin-offs are able to incorporate themselves and thus get the business started.

Similarly, the OTRI administers the “Valora y transfiere” competitive call for projects, aimed at financing R&D activities with both market and knowledge-transfer potential, which are in their early stages of development, enabling as such the creation of new spin-offs within the University of Valencia.

Furthermore, the University of Valencia Science Park organizes the Capital and Science Forum, the aims of which is to connect entrepreneurs and investors interested in science- and technical-based business projects.

Other mechanisms for accessing funding are the different prizes and awards, for varying endowment amounts, which are organized and awarded by the University of Valencia in collaboration with different businesses and entities. Some of the many awards include the Motivem Prize, the Bancaja Young Entrepreneur Prize, and the Faculty of Economics’ Entrepreneur Award.

And lastly, it is worth noting that the University of Valencia was the first Spanish university to use crowd-funding as a tool to generate funds for entrepreneurs. Presently, access to this type of funding is carried out via the Uniempren Platform, under the auspices of the OPAL (Professional Insertion and Work Assessment Observatory), which is also used to search for business partners and private investors.

15.2.4 Stage 4: Support Business Development

This stage comprises the monitoring of businesses created under the protection of the university. Monitoring consists of supervising the businesses during its early years, as well as providing support for its growth and consolidation. In the case of the University of Valencia, this function is assumed by the OTRI (Research Results Transfer Office), which is in charge of monitoring and providing support to spin-offs.

15.3 Results

The hard work carried out by the University of Valencia in its mission to promote entrepreneurship over the course of 2015 can be seen in the following results that appear in Table 15.3.

Of the total of 19 business start-ups, 32 % are by University of Valencia students, while the remaining 68 % comprised graduates.

Obviously, these results are possible thanks to the involvement and interaction of all the participating agents, but the main activity of the OTRI, whose success culminates with the creation of spin-offs, is of particular note. In this regard, the papers by O'Shea, Chugh, and Allen (2007) and Lockett and Wright (2005) conclude that the entrepreneurial expertise of the technicians from the OTRIs positively influence the number of spin-offs created.

Table 15.3 Results for the University of Valencia in its entrepreneurship activities

Indicators	2015
No. of entrepreneurs attended to	639
No. of businesses attended to	148
No. of business plans developed	131
No. of businesses created	19
No. of training days	59
No. of networking actions	104

Source: Compiled by the authors based on data contributed by the OTRI

15.4 Conclusions

Universities these days are no longer institutions that merely provide support to students to secure employment in the current the job market, but rather assume the proactive function of instilling or strengthening the entrepreneurial spirit among students. In other words, they are no longer passive institutions but have become entities to stimulate entrepreneurship, and as such, promote self-employment and are therefore in line with the Entrepreneurship 2020 Action Plan.

The business idea is conceived by the entrepreneur, but universities have to help them to shape it, contributing the knowledge, tools and skills that entrepreneurs need to be able to put their ideas to work, as well as to consolidate them and reduce business failure due to ineffective management practices.

In our case study, we have been able to demonstrate that the University of Valencia has consolidated its position as an entrepreneurial university, since its activities comply with all the requisites of the Model put forward by Arroyo and Van der Sijde (2008), which defines the stages of the comprehensive process of university entrepreneurship.

Furthermore, it complies with the definition put forward by Salamzadeh et al. (2011) regarding the concept of the entrepreneurial university, so the University of Valencia therefore, appears as a dynamic system with the necessary inputs to be able to put its entrepreneurial activities into practice. At the same time, it achieves the desirable outputs, and lastly, achieves the goals that are expected of all consolidated entrepreneurial universities in compliance of its so-called Third Mission.

In conclusion, the University of Valencia fits the entrepreneurial university profile by meeting the criteria established in the five requisites outlined by Etzkowitz (2004): capitalisation and transmission of knowledge; interdependence of the entrepreneurial university, business and government; independence from other institutional entities; organizational hybridisation based on interdependence and independence, and lastly, reflexivity to renovate and adapt to the changes in the environment.

References

- Arocena, R., & Sutz, J. (2001). Changing knowledge production and Latin American universities. *Research Policy*, 30, 1221–1234.
- Arroyo, M., & van der Sijde, P. (2008). Entrepreneurship encouragement and business development support at universities and science parks. Proposal for a new conceptualization. *Industry and Higher Education*, 22(1), 37–48.
- Bueno, E. (2007). La Tercera Misión de la Universidad: El reto de la Transferencia del conocimiento. *Revista madri+d*, No. 41.
- Clark, B. (2004). *Sustaining change in universities: Continuities in case studies and concepts*. London: Society for Research into Higher Education; Maidenhead: Open University Press.
- Clark, B. (1998). *Creating entrepreneurial universities: Organisational pathways of transformation*. New York: International Association of Universities and Elsevier Science.

- Corti, E., & Riviezzo, A. (2008). Hacia la universidad emprendedora, un análisis del compromiso de las universidades italianas en el desarrollo económico y social. *Economía Industrial*, 368, 113–124.
- Etzkowitz, H. (2002). Networks of innovation: Science, technology and development in the triple helix era. *International Journal of Technology Management & Sustainable Development*, 1(1), 7–31.
- Etzkowitz, H. (2003). Research groups as ‘quasi-firms’: The invention of the entrepreneurial university. *Research Policy*, 32(1), 109–121.
- Etzkowitz, H. (2004). The evolution of the entrepreneurial university”. *International Journal of Technology and Globalization*, 1(1), 64–77.
- Ortega y Gasset, J. (1930). *La Misión de la Universidad*. Obras Completas vol. IV. Revista de Occidente-El Arquero, Madrid.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge*. London: Sage.
- Lockett, A., & Wright, M. (2005). Resources, capabilities, risk capital and the creation of university spin-out companies. *Research Policy*, 34(7), 1043–1057.
- O’Shea, R. P., Chugh, H., & Allen, T. J. (2007). Determinants and consequences of university spinoff activity: A conceptual framework. *The Journal of Technology Transfer*, 33(6), 653–666.
- Salamzadeh, A., Salamzadeh, Y., & Daraei, M. (2011). Toward a systematic framework for an entrepreneurial university: A study in Iranian context with an IPOO model. *Global Business and Management Review: An International Journal*, 3(1), 30–37.
- Sánchez, J., Caggiano, V., & Hernández, B. (2011). Competencias emprendedoras en la educación universitaria. *International Journal of Developmental and Educational Psychology*, 3(1), 19–28.
- Sheen, D. (1992). Barriers to scientific and technical knowledge acquisition in industrial R&D. *R&D Management*, 22, 135–143.
- Slaughter, S., & Leslie, L. (1997). *Academic capitalism: Politics, policies and the entrepreneurial university*. Baltimore: John Hopkins University Press.
- Stiles, D. (2002). Higher Education Funding Council (HEFC) methods in the 1990s: national and regional developments and policy implications. *Public Administration*, 80(4), 711–731.
- Sutz, J. (2000). The university-industry-government relations in Latin America. *Research Policy*, 29, 279–290.
- Ziman, J. (1994). *Prometheus Bound: Science in a dynamic steady state*. Cambridge, UK: Cambridge University Press.

Chapter 16

Entrepreneurship at the Universitat Politècnica de València

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Abstract There is growing interest in entrepreneurship within universities. Universities aim to develop entrepreneurial skills in their students and establish the necessary paths to support entrepreneurial activities. This chapter focuses on entrepreneurial universities as key agents for the socioeconomic development of cities, regions, and nations. The chapter examines the transformation of universities to meet new business development needs and the Universitat Politècnica de València (UPV) as an entrepreneurial university.

Keywords Competences • Creation technology-based companies • Economic and social development • Entrepreneurial culture • Entrepreneurship support programmes • Entrepreneurship • European Higher Education Area • Flexible organizations • Generic skills • Instrumental skills • Interpersonal skills • Key competences • Skills development • Systematic skills • Teaching methodologies • Technology transfer • Thinking strategies • Universitat Politècnica de València • University entrepreneurship • University–industry relations

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16.1 Introduction

If universities are to be considered as key players in the process of economic development (Goldstein, 2009) then the concept of the entrepreneurial university is relevant. Entrepreneurial universities integrate the traditional activities of education and research while contributing to economic and social development (Etzkowitz, 1998; Goddard, 1998). This new role requires a redesign of the overall strategy of universities so that they can effectively meet the challenges posed (Arroyo, 2016). The fostering and dissemination of entrepreneurial culture at all levels of a university (teaching, research, and management) is a key part of this strategy and encourages an effective economic and social contribution to society.

However, a lack of consensus regarding the term entrepreneurship and a divergence between the conceptualisation of the term and its practical application, has led to entrepreneurial universities being frequently seen as those associated with technology transfer or the creation technology-based companies (Arroyo, 2016).

There are five common characteristics that describe entrepreneurial universities according to Clark (1998, Clark 2004):

- A core of strong government.
- A broad periphery of development.
- A motivated academic centre.
- A wide funding base.
- An integrated entrepreneurial culture.

The five characteristics described above generate a transformation based on innovative actions that drive the development of an entrepreneurial culture within a university with proactive attitudes by staff and agents.

Entrepreneurship support programmes (ESPs) are important for fulfilling related objectives because these programmes: encourage entrepreneurial culture in all areas; support the creation of new innovative or technology-based companies; support the development of new companies; provide training related to the creation and management of enterprises; and encourage university–industry relations (Arroyo-Vazquez & Van der Sijde, 2008).

Taking these points into consideration we examine if and why the Universitat Politècnica de València (UPV) can be considered an entrepreneurial university.

This paper is organised as follows. The first section presents an introduction. The theoretical framework with conceptual and legislative references appears in the second section. The model of the Universitat Politècnica de València is described in the third section and the fourth section presents the results. Finally, conclusions drawn from this work are presented.

16.2 Conceptual Framework

The functions of a modern entrepreneurial organisation are (Harbison, 1956):

- Management of risk and economic uncertainty.
- Planning and innovation.
- Coordination, management, and control.
- Routine monitoring.

Jelinek and Litterer (1995) state that an entrepreneurial organisation has at least three interconnected basic properties:

- Shared management.
- Open mindedness that is alert to anomalies.
- Superior ability to absorb ambiguity.

Jelinek and Litterer also indicate that entrepreneurial organisations must reorganise themselves to convert their resources and staff to new uses, as well as providing and managing new ideas.

We can distinguish five general types of universities (Fernández de Lucio, Castro Martínez, Conesa Cegarra, & Gutiérrez Gracia, 2000):

- Academic: basically a teaching university where decisions and resources are geared exclusively towards improving teaching.
- Classical: combines teaching and research activities—recognised institutionally and by the academic community.
- Social: active in the discussion and resolution of societal problems.
- Business: considers that knowledge is disseminated through regular educational and scientific channels but also has a market ‘value’ and therefore can be sold. Therefore, part of its teaching and R&D activity is focused on business criteria and an effort is made to effectively manage cooperation with society.
- Entrepreneurial: shares features with the business type but rather than viewing knowledge as an economic good for exchange, it uses knowledge to serve the objectives of the local environment, and takes an active social role.

For Clark (1998, 2004) entrepreneurial universities are those that make the most of the marketing potential of their ideas and create value for society. It is assumed that these universities are flexible organisations that respond to their environment in a coherent, strategic, and timely manner—without undermining their traditional academic mission. According to Clark there are four sets of values in higher education systems: social justice; competition; freedom; and loyalty. The third set is one of the most important in an entrepreneurial university. In short, according to Clark (2004) an entrepreneurial university has:

- Three groups of funding sources:
 - Complementary sources of government funding possibly linked to new projects or activities.

- Private sources related to non-profit organisations and professional associations—among others. This aspect may reflect relationships with social actors.
- Self-generated sources through mechanisms such as selling services and patents.

To offset declines in state funding many universities since the late 1980s have been forced to develop alternative strategies for raising funds from non-traditional sources (Arroyo, 2016).

- A high-level steering group that encourages decentralised autonomy and shares management responsibilities with stakeholders.
- An organisational structure in which classic units are complemented by new internal and external units, as well as broadly based units with professional profiles and new structures that create changes in those bureaucratic units that have remained unchanging and unmotivated.
- Efforts by academic departments to attract lecturers, students, and other resources to foster the development of the organisation—and involving those segments that need to become more entrepreneurial to improve organisational development.
- An entrepreneurial culture that shares a set of university-based ideas, beliefs, and values that provide a competitive identity.

Other features of an entrepreneurial university include:

- Graduates: trained to acquire a strongly entrepreneurial spirit.
- Faculty: stimulate an entrepreneurial spirit.
- Business: facilitate the creation of innovative and knowledge-intensive companies.
- Funding: additional funding sought.
- Dissemination: importance attached to the creation of knowledge and its dissemination and practical application.
- Community service: professional service to the community rewarded as well as academic performance.
- Innovation: seen is a key cultural element by encouraging flexibility and risk-taking, and honestly made mistakes not punished.
- Open doors: the creation of ‘ivory towers’ avoided, faculty encouraged to work and study in other universities, staff recruited from other universities, and integration with non-academic worlds encouraged.
- Cooperation: all types of agreements and cooperation with companies and organisations encouraged.

An entrepreneurial university can be defined as a development of the concept of an entrepreneurial organisation. Such a university can be understood as a flexible organisation that interacts with its social and economic environment by adapting to changes and seeking additional funding for research and teaching (Arroyo, 2016).

Entrepreneurial universities combine traditional teaching and research activities with an interaction with their local environment in order to contribute to development (Etzkowitz, 1998).

According to Arroyo (2016) programmes promoting entrepreneurship divide their activities into three main areas:

- Consultancy: including support for the development of business plans and advice for creating and developing companies.
- Training: specific entrepreneurship training in workshops, courses, masters, and so on.
- Entrepreneurship: encouraging entrepreneurial culture beyond consultancy, training, and business creation—such as research on issues related to entrepreneurship and measures to develop an innovative and entrepreneurial spirit in the university community.

As a result of national legislation, all Spanish universities now have programmes for advising and creating spin-offs from research (specifically, Act 4/2007 that amended Act 6/2001). Many universities manage their entrepreneurial activities with external institutions (such as municipal and regional governments, foundations, start-up company centres, and financial institutions).

An entrepreneurial university should approach these three missions in an entrepreneurial manner.

16.3 Universitat Politècnica de València

Spanish universities have traditionally been distant from the needs of business (Arroyo, 2016) and sought to train employees without much concern for the training of entrepreneurs and businessmen (Dalmau, Alonso, & Colomer, 2003).

The first initiative by a Spanish university to promote entrepreneurship and business creation was made by the UPV with the launch of the IDEAS programme (Initiative for the Development of New Businesses) in 1992. This was the only programme of its kind in Spain until 1997. All Spanish universities now have a programme to encourage entrepreneurship and spin-offs (Morales Gualdrón, 2008).

The UPV launched its first strategic plan in 2007 (covering the period until 2014). The plan aimed to convert the UPV into a world-leading innovative and entrepreneurial university (Arroyo, 2016).

The UPV has obtained good results if we look at the number of new companies created by students, graduates, and university staff—nearly 500 since 1992 (Programa IDEAS, 2015).

The UPV currently has 37,800 students, 2600 faculty, and 1700 administrative staff. It has 15 internal centres plus 3 affiliated centres (UPV, 2016).

16.3.1 *Entrepreneurship at the UPV—Historical Development*

The UPV was founded in 1968 as the *Instituto Politécnico Superior de Valencia*. The four original centres included the: School of Agricultural Engineers (founded in 1959); School of Architecture (founded in 1966); School of Civil Engineering (founded in 1968); and School of Industrial Engineering (founded in 1968) (UPV, 2016).

The UPV has focused on cooperation with partners since its foundation—although in the past the Spanish legal and institutional framework did not look favourably on relations between universities and business. The first contracts with companies were signed in 1971. The Centre for Employment Guidance and Information (CEGI) was founded in 1982 to help graduates find jobs—the result of an agreement with the National Employment Institute.

The 1983 University Reform Act favoured university relations with businesses through agreements and contracts for research and development. To help with the administrative tasks, an R&D office was established in 1986 under the Vice Rectorate for Economic Affairs, Research and Technological Development. Two executive units were subsequently created in 1989:

- Postgraduate Training Centre (PTC) which was responsible for continuous training.
- Centre for Technology Transfer (CTT) which was responsible for research and knowledge transfer.

In 1992 the UPV was the first Spanish university to launch a programme promoting entrepreneurship—called IDEAS. It started as a programme aimed at individuals in the UPV willing to start their own technology based company (Fernández de Lucio, Jiménez, Azagra, Castro, & Gutiérrez, 1999). The programme has evolved and still runs today.

The Socioeconomic Environment Relations Centre (SERC) was created in 1996 to coordinate the CTT, PTC, and COIE. This centre designed new strategies to improve relations with local businesses and encouraged entrepreneurial initiatives. SERC was directed and coordinated by experienced staff and was considered a key unit (UPV, 2016).

In 2000 the Vice-Rectorate for Employment was established (currently known as the Office for Entrepreneurship and Employment) and the COIE was renamed as the Integrated Employment Service (IES). Since then the service has contributed to the development of new initiatives and activities with businesses and developed opportunities for graduates to find their first job (Memoria SIE, 2015).

SERC was disbanded in 2001 and each of its units became an independent service, while the PTC and CTT were transferred to the Vice Rectorate for Research, Development and Innovation. The IDEAS programme was moved from the CTT to the Institute for Creation and Development of Enterprise (ICDE) under the Vice Rectorate for the UPV Foundation. The ICDE-IDEAS programmes were subsequently transferred to Vice Rectorate for Employment in 2005 (UPV, 2016).

New national legislation in 2007 (Act 4/2007) offered an opportunity to accelerate the creation of spin-offs using university research and prompted the creation of

the UPV science park—known as the ‘Ciudad Politécnica de la Innovación’. The science park features an open cooperation network with a flexible configuration that brings together public and private stakeholders to share knowledge and resources. It follows the commitment of the UPV to foster the economic development of the Valencia region.

The UPV developed in 2013 an overall entrepreneurship plan, called Poli [emprende], under the management of the IDEAS Institute, to organise the UPV’s entrepreneurial initiatives.

16.3.2 UPV as an Entrepreneurial University

The UPV statutes define the university as being entrepreneurial with a clear orientation towards the economic and social development of the Valencia region and Spain (UPV, 2016). However, an entrepreneurial the university must satisfy three missions:

- Entrepreneurial training:
 - Curricular education: the UPV has incorporated into its study plan subjects related to entrepreneurship and innovation. These subjects are taught by the management and projects departments at undergraduate and postgraduate levels.
 - Non-curricular education: the UPV offers extensive training in subjects related to entrepreneurship—some of which have been taught by the IDEAS Institute since 2000. These courses are practical in nature. A programme entitled ‘Entrepreneurs’ offers business management training. There are also workshops on small businesses, business opportunities, and feasibility studies—as well as online courses on successful entrepreneurship.
- Innovation in teaching:
 - The Institute of Educational Sciences in Spanish *Instituto de Ciencias de la Educación* (ICE) trains, advises, helps educational innovation, assists in formative assessment, and provides resources to teachers.
 - The UPV’s multimedia services offers a wide range of services and technical assistance to UPV faculty for incorporating new technologies in teaching. These technologies include video notes, polymedia, massive open online courses (MOOC), and flip-teaching.
- Contribution to economic and social development of Valencia and Spain: this is covered by the IDEAS programme, the *Ciudad de la Investigación* science park, and the Integrated Employment Service (IES).
 - The IDEAS programme served nearly 6000 entrepreneurs between 1992 and 2013 and has supported the creation and development of 640 companies.
 - The *Ciudad Politécnica de la Innovación* science park has signed agreements, R&D contracts, and technology licensing agreements that benefit some 3000 companies and public organisations annually.

- The Integrated Employment Service manages several employment initiatives at the UPV and helps graduates find jobs. A total of 4964 students took part in 7861 internships in companies in Spain and abroad in educational cooperation programmes during 2015 (involving a total of 2587 companies and organisations—Memoria SIE, 2015).
- UPV funding: the university is funded 69 % by government funds; 30 % by self-generated funding; and 1 % from private funding (Presupuesto UPV, 2015).

16.4 Results

In this section we will assess the UPV using both the Clark and Rey models for enterprising universities.

- In line with the Clark model (1998, 2004):
 - There is a strong management core that encourages self-management, decentralisation, and shared responsibility. This is true in the UPV as the management system gives autonomy to service providers, centre and departmental managers, as well as research facilities. However, this autonomy is subject to legislation and a growing bureaucratisation—especially in economic aspects—that limit management flexibility.
 - Flexible organisation oriented to the needs of the environment. Although the UPV is a flexible organisation that responds to local needs (as we have seen through the CTT, IDEAS, and the *Ciudad Politécnica de la Investigación* science park) the fact that staff are state employees limits flexibility.
 - Diversified funding: the UPV is 69 % state funded, and only 30 % self-funded: this mix should be changed for it to become a truly entrepreneurial university.
 - Motivated academic centre: the UPV through the ICE, CTT, PTC, IDEAS units and other centres does an important job in motivating teachers. This work should be further extended with the UPV taking some direct teaching responsibility.
 - Integrated entrepreneurial culture: the UPV encourages the creation and development of business with actions aimed at promoting entrepreneurship. The Vice Rectorate of Entrepreneurship should further encourage this work.
- In contrast, the characteristics indicated by Rey (2015) reveal:
 - Graduates: only some degrees include courses in entrepreneurship. Students can improve this training with courses provided by IDEAS.
 - Faculty: most lecturers do not provide training in entrepreneurship and just 2 of the 42 departments teach entrepreneurship.
 - Companies: the UPV facilitates the creation of innovative companies and spin-offs.

- Financing: the funding mix should be substantially changed.
- Dissemination: the UPV successfully spreads knowledge and practical applications to society.
- Community service: although the UPV recognises professional services given to the community, such services are not as highly valued as research publication.
- Innovation: this is a part of the UPV culture as evidenced by the Vice Rectorate for Entrepreneurship, IDEAS Institute, the *Ciudad Politécnica de la Investigación* science park and other organisations.
- Open doors: the UPV has always employed professionally qualified associate lecturers who work in companies.
- Cooperation: the UPV participates in projects and works with companies under various agreements.

16.5 Conclusions

The concept of the entrepreneurial university is usually identified with activities that develop knowledge transfer and support for business creation. In this regard, the UPV can be considered an entrepreneurial university.

However, if we consider an entrepreneurial university as a university that fulfils certain entrepreneurial missions (training, teaching, finance, social responsibility and management) then we can only say that the UPV is on the right track. Being an entrepreneurial university is much more than supporting entrepreneurship and exploiting research results.

The UPV encourages and supports entrepreneurship. It is making considerable progress on the road to becoming an entrepreneurial university: however; certain changes need to be made and these include funding. The current Spanish university system does not help in this respect. Nor do the current regulations governing universities, although these have improved with the change of legislation in 2008. This legislative reform opened the door for the creation of companies based on technology produced from university research.

The creation and development of an entrepreneurial culture in universities is essential—yet it is not an easy or quick road. Long-term commitment by universities and governments is needed.

For the UPV to be considered an entrepreneurial university it is necessary to change the imbalance of funding sources and further develop the entrepreneurial culture.

However, the UPV has established a good foundation and since its inception some 40 years ago it has always contributed to the economic and social development of Valencia and Spain—especially from the point of view of transferring scientific knowledge and supporting the creation of technological businesses. This last point has been further accelerated by the establishment of the IDEAS institute and programmes and the *Ciudad Politécnica de la Investigación* science park.

References

- Arroyo, M. (2016). *Emprendimiento y Universidad Emprendedora: conceptualización, propuesta metodológica y caracterización de la Universidad Politécnica de Valencia*. Doctoral dissertation.
- Arroyo, M., & van der Sijde, P. (2008). Entrepreneurship encouragement and business development support at universities and science parks. Proposal for a new conceptualization. *Industry and Higher Education*, 22(1), 37–48.
- Clark, B. (2004). *Sustaining change in universities: Continuities in case studies and concepts*. London: Society for Research into Higher Education.
- Clark, B. (1998). *Creating entrepreneurial universities: Organisational pathways of transformation*. New York: International Association of Universities and Elsevier Science.
- Dalmau, J. I., Alonso, J. L., y Colomer, J. (2003). *Programa IDEAS*. Un modelo de éxito para fomentar la creación de empresas desde las universidades. Editorial Universitat Politècnica de València.
- Fernández de Lucio, I., Jiménez, F., Azagra, J., Castro, E., & Gutiérrez, A. (1999). *Una Primera Aproximación a la Contribución del Programa Nacional de Tecnología de Alimentos a la Articulación del Sistema Alimentario Español*. Actas de ALTEC.
- Etzkowitz, H. (1998). The norms of entrepreneurial science: Cognitive effects of the new university-industry linkages. *Research Policy*, 27(8), 823–833.
- Fernández de Lucio, I., Castro Martínez, E., Conesa Cegarra, F., & Gutiérrez Gracia, A. (2000). Las relaciones universidad-empresa: entre la transferencia de resultados y el aprendizaje regional. *Espacios*, 21(2), 127–148.
- Goddard, J. (1998). *The role of universities in regional development*. World Conference on Higher Education, Thematic Debate Contributing to national and regional development, Paris.
- Goldstein, H. (2009). Theory and practice of technology-based economic development. In J. E. Rowe (Ed.), *Theories of local economic development: Linking theory to practice* (pp. 237–264). Farnham, England: Ashgate Publishing Limited.
- Harbison, F. (1956). Entrepreneurial organization as a factor in economic development. *The Quarterly Journal of Economics*, 70, 364–379.
- Jelinek, M., & Litterer, J. A. (1995). Toward entrepreneurial organizations: Meeting ambiguity with engagement. *Entrepreneurship: Theory and Practice*, 19(3), 137–169.
- Memoria SIE. (2015). Retrieved March 12, 2016, from www.upv.es/entidades/SIE/info/U0724356.pdf.
- Morales Gualdrón, S. T. (2008). *El emprendedor académico y la decisión de crear Spin off: Un análisis del caso español*. Doctoral dissertation.
- Presupuestos UPV. (2015). *Presupuestos de la Universitat Politècnica de València 2015*. Retrieved April 22, 2016, from www.upv.es/entidades/GER/info/U0677411.pdf.
- Programa IDEAS. (2015). *IDEAS Program website*. Retrieved March 12, 2016, from <http://www.ideas.upv.es/>.
- Rey, A. (2015). *La universidad emprendedora*. Retrieved March 25, 2016, from www.amaliorey.com.
- UPV (2016). *Universitat Politècnica de València Website*. Retrieved March 25, 2016, from www.upv.es.

Chapter 17

CETYS University: Teaching in a Proactive and Entrepreneurial University

Marta Peris-Ortiz, Monica Acosta-Alvarado, and Mariella C. Remund

Abstract This chapter describes several basic aspects of the economy and entrepreneurship in Mexican society as the framework in which CETYS University carries out its teaching program. The aim of this paper is to focus on the Master of Business Administration teaching program at CETYS. The globalization of markets, technological change and the knowledge economy require that universities play a more proactive role, and this is what CETYS seeks to incorporate. It also considers that the biggest challenges for Mexico are to help entrepreneurs to be more innovative and technologically oriented, so they can increase competitiveness and satisfy the global consumer and provide them with the knowledge and skills which they need in order to reduce the fear of failure. To provide these skills and knowledge, this paper highlights that there are two types of skills which must accompany entrepreneurship: the skills related to team work and those related to communication; accordingly, the entrepreneur is not only able to discover opportunity, but he/she can also create it, both in the economic dimension as well as in the social dimension of entrepreneurship.

Keywords Baja California • CETYS University • Competitiveness • Entrepreneurial activity • Entrepreneurial University • Mexico • Moocs • Program • Skills • Teamwork

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17.1 Introduction

The globalization of markets, technological change and the knowledge economy require that universities play a more proactive role; this has led them to implement innovation and entrepreneurship initiatives in the educational field, and in other activity sectors, in order to satisfy and anticipate the requirements of this new environment.

In recent decades, knowledge has been generated by a wide variety of institutions and organizations and in a very relevant way, in corporate R&D departments or in the company as a whole (Nonaka & Takeuchi, 1995), and this is the result of the practice and experience inherent to human activity (Spender, 2008). On the other hand, the university, as an institution which has traditionally assumed the role of generating knowledge, safeguarding, disseminating, and subjecting it to criticism, faces the modern day challenge to avoid becoming outdated. This challenge is primarily manifested: (1) in terms of the teaching-learning process which may be inconsistent with the new requirements and lifestyles (Moocs, Ted talks, Youtube); (2) in the organization models of the universities, based on organizational structure which are not adapted and/or fail to respond to the speed, interdependence and complexity of the context in which they operate; (3) in the profile and career plan of the professors; (4) in the curricular design of the programs; and (5) in the university's general link with the environment.

This chapter is focused on the CETYS University and suggests procedures to be considered in order to generate entrepreneurial and innovation initiatives in the students, based on the theoretical and practical experience of the professors. In this case, the chapter is based on the experience of three professors from CETYS who come from different continents (Europe, Asia and the USA), who share classes in the Master in Business Administration (MBA) program of this university. The methodology or the teaching procedures to which we refer, include the development of entrepreneurship, team work and communication competencies.

17.2 Context and Background

Specific information is provided in order to better understand the context and background of the Graduate students to whom we refer in this case. Mexico is the second largest economy in Latin America, according to World Bank (2014), Table 17.1 shows basic data about the country.

In 2013, the Literacy rate for Mexico was 93.96%, as stated by Statista (2016). According to Mexico's National Counsel of Science and Technology, which is the translation of Consejo Nacional de Ciencia y Tecnología (CONACYT) in 2011, the total population in Mexico stood at 112 million, only 12 million citizens have a Bachelors degree and less than a million have a Graduate degree.

Table 17.1 Basic data about Mexico

Population	125.4 million	2014
GDP	\$1.295 trillion	2014
GDP growth	2.2 %	2014
Inflation	4.0 %	2014

As reported by OECD (2014), Mexico has the largest proportion of students enrolled in public institutions, at *nearly* all levels of education, compared with other Latin American countries. Only Argentina has a larger proportion of students enrolled in public institutions at the tertiary level (74 % compared to 68 % in Mexico). However, when we discuss Graduate studies, this is another story, even more so, when we specifically analyze the situation in Baja California.

Baja California is a state located in the northwestern region of Mexico; data from the 2012–2013 period shows that of the 6174 students enrolled in Graduate programs, 78.6 % were in Master’s Degree programs and 13 % in Doctoral studies. Private Universities represented 52 % of the total enrollment and the rest was distributed among other institutions with State or Federal resources (SEE, 2014).

Mexico is considered among the countries with strong perceptions of opportunities and capabilities with a growing level of entrepreneurial activity; in the last few years, Total early-stage Entrepreneurial Activity (TEA) rates in the country have been increasing consistently; TEA in 2011 was 9.6 % in comparison with 2014 when the rate doubled (19 %) for the adult population, which represents a rate above the average for Latin-American countries (17.6 %) and for efficiency-driven economies. The results for Mexico are higher than all countries in the innovation-driven stage of development, according to the Global Entrepreneurship Monitor (GEM) data from 2014.

Mexicans tend to start businesses to pursue an opportunity, rather than out of necessity—three out of four (76 %) early-stage entrepreneurs start a business pursuing an opportunity and 50 % are improvement-driven. Nearly half of the adult population perceive good opportunities to start a business (49 %), probably the downside of the situation is in the growing stage, only 1.5 % of Mexico’s entrepreneurs expect to grow their businesses by 20 or more employees in the next 5 years, which is low compared with the Latin America average of 7.5 %. It is important to highlight the profile of the Mexican entrepreneur who has an average age between 25 and 44, male or female, with post-secondary education, and in a consumer-oriented business (GEM, 2014). The fear of failure (30 %) has remained generally consistent since GEM data was first collected in the country in 2001 (about one third of the population), this is mainly because of the Mexican culture and idiosyncrasy, and the perception and interpretation of failure by the society.

For Mexico, the biggest challenges are to encourage entrepreneurs to be more innovative and technologically oriented, increasing competitiveness and satisfying the global consumer and provide them with the knowledge and skills they need in order to reduce the fear of failure (Urbano & Alvarez, 2014).

This represents a major challenge for Higher Education Institutions (HEI), even more so for Graduate Business Schools, which is the reason why they are actively promoting entrepreneurship as a way of life.

Since Baja California is near to the US, in fact, Mexicali, B.C. the capital of the state lies directly on the border of Calexico, CA and Tijuana is on the border of San Diego, CA, the students and professors are very familiar with the learning strategies used in that country, the major educational partnerships are with US educational institutions, at least this is the case of the entrepreneurial and innovative university subject of this chapter, since, it is the university where the three female professors participating in this chapter concur, giving lectures to the Master in Business Administration (MBA) students, applying innovative learning strategies.

17.3 The MBA and the Experience

In order to promote entrepreneurship as a way of life, the MBA program has to attract, retain and deploy professors with an innovative and entrepreneurial educational approach (Lefebvre & Redien-Collot, 2012).

“Entrepreneurship educators are the promoters of dreams, agents of change, facilitators of opportunity, generators of empowerment and promulgators of revolution – whether through our research, teaching or outreach, this is our sacred role... this is our destiny” (Morris, Kuratko, & Cornwall, 2013). We believe, as the authors mentioned, every Entrepreneurship University, whether it has a entrepreneurship specific academic program or a certain curricula devoted to entrepreneurship or not, must be innovative and be assertive, it has to take risks with new ways of facilitating knowledge and adding new and creative educational techniques and strategies to achieve the learning they aim for their students.

In these universities, the professors lecturing in any curricula must be the disrupters, by creating hands-on activities (Woolfolk & Acosta, 2016), designing applied projects in the industry to be developed from their students, bringing entrepreneurs to the classroom to share their experiences or just reimagining, redesigning and reformulating the facilitation process in/or outside the classroom, linking strategic entrepreneurship and strategic business courses (Genç, 2012); which is exactly what has been occurring in the MBA program of CETYS University. Additionally, it has been incorporating the entrepreneurial international dimension (Manek Kirpalani & Gabrielsson, 2004) through their foreign professors, through the educational partnerships with international institutions, enterprises and sending students overseas to have the opportunity of an international learning experience, combining recognized international professors' lectures in addition to collaborating with international classmates in other countries.

Furthermore, the implementation of the incubator in the University and the participation of diverse mentors to advise and assess the students with their projects, to help them to found start-up companies (Todorovic & Suntornpithug, 2008); and on the other hand, integrating new and different business models in the curricula, from

business plans to business model canvas, not just developing their canvas, but also validating it (Del Carmen Aldana Fariñas, Del Carmen Ibarra Santa Ana, & Loewenstein Reyes, 2011; Sart, 2015) and developing competencies such as teamwork and communication skills.

17.3.1 Teamwork

Teamwork is an essential element of any successful organization in a highly competitive industry, because if there is relevant knowledge that needs to be shared, teamwork is a better organizational structure (Nonaka & Takeuchi, 1995). Educational institutions have a responsibility to teach students to work effectively in teams because if there are intangibles, knowledge or dynamism of the environment, organizational performance depends on group synergies rather than individual contributions. Teamwork is also a key competence; a prerequisite for university students who need to think analytically and systematically to manage time and meetings between team members, and participate in decision-making and management of goals and projects.

Dickinson, Converse, and Tannenbaum (1992) defined a team as a distinguishable set of two or more people who interact dynamically, interdependently, and adaptively towards a common and valued goal/object/mission who have each been assigned specific roles or functions to perform. Teams are formed by individuals who share the following characteristics. They (1) have common goals; (2) have a collective identity; (3) are interdependent in terms of their assigned tasks and resources; (4) have distinctive roles within the team; and (5) are part of a larger organizational context that influences their work and that they in turn can influence (Morgeson, Lindoerfer, & Loring, 2010). The concept of teamwork as an organizational competence is relatively new. Several authors have defined the term. For Cannon-Bowers, Tannenbaum, Salas, and Volpe (1995), teamwork competencies include knowledge, principles and concepts of the tasks and operation of an effective team, the set of skills and behaviours needed to perform tasks effectively whilst respecting attitudes of each team member. Researchers have recognized the complexity of teamwork and have reported that teamwork competencies are multidimensional.

In a more general sense, the capacity to work in a team can have major importance for entrepreneurship. Shane and Venkataraman (2000) essentially define entrepreneurship as the entrepreneur's capacity to discover opportunities, which make him/her a precursor of certain activities which the other competitors will take time to discover or imitate. However this question, which corresponds to a relevant feature of the entrepreneur, is not his/her only important characteristic because opportunity is not only discovered, it can also be created (Schumpeter, 1934, 1950), and in this case, its creation relies on the personal experience acquired in the company and in cooperation with the other members of the company (Hayton, 2005, 2006; Zotto & Gustafsson, 2008). This clarifies why in the MBA teaching program

in CETYS, we place so much importance on team work and communication skills. This means that the entrepreneur, when he/she acts based on his/her own experience and from his/her company to create opportunity (as a corporate entrepreneur), he/she finds the required skills in his/her organization.

17.3.2 Communication and Participation

Thus as we have just mentioned, an important set of skills for team members is communication skills. Communication skills can be grouped into written and oral communication. Oral communication is most relevant in teamwork meetings. Crucially, teamwork success depends heavily on circumstances and contingencies, and focusing this research on teamwork meetings simplified the study considerably. Oral communication is the ability to talk to others to give and exchange information and ideas. Mastery of oral communication involves effective communication of ideas, knowledge and feelings in conversations and group activities (oral presentations and class activities). Mastery of this competency means clear and effective communication, structuring of discourse, adapting to different audiences, simultaneously using verbal and non-verbal language, proper use of tone and rhythm, use of pauses, use of and media support. Interpersonal skills overlap considerably with communication skills in their broadest sense. The close relationship between communication skills, teamwork skills and the corporate entrepreneur is clear.

In the CETYS MBA the professor works with the Business Model Canvas in order to develop the three aforementioned competencies: entrepreneurship, teamwork and communication skills.

The class starts by forming groups of five students and providing time for brainstorming in order to think about an innovative and viable business model. Then they start developing the nine building blocks of the building model canvas step by step. The students work in teams during each class and have to present the evolution of their model at the end of each class. Once their business model has been evaluated, each team starts working on the corresponding business plan. At the end of the course they have to present a portfolio with all the activities that they have developed and a memory of their project as well as a 15 min oral presentation. In this way, the students develop three important competences: communication skills, teamwork and entrepreneurship.

In reference to the participation by the teaching party—the current or future entrepreneurs who attend the classes—this proves to be essential, and accordingly, they must fulfil the three conditions which complete that stated above:

1. It is necessary to develop a highly structured course design, where at all times, the students are perfectly familiar with the current phase of their learning process. The creation of a roadmap for the entire course with the key concepts has proven to be very successful. Having understood the systematic approach behind the decision making process, the students will localize it and adapt it to their own business environment, making the knowledge obtained in class come to life within the framework of their own circumstances.

2. Students want to be an active part of the learning process. The strategy here to meet their expectations is to simulate a real marketing or business plan in class by asking the students to select a company or a product which is used to apply the concepts and tools explained in class. By doing this, the students' expectations to learn from the teacher in class and to be a part of the process are met. The selected company is compatible with the business model which must be evaluated along with the team work.
3. The students expect real feedback on their work and progress especially during in-class presentations as the work progresses. If this does not take place in a suitable way, it can create misunderstandings. The professor needs to take a leading role in showing the correct way of analyzing or interpreting a business situation, and invite the students to a deeper level of knowledge by pointing out the connections and strategic implications of their decision making.

In this way, the entrepreneurial apprenticeship, which the Master's program aims to provide, shall be fulfilled in a satisfactory way.

17.4 Conclusions

In this way, the students develop three important competencies: communication skills, teamwork and entrepreneurship. All these competencies are related and unified in the corporate entrepreneur concept, when the entrepreneur qualities are not only linked to the discovery of opportunities, but one of their most important characteristics also resides in the ability to create opportunity.

The way in which teaching establishes the training and discovery route for the student has major importance by combining the building model canvas with their own experience. In the attitudes and behaviors as well as the work method which they propose to the student in class, CETYS intends for them to be the same type as those which the entrepreneur would require in their performance in the real world.

Certainly, there is a long road ahead, and a lot to be done, particularly in the venture capital, the start-ups' needs, raising funds for new ventures or to accelerate those companies; currently there is an infrastructure plan for co-working spaces to provide the students with the space and environment required to generate new ideas. There are always opportunities for improvement, space for innovations and the development of entrepreneurial perspectives in education.

References

- Cannon-Bowers, J. A., Tannenbaum, S. I., Salas, E., & Volpe, C. E. (1995). Defining competencies and establishing team training requirements. In R. Guzzo & E. Salas (Eds.), *Team effectiveness and decision making in organizations* (pp. 333–380). San Francisco: Jossey Bass.

- CONACYT. (2011). Retrieved March 13, 2016, from <http://noticias.universia.net.mx/ciencia-nyt/noticia/2011/04/01/807511/solo-2-10-mexicanos-cursan-posgrado-conacyt.html>.
- Del Carmen Aldana Fariñas, E., Del Carmen Ibarra Santa Ana, M. T., & Loewenstein Reyes, I. (2011). El modelo de negocios como reforzador del emprendimiento en las universidades. Caso del Tecnológico de Monterrey Campus Ciudad de México. *Revista Ciencias Estratégicas*, 19(26), 185–201.
- Genç, K. Y. (2012). The response of the entrepreneurship to the changing business environment: Strategic entrepreneurship. *International Journal of Economic & Administrative Studies*, 5(9), 71–83.
- Global Entrepreneurship Monitor. (2014). Retrieved March 17, 2016, from <http://www.gemconsortium.org/country-profile/87>.
- Hayton, J. C. (2005). Promoting corporate entrepreneurship through human resource management practices: A review of empirical research. *Human Resource Management Review*, 15, 21–41.
- Hayton, J. C. (2006). A competency-based framework for promoting corporate entrepreneurship. *Human Resource Management*, 45(3), 407–427.
- Lefebvre, M. R., & Redien-Collot, R. (2012). Achieving legitimacy in entrepreneurship education: A case study. *Journal of Enterprising Culture*, 20(4), 481–500. doi:10.1142/S0218495812500203.
- Manek Kirpalani, V. H., & Gabrielsson, M. (2004). The need for international intellectual entrepreneurs and how business schools can help. *Journal of Teaching in International Business*, 16(1), 101–118.
- Morgeson, F. P., Lindoerfer, D., & Loring, D. (2010). Developing team leadership capability. In E. Van Velsor, C. D. McCauley, & M. N. Ruderman (Eds.), *The center for creative leadership handbook of leadership development* (3rd ed., pp. 285–312). San Francisco: Jossey-Bass.
- Morris, M. H., Kuratko, D. F., & Cornwall, J. R. (2013). *Entrepreneurship programs and the modern university*. Northampton, MA: Edward Elgar Publishing, Inc.
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company. How Japanese companies create the dynamics of innovation*. Oxford: Oxford University Press.
- OECD. (2014). *Education at a glance: OECD indicators, Mexico*. Retrieved March 17, 2016, from <http://www.oecd.org/edu/Mexico-EAG2014-Country-Note.pdf>.
- Salas, E., Dickinson, T. L., Converse, S., & Tannenbaum, S. I. (1992). Toward an understanding of team performance and training. In R. W. Swezey & E. Salas (Eds.), *Teams: Their training and performance*. Norwood: Ablex.
- Sart, G. (2015). The new leadership model of university management for innovation and entrepreneurship. *Eurasian Journal of Educational Research (EJER)*, 58, 73–90.
- Schumpeter, J. A. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.
- Schumpeter, J. A. (1950). *Capitalism, socialism and democracy* (3rd ed.). New York: Harper & Row.
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25, 217–226.
- Sistema Educativo Estatal. (2014). *Baja California, Principales cifras estadísticas*. Retrieved March 16, 2016, from <http://www.educacionbc.edu.mx/publicaciones/estadisticas/2015/PublicacionesEstadisticas/Cuadernillo%202013-2014.pdf>.
- Spender, J. C. (2008). Organizational learning and knowledge management: Whence and whither? *Management Learning*, 39(2), 159–176.
- Statista. (2016). Portal de estadísticas para datos de mercado. [Página web] Recuperado 27 October 2016.
- Todorovic, Z. W., & Suntornpithug, N. (2008). The multi-dimensional nature of university incubators: Capability/resource emphasis phases. *Journal of Enterprising Culture*, 16(4), 385–410.
- Urbano, D., & Alvarez, C. (2014). Institutional dimensions and entrepreneurial activity: An international study. *Small Business Economics*, 42(4), 703–716.
- Woolfolk, D., & Acosta, M. (2016). Experiential activities: A tool to increase entrepreneurial skills. In M. Peris-Ortiz, J. A. Gomez, F. Velez, & C. Rueda-Armengot (Eds.), *Education tools*

for entrepreneurship: Creating an action-learning environment through educational learning tools (pp. 153–166). New York, NY: Springer.

World Bank. (2014). *Mexico*. Retrieved March 17, 2016, from <http://www.worldbank.org/en/country/mexico>.

Zotto, C. D., & Gustafsson, V. (2008). Human resource management as an entrepreneurial tool. In R. Barret & S. Mayson (Eds.), *International handbook of Entrepreneurship and HRM* (pp. 89–110). Cheltenham, UK: Edward Elgar.

Chapter 18

Intrapreneuring Within a Higher Education Institution: Introducing Virtual Business Internships

Gisela Sanahuja Vélez, Gabriela Ribes Giner, and Ismael Moya Clemente

Abstract Past research on business internships recognizes positive effects on its main stakeholders: students, employers, and higher education institutions. Moreover, some authors have acknowledged further effects in virtual internships and when applying new technologies to the internship experience, particularly referred to enhanced computer skills and learning outcomes. The Faculty of Business Administration and Management of the Universitat Politècnica de València, in Spain, has experienced an outstanding increase of its internships in recent years. As employers are demanding more computer skills in a globalized and technological world, it is expected that virtual internships and the use of ICTs during the traineeship will be a tendency in higher education institutions in the future. At present, the management of internships of the two new Double Degrees in our institution (Business Administration and Management+Computer Science Engineering, and Business Administration and Management+Telecommunications Engineering), offers, in the opinion of the authors, the perfect scenario to explore the possibilities of new technologies applied to internships and to put into practice virtual internships. Recent changes in the Spanish laws and in the regulations of universities, such as the Universitat Politècnica de València, allow business internships to take place abroad. These conditions could provide an opportunity for innovation and growth, especially by combining internationalization with virtualization of traineeships. The above mentioned initiative is a good sample of intrapreneurship within a large organization, where the employees, in this case, the authors of this text, behave like entrepreneurs, acting like agents of change.

Keywords Business administration • Higher education • Internship • Intrapreneuring • Intrapreneurs • Knowledge • New technologies • Virtual business

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18.1 Introduction

According to Pinchot (1984), intrapreneurs are “those who take hands-on responsibility for creating innovation of any kind, within a business”. Being an intrapreneur is considered to be positive for both intrapreneurs and large organizations. Enterprises support intrapreneurs with funding and access to corporate means, while intrapreneurs create innovation for enterprises (Pinchot, 1984). Antoncic and Hisrich (2003) defined intrapreneurship as “entrepreneurship within an existing organization”. “Intrapreneurship refers not only to new business ventures, but also to other innovative activities and orientations such as development of new products, services, technologies, administrative techniques, strategies and competitive postures” (Antoncic & Hisrich, 2003). Intrapreneurs are employees and also leaders within large organizations that behave similar to entrepreneurs in terms of self-motivation, creativity and pro-activity (Pinchot, 1984).

In this paper, the authors acted as intrapreneurs, searching for opportunities within the field of the business internships management within a large organization, the Universitat Politècnica de València, and shaped them into a high-potential innovation.

Past research on business traineeships has recognized beneficial effects on its three main agents: students, employers, and higher education institutions (Coco, 2000; Divine, Linrud, Miller, & Wilson, 2007; Gault, Redington, & Schlager, 2000; Thiel & Hartley, 1997). A systematic review of the literature about business internships and their impact on their stakeholders by Sanahuja Vélez and Ribes Giner (2015) listed good number of beneficial effects and indicated that they are a win-win situation. Evidence proves the efficacy of business traineeships done by university students in increasing their employability (Callanan & Benzing, 2004; Cook, Parker, & Pettijohn, 2004; Divine et al., 2007; Gault, Leach, & Duey, 2010; Gault et al., 2000; Knouse & Fontenot, 2008; Knouse, Tanner, & Harris, 1999; Mihail, 2006; Taylor, 1988; Weible & McClure, 2011). Also, the enhancement of skills is highlighted as another important positive effect on students (Beard & Morton, 1999; Chen, 2011; Cook et al., 2004; Divine et al., 2007; Gault et al., 2000; Green, Graybeal, & Madison, 2011; Gryski, Johnson, & O’Toole, 1987; Knouse & Fontenot, 2008; Knouse et al., 1999; Mihail, 2006; Scholz, Steiner, & Hansmann, 2003; Taylor, 1988; Thiel & Hartley, 1997).

Advances in technology, including high speed internet connections and low-cost portable devices, have made the virtual workplace a reality which is expected to develop (Franks & Oliver, 2012). The work market presents an increasing trend to telecommuting, distant work or telework. “Telecommuting” is a work agreement in which employees do not travel to a central place of work. “Telework” refers to all types of technology-assisted work conducted outside of a centrally sited work space (comprising work undertaken at home, outside calls, etc.). In the same way, institutions of higher education are beginning to spot the value of virtual internship as effective experiential learning opportunities to acquire professional skills and competencies (Franks & Oliver, 2012).

The purpose of this research was to examine the literature published during the past 10 years on the relation of business internships and new technologies. Our aim was also to analyze the current state at the Universitat Politècnica de València in order to determine if the existing conditions would allow an opportunity for innovation and growth in this field. Undertaking this research in order to spot the convenience of suggesting a project of virtual internships to the large higher education institution to which we belong, is a good example of intrapreneurship.

18.2 Method

18.2.1 Literature Search and Identification of Studies

Using the systematic review on the effects of business internships published by Sanahuja Vélez and Ribes Giner (2015), we identified a sample of studies relating ITCs and business internships, published during the past 10 years. We scanned the selected chapters in search of interactions and effects of the ITCs on business internships. We enumerated these effects using the method of Perello-Marín and Ribes Giner (2014), which is a version of the Q sorting (Petter, Straub, & Rai, 2007).

18.2.2 Data Gathering and Analysis of the Present Conditions

We obtained the statistical figures about business internships through the official sources of the Universitat Politècnica de València. We checked the Spanish legislation which regulates the business internships (*Real Decreto 592/2014 de 11 de julio, por el que se regulan las prácticas académicas externas de los estudiantes universitarios*), and the internal regulations of the Universitat Politècnica de València (*Reglamento sobre Prácticas en Empresas e Instituciones de los Estudiantes de la Universitat Politècnica de València*, approved by the Universitat Politècnica de València on the 28th of May of 2015) to picture and analyze the legal background.

18.3 Results

18.3.1 Business Internships and Their Relation to New Technologies

The literature review returned a total of five papers relevant to business internships and ICTs. Two studies were of quantitative and three were qualitative. The findings related to new technologies found were listed and can be found in Table 18.1.

Table 18.1 Business internships and their relation to new technologies

	Findings	Authors
1.	Virtual internships increase computer and ITCs skills	Franks and Oliver (2012), Mihail (2006)
2.	Virtual internships enhance independent and critical thinking. Other skills learned or developed include: project management, independent work, research skills, virtual presentations, teamwork	Franks and Oliver (2012)
3.	Virtual internships provide new knowledge and skills through social negotiation with both the faculty internship supervisor and the company supervisor (social learning theory)	Franks and Oliver (2012)
4.	Blogging can improve knowledge construction, reflection, learning, and communication of emotions	<i>Chu, Chan, and Tiwari (2010), Chu, Kwan, and Warning (2012)</i>
5.	Additional learning from social networking: managing a social media site, writing in a digital environment, learn to transfer social media personal skills to professional settings	McEachern (2011)
6.	Virtual traineeships enable distance students to obtain industry appropriate experience	Conroy and Khan (2008), Franks and Oliver (2012)

Qualitative studies in regular characters and *Quantitative studies in italic characters*

With the rapid growth of the number of on-line enrollments in universities, educators have the challenge of guaranteeing that work placement experiences are offered to distant students. Institutions of higher education are beginning to recognize the value of virtual internships as valid experiential learning as well as a good chance to acquire professional skills and competences (Franks & Oliver, 2012). Some institutions are therefore integrating in their programs on-line virtual internships and thus allowing distant students to attain industry-relevant experience (Conroy & Khan, 2008; Franks & Oliver, 2012).

On the one hand, according to past research, virtual internships offer the same benefits as place-based work placement, but they offer supplementary benefits as well, such as learning to use modern information and communication technology to perform their work and to cooperate with their site supervisor and co-workers (Franks & Oliver, 2012). Virtual traineeships enhance computer and ITCs skills (Franks & Oliver, 2012; Mihail, 2006) and some other skills are also improved through virtual internships, such as working independently and critical thinking (Franks & Oliver, 2012).

On the other hand, blogging has been endorsed as a suitable tool for learning during traineeship due to its associated utility in collaborative learning, reflection, communication, and social support (Chu et al., 2010). The term “blog” is an abbreviated form of “web log”, which is a web-based diary, offered in reverse sequential order that consists of a person’s ideas published on the web for multiple viewers in a flexible way (Flatley, 2005). Some articles presented evidence to support the use of blogging during the traineeship and computer-based tools for learning and teaching, and that blogs may be a suitable learning platform that interns should engage in throughout their professional learning (Chu et al., 2010, 2012).

Finally, as social networking becomes gradually more popular as a communication tool for business and organizations, it is also essential that students learn to transfer personal social networking skills to professional situations. A study (McEachern, 2011) proved that this can be achieved through a Facebook Internship, experiencing a social network in the organizational context.

18.3.2 Business Internships at the Faculty of Business Administration and Management of the Universitat Politècnica de València

The Faculty of Business Administration and Management of the Universitat Politècnica de València in Spain has a consolidated program of business internships. This institution is aware of the beneficial impact of business internships and therefore devotes many energies and means to the management, growth, and improvement of the business traineeships. The outcome is that an increasing number of students has been able to undertake a work placement during their studies in this faculty of business during the past years, as Table 18.2 shows.

In addition to the traditional Bachelor and Master Degrees in the field of business administration and management, the faculty has launched two Double Degrees: Business Administration and Management+Computer Science Engineering, and Business Administration and Management+Telecommunications Engineering. These two double degrees will provide the labor market with graduates strong in business and management skills but also with a solid knowledge of ICTs, and they are expected to be highly demanded.

Also, this faculty offers a mode of teaching in some courses known as “flipped teaching”, in which one of the features is that part of the theoretic classes are taught through the support of high quality audiovisual materials, instead of in person.

Table 18.2 Number of internships at the Faculty of Business Administration and Management of the Universitat Politècnica de València (2008–2015)

Year	No. internships at the Faculty of Business Administration and Management	No. employers	No. internships at the Universitat Politècnica de València
2008	398	139	7345
2009	419	132	6179
2010	448	156	6010
2011	420	181	5755
2012	559	201	5816
2013	556	223	6570
2014	625	280	6911
2015	634	284	7856

Source: Own elaboration using the official data provided by the Universitat Politècnica de València

The Universidad Politècnica de València is currently analyzing the situation and is aiming at launching a project in which virtual internships will be possible. We expect to provide empirical data of the first experiences in short as it will be paramount to assess this first experiences from the point of view of the satisfaction of participants and of the learning outcomes.

18.4 Conclusions

Intrapreneurs are employees who work within large organizations and behave like entrepreneurs, by acting as agents of change. The authors of this text highlighted, through previous scientific literature, that new technologies can enhance the traditional internship programs, in particular computer skills improvement and making the internship experience available to more students and companies, including distance students.

First of all, ICTs could enable the realization of virtual internships or telecommuted internships, which could make possible the internship experience to students and companies with difficulties of compatibility of space and in which on-line work would more efficient and recommended. Therefore there is the possibility of increasing the number of business internships and to expand their beneficial effects to a larger number of students and companies.

Secondly, the use of new technologies applied to business internships improves computer skills of its participants, as some authors have stressed in their researches. Also, the use of computer tools and social networks can enhance the overall learning outcomes of the internship experience.

We believe that higher education institutions and administrations would be astute to stimulate virtual internship programs as a way of multiplying the valuable effects internships have on students in various spheres, especially on employability. This employability heightening is achieved through the ITCs competences that can be acquired, which are highly demanded by the work market.

Moreover, the possibility of undertaking a virtual internship in an international scope, could even add further beneficial effects to the work placement, as international internships have a lot to offer, particularly in terms of foreign languages improvement and intercultural skills enhancement. Virtual internships in a foreign country could also enable working in a different country without having to travel and this could be especially significant in moments or fields with difficulties, when it is problematic to find placements for all students. Also, companies in the foreign markets could benefit from experience, by hiring qualified employees among the Spanish students at a reasonable price.

If higher education institutions are committed to the employability of its university graduates, they should make business internships accessible to the maximum possible number of students and manage effective and adequate internship programs. They should also pay attention to the problems that can make students opt out of the valuable internship experience and accept the challenge of supporting

students finding placements that will contribute positively to their career progress. One way could be, in the opinion of the authors, by being active in promoting virtual traineeships for its students, as well as attracting international virtual traineeships. Given that the Spanish law and that the regulations of the Universitat Politècnica de València allow internships in a foreign company and also bearing in mind the existing situation and conditions of the considered institution, the authors think that there is a space for innovation and growth in this field.

This idea of innovating within the business internship field at the Universitat Politècnica de València can be acknowledged as intrapreneuring. Following the goals of the organization, which is to enhance employability through making the internship available to the maximum possible number of students, we propose to transform our idea into a profitable project, while operating within the organizational environment and using the corporate resources.

References

- Antoncic, B., & Hisrich, R. D. (2003). Clarifying the intrapreneurship concept. *Journal of Small Business and Enterprise Development*, 10(1), 7–24.
- Beard, F., & Morton, L. (1999). Effects of internship predictors on successful field experience. *Journalism & Mass Communication Educator*, 72(2), 113–115.
- Callanan, G., & Benzinger, C. (2004). Assessing the role of internships in the career-oriented employment of graduating college students. *Education and Training*, 46(2), 82–89.
- Chen, C. H. (2011). A study of the effects of internship experiences on the behavioral intentions of college students majoring in leisure management in Taiwan. *Journal of Hospitality Leisure Sport & Tourism Education*, 10(2), 61–73.
- Chu, S. K. W., Chan, C. K. K., & Tiwari, A. F. Y. (2010). Using blogs to support learning during internship. *Computers & Education*, 58(3), 989–1000.
- Chu, S. K. W., Kwan, A. C. M., & Warning, P. (2012). Blogging for information management, learning, and social support during internship. *Educational Technology & Society*, 15(2), 168–178.
- Coco, M. (2000). Internships: A try before you by arrangement. *SAM Advanced Management Journal*, 65(2), 41–47.
- Conroy, R., & Khan, R. (2008). Integrating virtual internships into online classrooms. *Journal of Commercial Biotechnology*, 15(2), 97.
- Cook, S. J., Parker, R. S., & Pettijohn, C. E. (2004). The perceptions of interns: A longitudinal case study. *Journal of Education for Business*, 79(3), 179–185.
- Divine, R. L., Linrud, J. K., Miller, R. H., & Wilson, J. H. (2007). Required internship programs in marketing: Benefits, challenges and determinants of fit. *Marketing Education Review*, 17(2), 45–52.
- Flatley, M. (2005). Blogging for enhanced teaching and learning. *Business Communication Quarterly*, 68(1), 77–80.
- Franks, P. C., & Oliver, G. C. (2012). Experiential learning and international collaboration opportunities: Virtual internships. *Library Review*, 61(4), 272–285.
- Gault, J., Leach, E., & Duey, M. (2010). Effects of business internships on job marketability: The employers' perspective. *Education & Training*, 52(1), 76–88.
- Gault, J., Redington, J., & Schlager, T. (2000). Undergraduate business internships and career success: Are they related? *Journal of Marketing Education*, 22(1), 45–53.

- Green, B. P., Graybeal, P., & Madison, R. L. (2011). An exploratory study of the effect of professional internships on students' perception of the importance of employment traits. *Journal of Education for Business*, 86(2), 100–110.
- Gryski, G. S., Johnson, G. W., & O'Toole, L. J. (1987). Undergraduate internships: An empirical review. *Public Administration Quarterly*, 11(2), 150–170.
- Knouse, S. B., & Fontenot, G. (2008). Benefits of the business college internship: A research review. *Journal of Employment Counseling*, 45(2), 61–66.
- Knouse, S. B., John, R. T., Tanner, J. R., & Harris, E. W. (1999). The relation of college internships, college performance and subsequent job opportunity. *Journal of Employment Counseling*, 36(1), 35–43.
- McEachern, R. W. (2011). Experiencing a social network in an organizational context: The Facebook internship. *Business and Professional Communication Quarterly*, 74(4), 486–493.
- Mihail, D. M. (2006). Internships at Greek Universities: An exploratory study. *Journal of Workplace Learning*, 18(1), 28–41.
- Perello-Marín, M. R., & Ribes Giner, G. (2014). Identifying a guiding list of high involvement practices in human resource management. *Working Papers on Operations Management*, 5(1), 31–47.
- Petter, S., Straub, D., & Rai, A. (2007). Specifying formative constructs in information systems research. *MIS Quarterly*, 31, 623–656.
- Pinchot, G. (1984). *Who is the intrapreneur? Intrapreneuring: Why you don't have to leave the corporation to become an entrepreneur* (pp. 28–48). New York: Harper & Row.
- Real Decreto 592/2014 de 11 de julio, por el que se regulan las prácticas académicas externas de los estudiantes universitarios*. BOE Núm. 184, July 13, 2014, 60502- 60511.
- Reglamento sobre Prácticas en Empresas e Instituciones de los Estudiantes de la Universitat Politècnica de València*, approved by the Universitat Politècnica de València on May 28, 2015.
- Sanahuja Vélez, G., & Ribes Giner, G. (2015). Effects of business internships on students, employers, and higher education institutions: A systematic review. *Journal of Employment Counseling*, 52(3), 121–130.
- Scholz, R. W., Steiner, R., & Hansmann, R. (2004). Role of internship in higher education in environmental sciences. *Journal of Research in Science Teaching*, 41(1), 24–46.
- Taylor, M. S. (1988). Effects of college internships on individual participants. *Journal of Applied Psychology*, 73(3), 393–401.
- Thiel, G. R., & Hartley, N. T. (1997). Cooperative education: A natural synergy between business and academia. *SAM Advanced Management Journal*, 62(3), 19–24.
- Weible, R., & McClure, R. (2011). An exploration of the benefits of student internships to marketing departments. *Marketing Education Review*, 21(3), 229–240.

Chapter 19

Entrepreneurship by Students in Tourism Degree Program. A Cross-Cultural Analysis

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Abstract The main objective of the research is to analyze the entrepreneurial attitude of university students of the Tourism Degree in Spain and Portugal, as well as insight into how they perceive that the studies carried out have assisted them to increase their entrepreneurial profile. The methodology consists of a descriptive analysis of the data obtained through a questionnaire administered using statistical tests of comparison of means, T-Student and Contingency tables allowing to check the hypotheses and analyze the differences between the two countries. The results show that over 65 % of students surveyed intend to create their own business, being greater in Portugal with 85 % and considering that for Spanish students the most important personal attributes that they must have are assuming responsibility for the decisions taken and easily adapting to changes in the case of Portugal, considered essential to be autonomous and making working hours be precise. In terms of training, students consider the discipline of entrepreneurship important for their education and they say they should have more courses related to entrepreneurship.

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Keywords Contingency tables • Cross-cultural analysis • Desirability • Entrepreneurial attitude • Entrepreneurial intention • Entrepreneurial spirit • Entrepreneurship • Intentionality • Models of entrepreneurial • Motivations • Obstacles • Personal attributes • Portugal • Potential entrepreneur • Spain • Test of comparison of means • Tourism degree • University education • University students • Viability

19.1 Introduction

In the current economic context of Spain and Portugal, characterized by high unemployment rates of 20.9% and 11.8% respectively in December 2015 according to Eurostat data, creating your own business becomes on many occasions the only way out for young people, where the unemployment rate is higher. Therefore, it is essential for the education system of a country to provide the necessary training so that young people can start their own businesses. In this regard, there are several studies that emphasize that entrepreneurs with a higher and more specific educational level in management tools and entrepreneurship have a greater chance for success, especially in the early stages of the process (Jo & Lee, 1996; Robinson & Sexton, 1994; Yusuf, 1995).

The entrepreneurial attitude of students according to Liseras, de Rearte, Mar a, and Gra a (2003) and Olmos and Castillo (2007) is formed on the basis of: (1) environmental factors (role models and local business culture), (2) personal characteristics (including socio-demographic variables such as age, sex, field of development, family history and previous experience) and attitude (self-confidence, creativity, negotiation capacity, action-orientation, propensity to risk and attitude to unemployment), and finally, (3) training (work experience, career orientation, skills acquired at university, specific courses and expectations of higher relative incomes).

In this sense, the creation of entrepreneurial spirit through education has become one of the research approaches followed by numerous authors on the study of entrepreneurial intentions (L uthje & Franke, 2003; Souitaris, Zerbinati, & Al-Laham, 2007). Universities have a key role in encouraging the entrepreneurial spirit of their students, so we believe it is essential to analyze the entrepreneurial profile of students in their final year of the Degree in Tourism. This university degree is interesting for two reasons:

1. Tourism is one of the main sources of wealth of both countries and education is fundamental. According to the Tourism Satellite Account of the National Statistics Institute (INE, 2015), the contribution to the Spanish Gross Domestic Product (GDP) of tourist activities was 116,500 million at the end of 2014, which is equivalent to 10.2% of the GDP and 11.5% of employment, growing at 3.4% compared to the previous year, with 70 million visitors and approximately 51,000 million in foreign exchange income at the end of 2015. With regard to Portugal, tourism generates 9.2% of the GDP and 8.2% of employment (INE, 2015).
2. Studies in Tourism have been incorporated into the University with much delay (Pedre o, 1996).

The main objective of this study is to analyze whether there are differences between entrepreneurial attitudes among students in the last year of the Degree in Tourism from two different countries, Spain and Portugal, both being part of the European Higher Education Area and what their students think about the training received. In both countries the specific objectives analyzed are:

- The entrepreneurial attitudes of students of the Degree in Tourism (desirability, viability and intentionality).
- The relationship between the gender and family history variables with entrepreneurial attitudes.
- The motivations and obstacles they perceive must be overcome.
- Personal attributes they perceive a potential entrepreneur should have.
- And finally, to find out if students consider that the training received is adequate to encourage their entrepreneurial spirit.

With the aim to respond to the research objectives posed, this chapter is divided into four sections. Firstly, we establish the theoretical background about Models of Entrepreneurial Intention. Secondly, we describe the method used to achieve the research objectives; sample, questionnaire and measures. In the third section, we present an analysis of the empirical results. Finally, in the last section, we discuss the main conclusions and implications of the study.

19.2 Theoretical Background

The first studies that tried to explain and predict entrepreneurial behavior of individuals were done using the discipline of psychology that “*focused mainly on the analysis of individual differences between entrepreneurs and non-entrepreneurs, aiming to develop a descriptive profile of the typical personality of the entrepreneur*” (León, Descals, & Domínguez, 2006:78). In this regard, in the literature on entrepreneurship using this discipline we can find two different lines of approach to the entrepreneurial behavior of individuals:

1. Psychological approach: those who believe that entrepreneurial behavior is pre-determined by intrinsic characteristics of one’s personality (Baum, Frese, Baron, & Katz, 2007; Cromie, 2000; Sánchez, 2003), that is, they consider that the entrepreneur is born. At present, there is no consensus on what the characteristic personality traits of entrepreneurs are (Chell, Haworth, & Brearley, 1991), identifying key factors such as propensity to risk, optimism, etc. (Rauch & Frese, 2007; Stewart & Roth, 2001).
2. Sociological approach: those who consider that entrepreneurial behavior can be stimulated from certain social variables (Cromie, 2000; Markman & Baron, 2003), including training, previous experience, family history, value system, social orientations, etc. (León, 2005:15). This approach considers that the entrepreneur “becomes” (Gibb & Ritchie, 1982). In this regard, Garcia et al. (2004:

25) state that “*the strategic variables that can affect the entrepreneurial situation are: the personal factor, the environmental factor, and institutional and social support*”.

The first of the lines has been widely criticized (Keh, Foo, & Lim, 2002; Mitchell et al., 2002), as the researchers consider that personality traits are not enough to predict entrepreneurial behavior (Baron, 2002; Shane & Venkataraman, 2000), being necessary to consider in addition to personal aspects also social aspects, as well as the interaction between the two (León et al., 2006).

The discipline of psychology is not the only one responsible for analyzing entrepreneurial behavior, being this an interdisciplinary and multidisciplinary field of research (Davidsson, 1989). The approaches used range from personal characteristics, business activities, economic and social impact to cultural aspects. Different approaches have led to theories and models that allow for the study of entrepreneurial intentions in order to predict entrepreneurial behavior (Table 19.1). These models, according to Chattopadhyay and Ghosh (2008) consider the entrepreneurial intention as a key factor of the entrepreneurial action.

As can be seen in the main models, two fundamental concepts appear: perception of desirability, perception of viability as antecedents of entrepreneurial intentions.

“Perceived desirability” according to the model of Shapero and Sokol (1982) refers to the degree of attraction for an individual to create a company. It is closely related, as we have already mentioned to the variables of attitude towards behavior (it refers to the opinion of an individual on whether it is for or against carrying out the behavior) and subjective standards (referring to the perception of an individual of social pressures that push him/her to develop a particular behavior) of the Theory of Planned Behavior of Ajzen (Krueger, Reilly, & Carsrud, 2000).

Regarding the concept of “perceived viability”, it is defined as the degree to which an individual believes that he/she is capable of starting a business. This concept is comparable to “control of perceived behavior” proposed by the Theory of Planned Behavior of Ajzen (1991), which refers to the resources or opportunities available that favor a particular behavior. According to Kuehn (2008), previous experience and the general sense of self-confidence in one’s own abilities to successfully execute tasks related to this dimension (concept of Self-efficacy).

19.3 Methodology

19.3.1 Sample

To achieve the proposed objective, the target population is 70 and 80 students enrolled in the third year of the Degree in Tourism in two different countries, but close to each other, Spain and Portugal respectively, population which according to Veciana (1989) is an important source of potential entrepreneurs.

Table 19.1 Models of entrepreneurial intention

Models and theories	Study variables
Theory of Reasoned Action (Fishbein & Ajzen, 1975)	Adopted theories from psychology. In these theories, a set of causal factors that try to predict and explain many social behaviors in individuals have been identified. In the theory of Reasoned Action, the determining factor of behavior is the intention formed through the attitude towards behavior and the subjective norm
Theory of Planned Behaviour of Ajzen (1991)	The second theory arises from the review of the first one by Ajzen and includes a new constraint on the intention "control on perceived behavior."
Entrepreneurial Event Model of Shapero y Sokol (1982)	It conceptualizes the entrepreneurial initiative as an event that can be explained by the interaction between initiatives, skills, management, relative autonomy and risk (Guerrero, Rialp, & Urbano, 2008). According to this model, the personal decision to start an initiative depends on three elements: the perception of desirability, the perception of viability and the propensity to perform
Model of Development of the Professional Career of Sonnenfeldt and Kotter (1982)	This model proposes the study of the entrepreneurial profile using psychosocial variables that are part of it: <ol style="list-style-type: none"> 1. <i>Family history</i>: entrepreneurial family and gender; many researchers state that this environment positively influences the development of the professional career (Shapero, 1982; Katz, 1992) 2. <i>Socio-labor</i>: variables such as work experience are taken into account (Kolvereid, 1996), education (Vesper, 1990; Rasheed, 2003); difficulties and obstacles for the creation of a company (Michail, 2000), social support Krueger et al. (2000) 3. <i>Personal</i>: the psychological variables included refer to personality traits such as the need for achievement, the ability to take risks, perseverance, creativity and initiative (Sánchez, 2003)
Entrepreneurial Attitude Orientation of Robinson, Stimpson, Huefner, and Hunt (1991)	These authors consider that the attitude approach is the most adequate to analyze entrepreneurs and their model tries to predict attitudes through four scales: achievement, innovation, perception of personal control and perception of self-esteem (Robinson et al., 1991:19)
Potential Entrepreneur Model (Krueger & Brazeal, 1994)	It integrates the vision of the model proposed by Shapero (1982) and the Theory of Planned Behavior of Ajzen (1991). The model focuses on the analysis of the perception of desire and the viability as the source of intention to create a company and that leads to the credibility to be able to create enterprises, and also includes the potential and a trigger event that causes the individual to move on from an intention to actions. "Perceived desirability" is equivalent to the subjective norm and attitude towards the behavior raised in the Theory of Planned Behavior (Krueger & Brazeal, 1994)
Model of Determinants of Entrepreneurial Intentions of Davidson (1995)	According to this economic-psychological model, the intention can be influenced by two elements: (1) the conviction defined by general attitudes such as willingness to change, competitiveness, monetary orientation, achievement and autonomy, dominant attitudes such as orientation monetary, social contribution and know-how; (2) the current situation in relation to employment status
Model of Entrepreneurial Intention of Elfving (2008) and Elfving, Brännback, and Carsrud (2009)	This model focuses on investigating the reasons why individuals want to be entrepreneurs, the cognitive structure of entrepreneurial intention and its impact on the behavior of the individual (motivation, goals, perceived desirability, perceived viability, opportunity assessment, self-efficacy)

Source: Author's

Both countries belong to the European Higher Education Area, which has as one of its objectives regarding the structure of its degrees, to pursue the adoption of an easily understandable and comparable degree system based on two main periods, Undergraduate and Postgraduate, with a structure at three levels. In the case of Portugal, the Degree was structured into 3 years and in Spain into 4 years. Analyzing the structure of the study plan for the fourth year in Spain, it was observed that the basic load for the student was formed by languages, external practices and the End of Degree Project, which complements the choice of elective subjects, being the other 3 years comparable with the 3 years in Portugal.

For that reason, it was decided to conduct the fieldwork in the third year in both countries. We emphasize that in Spain during the 3 years, there is no subject directly related to entrepreneurship and in Portugal in the last year there is a subject "Entrepreneurship", being optional. However, in the study plan structure, we consider that most of the subjects aim to develop the necessary management skills and tools for entrepreneurship.

The response rate was 88.57 % (62 out of 70) in Spain and 86.25 % (69 out of 80) in Portugal, very high response rates thanks to the collaboration of students and delivering the questionnaire in the classroom. As to the description of the sample, 69.35 % are women compared to 30.64 % of men in the case of Spain and 67.74 % reside in rural areas. In Portugal 84 % are women, compared to 15.94 % of men and 78.26 % reside in rural areas compared to 21.73 % that reside in urban areas. 46.77 % of Spanish students have a close relative with his/her own business and 52.77 % in the case of Portugal.

19.3.2 *Questionnaire and Measures*

With respect to the questionnaire, we used the one designed by Veciana and Urbano (2004), which allows to collect data on the students' aptitudes towards enterprise creation and which is an extension of the one developed by Genesca and Veciana (1984), in which the desirability and viability concepts were included, concepts that influence the entrepreneurial intention (see models by Shapero and Shokol (1982) and Krueger and Brazeal (1994)).

Following studies by Díaz et al. (2007) and Veciana and Urbano (2004), we analyzed the relationship of both concepts with the gender and family history variables. There are many studies that analyze the relationship between desirability, viability and the intention to create a company (Kolvereid, 1996; Matthews & Moser, 1995a; Scherer, Adams, Carley, & Wiebe, 1989) and with family history (Kolvereid, 1996; Matthews & Moser, 1995b). In both cases, most studies demonstrate this relationship empirically.

Therefore, like these authors, we propose the following hypothesis:

H1: Gender does not influence the perception of desirability to create a business.

H2: Gender does not influence the perception of viability to create a business.

H3: Gender does not influence the perception of intentionality to create a business.

H4: History of entrepreneurs in the family does not influence the perception of desirability to create a business.

H5: History of entrepreneurs in the family does not influence the perception of viability to create a business.

H6: History of entrepreneurs in the family does not influence the perception of intentionality to create a business.

In addition, the design of the questionnaire was completed with the one used by Fuentes, Saco, and Rodríguez (2013), in order to measure the entrepreneurial profile of the student of Córdoba and we added three extra questions that would allow to analyze whether students of the Degree in Tourism considered the subject of entrepreneurship important for their training; if they consider that universities can encourage entrepreneurship through their study plans and if they perceive that their current education provides them with the necessary tools and training to implement their business ideas.

In short, the questionnaire allows us to collect information on:

- Desirability, viability and intentionality to create a business.
- Reasons that prompt them to create their own business and what obstacles they perceive they will have to face.
- What they think the personal attributes a potential entrepreneur should have in order to be successful in the implementation of his/her project.
- Image that students have of the figure of the current entrepreneur (attributes).
- The training they receive is adequate to promote the entrepreneurial spirit among students.

A 7-point Likert scale was used, ranging from 1, strongly disagree to 7, totally agree.

19.4 Results

19.4.1 *Desirability, Viability and Intentionality to Create a Company*

With regard to the first concept “desirability to create a company” the data obtained, show that students of the Degree in Tourism in both countries, express they have a clear desire to start their own business, being the percentage higher in Portugal with almost 90 % than in Spain (80.64 %). It is also observed that there are major differences between the two countries regarding viability. In Spain, 75 % of students perceive today (period of strong global economic crisis), that it is more difficult to start your own business, compared to 47.82 % of Portuguese students. With regard to the question of whether they have seriously considered creating a company, the percentage is lower in Spain with 22.58 % than in Portugal with 30.43 % (Table 19.2).

Table 19.2 Desirability, viability and intentionality

	Spain	Portugal
<i>Do you consider it desirable to create your own company?</i>	Yes, 80.64 %	Yes, 89.85 %
<i>Do you think it is easier or more difficult to create a business today than in past decades?</i>	Easier, 24.19 %	Easier, 52.17 %
	More difficult, 75.80 %	More difficult, 47.82 %
<i>Have you seriously thought about creating or starting your own business?</i>	No, 32.25 %	No, 14.49 %
	Yes vaguely, 45.16 %	Yes vaguely, 55.07 %
	Yes, 22.58 %	Yes, 30.43 %

Source: Author's

We compare the results obtained in this study with those of other researchers who analyzed the three concepts in different populations: (1) students from other degrees different from tourism and (2) different countries, Spain, Puerto Rico and Portugal. The analysis of the results obtained by Aponte et al. (2006) (Business Administration and Engineering), Urbano (2006) (Business Studies), Fuentes et al. (2013) and Díaz et al. (2007) (different degrees) allows us to observe that the data regarding desirability, viability are very homogeneous.

However, students of the degree in tourism expressed in relation to investigations in other degrees a low intention to start their own business (the percentage in the study of Aponte et al. (2006) to start one's own business was 85.1 %, 68.2 % in the study by Urbano (2006), 66.7 % Díaz et al. (2007) and 66.7 % in the study by Fuentes et al. (2013)). We believe that this result can be explained by the composition regarding the gender of the sample, mostly women in both countries: 69.35 % of students in the sample in Spain are women and 80 % in Portugal. There are several investigations showing greater preference of men towards the creation of companies like Delmar and Davidsson (2000), Aponte (2002), Díaz (2003), Veciana, Aponte, and Urbano (2005).

Along the same lines, the GEM¹ Spain and Portugal provide data that confirm that women are less entrepreneurial than men; in Spain almost 6 out of 10 entrepreneurs in the early stage are male (58.5 % of the index Total Entrepreneurial Activity-TEA) (España, 2014: 62) and in Portugal the number of male early-stage entrepreneurs is 10.8 % of the adult male population and 5.8 % of the adult female population (GEM Portugal, 2013: 29).

To contrast the hypotheses between the demographic variables gender and history of entrepreneurs in the family with the three concepts, the statistical test of comparison of means "contingency tables" was used when working with categorical variables. These allow us to represent the data of two or more categorical variables and obtain the value of the Chi-Square (χ^2) proposed by Pearson (1911), which provides the degree of relationship between two categorical variables.

¹Global Entrepreneurship Monitor is the World's foremost study of entrepreneurship.

Table 19.3 Cross-tabulation between the variable gender, family history and desirability

Do you consider it desirable to create your own company?					
Variable	País country			%	Statistical test
Gender	Spain	Man	Yes	24.19 %	$\chi^2=0.051$ sig. =0.822
		Woman		56.45 %	
	Portugal	Man		13.04 %	Fisher exact test=0.309 (sig.) ^a
		Woman		76.81 %	
Family history	Spain	Family history		38.70 %	$\chi^2=0.156$ sig. =0.693
		No Family H.		41.93 %	
	Portugal	Family history		43.47 %	Fisher exact test=0.108 (sig.) ^a
		No Family H.		46.37 %	

^aExact significance associated because there are more than 25 % of values with expected frequency less than five

Source: Author's

This statistic allows us to test the hypothesis that the two categorical variables are independent, by verifying the observed frequencies with the expected frequencies. If the data are consistent with the hypothesis of independence, the probability associated with the χ^2 statistic will be high (sig. >0.05). If the probability is very small, less than 0.05, the data are considered incompatible with the hypothesis of independence and we will conclude that the variables studied are related.

In order for the probabilities of the χ^2 distribution to constitute a good approximation to the distribution of the statistic, it is convenient for certain conditions to be met: we must check whether one or more values have expected frequencies lower than five. In the case of finding more than 25 % of values with expected frequency less than five, it is necessary to apply exact significance and interpret the results of the statistical of Fisher, otherwise, we interpret the value of the χ^2 .

Table 19.3 shows the statistical test for hypotheses H1 and H4. Both hypotheses are accepted, so there is a dependent relationship between the gender of the students and the desirability to create a business, as well as with history of entrepreneurs in the family, which means that gender and family history do not influence the perception of desirability to create one's own company in neither of the samples considered (Spain and Portugal).

These results are corroborated by the study of Díaz et al. (2007) in Spain and Portugal and not by the results obtained by Genesca and Veciana (1984) and Veciana and Urbano (2004) who obtained a relationship of dependency between gender and desirability (Spain). We think like the authors Díaz et al. (2007: 1342) which is due to "*cultural differences in the roles attributed to gender seem to have diminished or disappeared*". With regard to history, the results are confirmed partially by the study of Díaz et al. (2007) who obtained a relationship between family history and desirability in the Portuguese sample, but not in the Spanish one. The study by Genesca and Veciana (1984:152) did conclude that "*having an entrepreneur in the family significantly influences the attitude towards business creation.*"

Table 19.4 Cross-tabulation between the variable gender, family history and viability

Do you think it is easier or more difficult to create a business today than in past decades?						
Gender	Spain	Man	More difficult	4.83 %	Fisher exact test=0.356 (sig.) ^a	
		Woman		19.35 %		
	Portugal	Man		10.14 %		$\chi^2=0.689$ sig. =0.406
		Woman		42.02 %		
Family history	Spain	Family history	9.67 %	$\chi^2=0.365$ sig. =0.546		
		Not Family H.	14.51 %			
	Portugal	Family history	31.88 %	$\chi^2=2.409$ sig. =0.121		
		Not Family H.	20.28 %			

^aExact significance associated because there are more than 25 % of values with expected frequency less than five

Source: Author’s

Table 19.5 Cross-tabulation between the variable gender, family history and intentionality

Has pensado seriamente en crear o fundar una empresa propia?					
Have you seriously thought about creating or starting your own business?					
			Man	Women	
Gender	Spain	Not	9.67	22.58	$\chi^2=1.690$ sig. =0.793
		Yes vaguely	14.51	30.64	
		Yes	6.45	16.12	
	Portugal		1.44	13.04	$\chi^2=0.682$ sig. =0.954
			10.14	44.92	
			4.34	26.08	
		History	No History		
Family history	Spain	Not	9.67	22.58	$\chi^2=10.082$ sig. =0.039
		Yes vaguely	24.19	20.96	
		Yes	12.90	6.67	
	Portugal		5.79	8.69	$\chi^2=06.543$ sig. =0.162
			26.08	28.99	
			20.28	10.14	

Source: Author’s

Hypotheses H2 and H5 which pose that there is no relationship between gender and family history and the viability perception to create a business (Table 19.4) are accepted, so there is no dependent relationship in neither samples.

These results are corroborated by studies of Díaz et al. (2007) and Veciana and Urbano (2004).

Table 19.5 collects data from the statistical test for both samples of the H3 and H5 hypotheses that consider that the students’ gender and family history of entrepreneurs do not influence the intention to create a company. Both hypotheses

for both samples are accepted, except the H5 hypothesis in the sample of Spain. In this case, the hypothesis is rejected, i.e., family history of entrepreneurs in the family influences the perception of intentionality to create one's own company.

These results differ from those obtained in the case of the H3 hypothesis (Gender-intentionality) with the studies by Díaz et al. (2007) and Veciana and Urbano (2004) and for the H5 hypothesis in studies by Díaz et al. (2007), it is accepted in the case of Extremadura and rejected in the case of Portugal. The same occurs in the study of Veciana and Urbano (2004), which is accepted in the case of Spain and rejected in the case of Puerto Rico. These differences lead us to think that it is necessary to study this issue and determine what the reasons are that lead to these differences (cultural, demographic, types of studies, etc.).

19.4.2 Reasons and Obstacles to Undertake

For the analysis of the internal consistency of the scale used to measure the motives and obstacles, the calculation of the coefficients of Pearson item-total was used; values lower than 0.30 should be discarded (Nurosis, 1993). The analysis of the reliability of the measuring instrument was carried out obtaining α Cronbach, that evaluates the internal consistency through the average correlation of each of the variables with the rest of the scale; a statistical value greater than 0.7 (Nunnally, 1979) is recommended. Given the data reliability of the scale, it is satisfactory for both scales (0.774 and 0.843 respectively).

Spanish students of the Degree in Tourism surveyed reveal that the reasons that would encourage them to create their own business are: the possibility to develop my own ideas (5.41), to search for new challenges (5.33), to create something of my own (to achieve personal assets) (5.24), to carry out a personal dream (5.11), to earn more money in comparison with the money earned as an employee (5.09) (the scale used is a 7-point one and we showed only those which exceeded 5 on average).

For the second sample (students of Portugal), the reasons are: to create something of my own (to achieve personal assets) (5.73), the possibility to develop my own ideas (5.59), to earn more money in comparison with the money earned as an employee (5.59), to search for new challenges (5.52), to invest in personal assets (5.46), economic Independence (5.40), to get a fair compensation in relation to my work (5.37), to carry out a personal dream (5.17), to run a Company (5.05).

We found no significant differences between the students of both countries, the order of importance practically coincides. On the other hand, the least important reasons for both samples are family tradition and dissatisfaction with a previous job. The results coincide with those carried out by other studies such as Fuentes and Sánchez (2010) and Fuentes et al. (2013).

With the intention to observe whether there are significant differences in the motivations depending on the country of origin of the students (Spain and Portugal), the T-Student test for two independent samples was applied. This analysis will allow us to compare the means of two groups of variables, one dependent variable (moti-

Table 19.6 Significant differences in reasons business start-up

Reasons	Spain	Portugal	Mean difference	T-Student test	
				t	Sig.
To create something of my own	5.24	5.73	-0.49	-2.194	0.030 ^a
To invest in personal assets	4.70	5.46	-0.75	-2.990	0.003
To get a fair compensation in relation to my work	4.85	5.37	-0.52	-2.047	0.043
Dissatisfaction with a previous job	4.51	3.85	0.66	2.5828	0.013
Family tradition	4.37	3.00	1.37	4.269	0.000

^aKruskal-Wallis test (nonparametric test)

Source: Author's

vation) with another independent dichotomous variable as is the country of origin. If the significance of T-Student is <0.05 , we reject the hypothesis of equality of means and we can say that there are significant differences, i.e., there is association between the dependent variable and independent variable.

To apply the T-Student statistical test, we explored the quantitative variable to verify that the conditions that allow us to apply this parametric test (Bisquerra, 1989) are met; normal distribution and homogeneity of variances. On the other hand, as the groups are of different size, we analyzed the equality of variances through the Levene test that allows us to contrast the hypothesis that the population variances are equal, so that if the significance level is less than 0.05, we reject the hypothesis of equality. In the case of non-compliance, we perform the Kruskal-Wallis test (nonparametric test), which is used without making any assumptions about the distributions of the data or equality of variance.

No significant differences in the 14 motivations raised were detected except as shown in Table 19.6 in 5 of those raised, so we can state that there is a relationship of positive dependence and statistically significant on a t contrast at a level of 95 %, among those motivations and the country of origin of the student. For the first three, students in Portugal tend to give a higher valuation, however, for the last two, which correspond to the least valued by students from both countries; Spanish students give them greater importance.

On the other hand, students perceive that the obstacles they will have to face to create their own business are: Lack of start-up capital (5.91, Spain; 5.89 Portugal), Difficulty in obtaining financing (5.54, 5.75), Too high risk (5.50, 5.46), coincide in both samples, being the average very homogeneous for each variable considered. The obstacle considered in fourth place varies, being Fear to fail (5.45) in Spain, on the contrary, the Portuguese students give more importance to Tax burden (5.05). The least valued obstacles in both samples are having to work a lot of hours and lack of family and friends' support.

Significant differences (sig. <0.05 in the T-Student test) in four of the obstacles were detected, so we can state that there is a relationship of dependency between them and the country of origin, being the average valuations higher in Spain (Table 19.7). The first two significant differences coincide with the main obstacles and the last two with the obstacles less valued by students of both samples.

Table 19.7 Significant differences in the obstacles for business start-up

Obstacles	Spain	Portugal	Mean difference	T-Student test	
				t	Sig.
Lack of innovative ideas	4.80	3.92	0.87	3.826	0.000
Fear to fail	5.45	4.69	0.75	3.194	0.002
Lack of family and friends' support	4.38	3.57	0.80	2.719	0.007
Have to work a lot of hours	4.24	3.30	0.93	2.991	0.003

Source: Author's

19.4.3 *Personal Attributes that the Entrepreneur Must Have*

Students believe that the most important qualities that a person must have to be a potential entrepreneur are: I get on easily with other people, I assume the responsibility of my decisions, I work as many hours as I need to work well, for Spanish students. It can be observed in Table 19.8 that they are the same for Portuguese students, except that for them the most important is "I consider that it is very important to be a self-employed worker", while for Spanish students this is in the last place. In the analysis to see if there are significant differences, they were only detected as was expected in this last mentioned feature (equal variances have not been assumed, Fisher exact -4.445 sig. 0.000).

19.4.4 *Important Factors for the Entrepreneur*

Students believe that the most important factors (refer to the skills acquired) are to know how to satisfy clients' needs and to know the market. The answers are very homogeneous in both samples. Significant differences in "to have a lot of contacts in the area and to be a relative of an entrepreneur" (the least valued factor in both samples) were found (Table 19.9).

19.4.5 *Image of Entrepreneurs Among Students*

Finally, the vision students have of the entrepreneur was analyzed. They were given a list of 14 attributes which they had to rate on a 7-point Likert scale. The image Spanish students of the Degree in Tourism have is that of a person with a great vision (5.51), with innovative mentality (5.33), job creators (5.24), they are capable of taking risks in their company (5.22) and they have the capacity to organize work (5.20). For the Portuguese student, they are active people (5.46), with capacity to organize work (5.31), with innovative mentality (5.31), trained professionally (5.14) and they have great financial and management skills (5.18). We observe that

Table 19.8 Personal characteristics

Personal characteristics			
	Spain	Ranking Portugal	Portugal
I get on easily with other people	5.53	4	5.44
I assume the responsibility of my decisions	5.38	3	5.43
I work as many hours as I need to work well	5.38	2	5.49
I get used to changes easily	5.37	5	5.26
I am creative and innovative resolving problems	5.35	7	5.15
I trust my personal and professional abilities and possibilities	5.22	6	5.23
I have enough leadership abilities to become an entrepreneur	5.17	12	4.89
I am a very dedicated person starting a new project	5.09	8	5.13
I can work many hours	5.06	13	4.59
I can make decisions in difficult situations	5.03	12	4.89
I have mental abilities to become an entrepreneur	4.96	11	4.92
I face obstacles in an optimistic and cheerful way	4.91	10	4.97
I am worried about the possibility of failure	4.63	9	5.05
I consider that it is very important to be a self-employed worker	4.40	1	5.71

Source: Author's

The reliability of the scale was satisfactory, since the Cronbach alpha statistic obtained was 0.848

Table 19.9 Personal factors

Important factors				
	Spain	Ranking Portugal	Portugal	T-Student
To know how to satisfy clients' needs	5.95	2	6.01	–
To know the market	5.79	1	6.04	–
To be able to set up goals/challenges	5.74	5	5.71	–
To be independent and self-confident	5.72	4	5.86	–
To have entrepreneurial vision	5.69	3	5.91	–
To have quality and to be efficient	5.59	7	5.65	–
Good financial system	5.46	8	5.50	–
To be organized	5.38	9	5.49	–
To have a lot of contacts in the area	5.25	6	5.68	–2.163 sig. 0.032
To be able to manage human resources	5.09	10	5.47	–
To have own experience in business	5.08	11	5.28	–
To be a relative of an entrepreneur	4.11	12	3.42	2.037 sig. 0.044

Source: Author's

The reliability of the scale was satisfactory, as the Cronbach alpha statistic obtained was 0.786

students in Portugal emphasize more the qualities that are created in the training received, such as professional training and financial and management skills. Being honest and fair people with society were the least valued.

Significant differences were found in a single attribute “have vision for the future” ($t=2.899$, sig. 0.04, mean difference 0.67). In Spain it is considered to be higher.

The reliability of the scale was satisfactory, since the Cronbach alpha statistic obtained was 0.856.

19.4.6 University Education for Entrepreneurship

A final section was included in the questionnaire to obtain the vision that the student of the Degree in Tourism has on whether the university education received promotes entrepreneurship by providing the required tools and knowledge.

In this sense, students perceive that their studies should provide them with more knowledge and skills in order to start the process of creating their own business (Table 19.10). 95% of Spanish students believe that the discipline of entrepreneurship is important for training and 94% in Portugal, therefore, they would like there to be subjects or specific courses on entrepreneurship. They also think that universities can encourage entrepreneurship among students through academic training by working with students the necessary skills for the business activity and in addition, they should further support the creation of businesses not only through training but with the implementation of business incubators, grants, etc. In summary, they perceive that the current study plans are not enough to encourage entrepreneurship.

In Table 19.10, we observe that there are statistically significant differences in three of the statements made and valued by students depending on the country of origin, so there is a relationship of dependency between these items and the country

Table 19.10 Training for entrepreneurship

	Spain	Portugal	T-Student		Mean difference
			t	Sig.	
<i>The Degree of Tourism that I study provides me the basic tools and knowledge to create my own business</i>	4.53	3.59	2.820	0.006	0.93
<i>I feel I lack management knowledge to create a company</i>	5.04	4.24	2.824	0.005	0.80
<i>Universities should support the creation of companies</i>	5.62	6.05	-2.053*	0.042	-0.42
<i>I would like my university to have entrepreneurship courses</i>	5.33	5.79	-1.885	0.062	-0.45

7-Point Likert scale, 1—totally disagree to 7—totally agree

*Kruskal-Wallis test (nonparametric test)

Source: Author's

of origin of the student. In this sense, students in Portugal perceive to a greater extent than in Spain that the current training they receive is not enough to encourage entrepreneurship among young people. In contrast, students in Spain feel to a greater extent a lack of management skills to start a business.

19.5 Conclusions

The results allow us to extract the following conclusions:

- In both countries, the students of the Degree in Tourism expressed a clear desire to create their own company. However, there are important differences regarding the viability in intentionality between the two countries. In this regard, Portuguese students perceive to a greater extent that it is easier to create your own business today than in the past and 30.43% have seriously considered starting a business compared to 22.58% of Spanish respondents.
- We have observed, taking into account the results obtained in other studies in other degrees, that the intention to start one’s own business among students of the degree in tourism is significantly lower.
- Sociodemographic variables, gender and family history, do not influence the perception of desirability and viability of starting one’s own business in neither of the two samples considered (Spain and Portugal). With regard to the relationship between the two variables and the intentionality to create one’s own business, we also found no relationship between the two, except in the case of Spain, where it is evident that the history of entrepreneurs in the family influence the perception of intentionality to create one’s own company.
- The main motives that encourage students of the degree in tourism in both countries to create their own business were determined: possibility to develop my own ideas (5.41), search for new challenges (5.33), to create something of my own (to achieve personal assets). Statistically significant differences in 5 of the 14 main motivations were detected. In the case of the least valued motivations, such as dissatisfaction with a previous job and family tradition, Spanish students give them more importance and in the most valued motivation in both samples, to create something of my own, the students in Portugal tend to give it a higher valuation.
- In both samples, the obstacles perceived by students which would have to be overcome to start their own business coincide; lack of start-up capital and difficulty in obtaining financing. No significant differences were detected in both obstacles among the samples analyzed.
- A ranking was developed with the most important qualities that students think an entrepreneur should have. The most important one for Spanish students is “I get on easily with other people” and for Portuguese students is “I consider that it is very important to be a self-employed worker” which is in the last position for Spanish students.

- Finally, students in both samples perceive that the current study plans are not enough to encourage entrepreneurship. In this sense, students in Portugal perceive to a greater extent than in Spain that the current training they receive is not enough to encourage the entrepreneurial spirit among young people. In contrast, students in Spain feel to a greater extent that they lack management skills to start a business.

It is considered that the main limitation of the study is derived from the sample; in which only one University Faculty in which the Degree in Tourism in Spain and Portugal is taught was taken into account. In this sense, this study is exploratory, since both countries belong to the European Higher Education Area (EHEA), so the study plans follow the same guidelines in all the Faculties of Tourism. Although the results cannot be extrapolated, they do offer a first approximation to the entrepreneurial profile of the university students of the Degree in Tourism of both countries. It also allows us to know and identify gaps, through the perception of students, if the current study plans offer them the necessary management skills and tools to start their own businesses.

References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.
- Aponte, M. (2002). *Factores condicionantes de la creación de empresas en Puerto Rico: un enfoque institucional*. Teses Doctoral, Universidad Autónoma de Barcelona.
- Aponte, M., Urbano, D., & Veciana, J. M. (2006). Actitudes hacia la creación de empresas: Un estudio comparativo entre Catalunya y Puerto Rico. Centro de Investigaciones Comerciales e Iniciativas Académicas de la Facultad de Administración de Empresas. *Forum Empresarial*, 11(2), 52–75.
- Baron, R. A. (2002). OB and entrepreneurship: The reciprocal benefits of closer conceptual links. In B. M. En, M. Staw, & R. M. Kramer (Eds.), *Research in organizational behavior—An annual series of analytical essays and critical reviews* (Vol. 24, pp. 225–270). Oxford: Elsevier Science.
- Baum, J. R., Frese, M., Baron, R. A., & Katz, J. A. (2007). Entrepreneurship as an area of psychology study: An introduction. In J. R. Baum, M. Frese, & R. A. Baron (Eds.), *The Psychology of Entrepreneurship* (pp. 1–18). Mahwah, NJ: Lawrence Erlbaum Associates Inc.
- Bisquerra Alzina, R. (1989). *Introducción conceptual al análisis multivariable* (Vol. 2). Barcelona: PPU.
- Chattopadhyay, R., & Ghosh, A. K. (2008). Entrepreneurial intention model-based quantitative approach to estimate entrepreneurial success. *Journal of Small Business & Entrepreneurship*, 21(1), 1–21.
- Chell, E., Haworth, J., & Brearley, S. (1991). *The entrepreneurial personality: Concepts, cases and categories*. Londres: Routledge.
- Cromie, S. (2000). Assessing entrepreneurial inclinations: Some approaches and empirical evidence. *European Journal of Work and Organizational Psychology*, 9(1), 7–30.
- Davidsson, P. (1989). *Continued Entrepreneurship and Small Firm Growth*. The Economic Research Institute (diss.), Stockholm.
- Davidsson, P. (1995). Culture, structure and regional levels of entrepreneurship. *Entrepreneurship and Regional Development*, 7(1), 41–62.

- Delmar, F., & Davidsson, P. (2000). Where do they come from? Prevalence and characteristics of nascent entrepreneurs. *Entrepreneurship and Regional Development*, 12(1), 1–23.
- Díaz, J. C. (2003). *La creación de las empresas en Extremadura: Un análisis institucional*. Doctoral dissertation, Universidad de Extremadura.
- Díaz, J. C., Hernández, R. M., & Barata, M. L. (2007). Estudiantes universitarios y creación de empresas. Un análisis comparativo entre España y Portugal. In J. C. Ayala (Ed.), *Conocimiento, innovación y emprendedores: Camino al futuro*. Madrid: Grupo FEDRA.
- Elfving, J. (2008). *Conceptualizing entrepreneurial intentions: A multiple case study on entrepreneurial cognition and perception*. Finland: Abo Akademi University Press.
- Elfving, J., Brännback, M., & Carsrud, A. (2009). Toward a contextual model of entrepreneurial intentions. In A. L. Carsrud & B. Malin (Eds.), *Understanding the entrepreneurial mind* (pp. 23–33). New York: Springer.
- GEM España. (2014). Global Entrepreneurship Monitor. In I. P. Legazkue, M. Guerrero, & J. L. González-Pernía (Eds.), *Informe GEM España 2014* (Vol. 18). Cantabria: Universidad de Cantabria.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Fuentes, F. J. G., & Sánchez, S. M. C. (2010). Análisis del perfil emprendedor: Una perspectiva de género. *Estudios de Economía Aplicada*, 28(3), 1–28.
- Fuentes, F., Saco, F., & Rodríguez, P. (2013). *Estudio sobre el perfil emprendedor en el alumnado universitario de Córdoba* (pp. 1–180). III Edición, Córdoba: UCO Consejo Social de la Universidad de Córdoba.
- García, I. S., Espinosa, M. D. M. B., & Arocas, R. L. (2004). El proceso de aprendizaje para los emprendedores en la situación actual: Un análisis cualitativo en el ámbito universitario. *Revista de Dirección Organización y Administración de Empresas*, 30, 34–48.
- Genesca Garrigosa, E., & Veciana Verges, J. M. (1984). Actitudes hacia la creación de empresas. *Información Comercial Española*, 611, 147–155.
- Gibb, A., & Ritchie, J. (1982). Understanding the process of starting small businesses. *International Small Business Journal*, 1(1), 26–46.
- Guerrero, M., Rialp, J., & Urbano, D. (2008). The impact of desirability and feasibility on entrepreneurial intentions: A structural equation model. *International Entrepreneurship and Management Journal*, 4(1), 35–50.
- INE. (2015). Spanish Statistical Office. National Statistics Institute. Retrieved January 2, 2016, from www.ine.es.
- Jo, H., & Lee, J. (1996). The relationship between an entrepreneur's background and performance in a new venture. *Technovation*, 16(4), 161–211.
- Katz, J. (1992). A psychological cognitive model of employment status choice. *Entrepreneurship Theory and Practice*, 17(1), 29–37.
- Keh, H. T., Foo, M. D., & Lim, B. C. (2002). Opportunity evaluation under risky conditions: The cognitive processes of entrepreneurs. *Entrepreneurship Theory and Practice*, 27(2), 125–148.
- Kolvereid, L. (1996). Prediction of employment status choice intentions. *Entrepreneurship Theory and Practice*, 21(1), 47–58.
- Krueger, N. F., & Brazeal, D. V. (1994). Entrepreneurial potential and potential entrepreneurs. *Entrepreneurship Theory and Practice*, 18, 91–104.
- Krueger, N. F., Jr., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, 15, 411–432.
- Kuehn, K. W. (2008). Entrepreneurial intentions research: Implications for entrepreneurship education. *Journal of Entrepreneurship Education*, 11, 87.
- León, J. A. M. (2005). *El perfil psicosocial del emprendedor* (pp. p15–p16). Madrid: Consejo Económico y Social.
- León, J. A. M., Descals, F. J. P., & Domínguez, J. F. M. (2006). El perfil psicosocial del emprendedor universitario The psychosocial profile of the university entrepreneur. *Revista de Psicología del Trabajo y de las Organizaciones*, 22(1), 75.

- Liseras, N., de Rearte, G., María, A., & Graña, F. (2003). Factores asociados a la vocación emprendedora en alumnos universitarios. *Investigación presentada en la VIII Reunión Anual Red Pymes Mercosur*, 8, *Rosario*, 1–3 octubre de 2003 [consultado 18 Jun 2014].
- Lüthje, C., & Franke, N. (2003). The ‘making’ of an entrepreneur: Testing a model of entrepreneurial intent among engineering students at MIT. *R and D Management*, 33(2), 135–147.
- Markman, G. D., & Baron, R. A. (2003). Person–entrepreneurship fit: Why some people are more successful as entrepreneurs than others. *Human Resource Management Review*, 13(2), 281–301.
- Mathews, C. H., & Moser, S. B. (1995). Family background and gender: Implications for interest in small firm ownership. *Entrepreneurship and Regional Development*, 7(4), 365–378.
- Matthews, C. H., & Moser, S. B. (1995a). The impact of family background and gender on interest in small firm ownership: A longitudinal study. In *Proceedings of the ICSB 40th World conference, Sydney* (pp. 18–21).
- Michail, K. (2000). Exploring perceptions of a priori barriers to entrepreneurship: A multidisciplinary approach. *Entrepreneurship Theory and Practice*, 25, 59–79.
- Mitchell, R. K., Busenitz, L., Lant, T., McDougall, P. P., Morse, E. A., & Smith, J. B. (2002). Toward a theory of entrepreneurial cognition: Rethinking the people side of entrepreneurship research. *Entrepreneurship Theory and Practice*, 27(2), 93–104.
- Nunnally, J. (1979). *Psychometric theory*. New York: McGraw-Hill.
- Nurosis, M. J. (1993). *SPSS. Statistical Data Analysis*. Chicago: SPSS Inc.
- Olmos, R. E., & Castillo, M. Á. S. (2007). La actitud emprendedora durante la vida académica de los estudiantes universitarios. *Cuadernos de Estudios Empresariales*, 17, 95–116.
- Pedreño, A. (1996). El turismo en el análisis económico. In A. Pedreño (Ed.), *Introducción a la Economía del Turismo en España* (pp. 19–43). Madrid: Civitas.
- GEM Portugal. (2013). *Estudo sobre o Empreendedorismo*. Global Entrepreneurship Monitor (GEM). Instituto Universitário de Lisboa (ISCTE/IUL). Retrieved from http://web.spi.pt/GEMportugal2012/files/GEM_PORTUGAL_2012.pdf.
- Rasheed, H. S. (2003). *Developing entrepreneurial characteristics in youth: The effects of education and enterprise experience*. Retrieved October 15, 2015, from <http://www.coba.usf.edu/departments/management/faculty/rasheed/youthentrepreneurship>.
- Rauch, A., & Frese, M. (2007). Let’s put the person back into entrepreneurship research: A meta-analysis on the relationship between business owners’ personality traits, business creation, and success. *European Journal of Work and Organizational Psychology*, 16(4), 353–385.
- Robinson, P. B., & Sexton, E. A. (1994). The effect of education and experience on self-employment success. *Journal of Business Venturing*, 9(2), 141–156.
- Robinson, P. B., Stimpson, D. V., Huefner, J. C., & Hunt, H. K. (1991). An attitude approach to the prediction of entrepreneurship. *Entrepreneurship Theory and Practice*, 15(4), 13–31.
- Sánchez, M. L. (2003). *Perfil Psicológico del Autoempleado* (p. 297). Madrid: Universidad Complutense de Madrid.
- Scherer, R. F., Adams, J. S., Carley, S., & Wiebe, F. A. (1989). Role model performance effects on development of entrepreneurial career preference. *Entrepreneurship Theory and Practice*, 13, 53–81.
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1), 217–226.
- Shapero, A. (1982). Social dimensions of entrepreneurship. In C. A. Kent, D. L. Sexton, & K. Vesper (Eds.), *The encyclopedia of entrepreneurship* (pp. 72–90). Englewood Cliffs: Prentice Hall.
- Shapero, A., & Sokol, L. (1982). *The social dimensions of entrepreneurship* (Encyclopedia of entrepreneurship, pp. 72–90). Englewood Cliffs, NJ: Prentice-Hall.
- Sonnenfeldt, J., & Kotter, J. P. (1982). The maturation of career theory. *Human Relations*, 35, 19–46.
- Souitaris, V., Zerbinati, S., & Al-Laham, A. (2007). Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. *Journal of Business Venturing*, 22(4), 566–591.

- Stewart, W. H., Jr., & Roth, P. L. (2001). Risk propensity differences between entrepreneurs and managers: A meta-analytic review. *Journal of Applied Psychology*, 86(1), 145.
- Urbano, D. (2006). *La creaci3n de empresas en Catalunya: Organismos de apoyo y actitudes hacia la actividad emprendedora*. Barcelona: CIDEM.
- Veciana, J. M. V. (1989). Caracterfsticas del empresario en Espa1a. *Papeles de Economfa Espa1ola*, 39, 19–36.
- Veciana, J. M., Aponte, M., & Urbano, D. (2005). University student's attitudes towards entrepreneurship: A two countries comparison. *International Entrepreneurship and Management Journal*, 1, 165–182.
- Veciana, J. M., & Urbano, D. (2004). *Actitudes de los estudiantes universitarios hacia la creaci3n de empresas: Un estudio empfrico comparativo entre Catalunya y Puerto Rico. El emprendedor innovador y la creaci3n de empresas de I+D+I* (pp. 35–58). Valencia: Universidad de Valencia.
- Vesper, K. H. (1990). *New venture strategies*. Englewood Cliffs: Prentice Hall.
- Yusuf, A. (1995). Critical success factors for small business: Perceptions of South Pacific entrepreneurs. *Journal of Small Business Management*, 33(2), 68.

Chapter 20

The Impact of Entrepreneurship Education Programs on Student Entrepreneurial Orientations: Three International Experiences

João J. Ferreira and Cristina I. Fernandes

Abstract This chapter involves verifying the influence of teaching entrepreneurship on entrepreneurial activities among university students (N=418) in a comparative international context on three distinct realities (Portugal, Spain and Brazil). We are made recourse to Structural Equation Modelling (SEM), estimated through the Partial Least Squares (PLS) method. In order to determine the statistically significant differences among the path coefficients for the models for the three countries, we adopted Henseler's approach. A multigroups analysis was performed to test the existence of significant differences between the three countries relating to student's entrepreneurial orientation. The results show differences between countries in several dimensions explaining the entrepreneurial intentions of the students. Furthermore, our results convey the relevance of identifying the different entrepreneurial intentions prevailing in different countries alongside the respective sources of such influences. Some entrepreneurial implications are discussed on final considerations.

Keywords Entrepreneurial behaviour • Entrepreneurial intention • Entrepreneurial orientation • Entrepreneurship education • Knowledge • Multigroups analysis • Portugal • Program • SEM • Spain

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20.1 Introduction

Knowledge, as a fulcrum point to any company, plays an ever increasing role in both spotting and leveraging entrepreneurial opportunities (Andersson & Hellerstedt, 2009). This knowledge is the product of universities that thereby contribute towards fostering productivity and innovation, factors fundamental to boosting both development and regional competitiveness (Howells & Tether, 2004; Koch & Stahlecker, 2006; Martin, 1998; Muller, 2001; Toivonen, 2004). A growing number of research project findings on the importance of entrepreneurship at the regional level demonstrate that the setting up of new companies results both from knowledge and the emphasis placed on spillovers generated by universities. Furthermore, this knowledge commonly gets generated through research collaboration between companies and higher education institutions (Audretsch & Lehmann, 2005; Riddel & Schwer, 2003; Varga, 2000). Acs, Audretsch, Braunerhjelm, and Carlsson (2006) defend how entrepreneurial activities tend to be greater whenever there is both rising levels of investment in new knowledge and companies, especially start-ups, turning deliberately to genuine sources of knowledge (universities and research and development institutions). According to Varga (2002), studying the location of spillovers of knowledge as a type of economic agglomeration and the way in which these contribute to regional economic development should be high on the agenda of political practices.

Entrepreneurship also represents a factor in regional development as, just as Schumpeter (1934, 1939, 1942) defends, entrepreneurs prove the key driver behind economic development. Correspondingly, this group proves able to bring about the innovation enabling the return of profits whilst openly and simultaneously assuming the risks inherent to such creativity. Indeed, this same entrepreneurship, especially in the case of new companies, may trace its very own origins back to universities given that many students now experience academic learning incorporating entrepreneurship based training where not undertaking the design of projects that they later go onto implement and commercialise in practice (Feller, Ailes, & Roessner, 2002; Steffensen, Rogers, & Speakman, 2000). We may thus state that the current perception identifies universities as critical institutions in terms of endowing society with the learning and the resources able to inspire and drive entrepreneurial spirits (Souitaris, 2002).

Hence, the core objective of this chapter involves verifying the influence of teaching entrepreneurship on entrepreneurial activities among university students and to this end carrying out a comparative international study on three distinct realities (Portugal, Spain and Brazil).

Following this introduction, we set out a review of the literature before proceeding to detail the research methodology. Subsequently, we present and discuss the results obtained before then putting forward our final considerations.

20.2 Literature Review

Within the entrepreneurial behaviour field of research, the study of entrepreneurial intent takes on particular importance (Bird, 1988; Davidsson & Honig, 2003; Douglas & Shepherd, 2002; Krueger, 1993; Shapero & Sokol, 1982). Should we approach the entrepreneurial process as a way of thinking that emphasises the opportunities over the threats, then we may consider the process of identifying business opportunities as an intentional process. Setting up any new firm requires time and also implies a considerable amount of planning. Thus, it proves difficult to conceive of launching a company simply as some response to a stimulus and correspondingly perceived as far more of a planned and thought out process. Hence, entrepreneurial behaviours represent precisely the type of planned behaviour (Bird, 1988; Katz, 2003) for which models of intent prove particularly ideal given that they provide a means both to better explain and to predict entrepreneurial behaviour (Krueger, Reilly, & Carsrud, 2000). Authors such as Krueger (1993) argue that entrepreneurial intentions constitute the key to understanding the entrepreneurial process and may best be grasped as only the first step in the long and complex process of entrepreneurship (Gartner, 1989).

Over the years, various models of entrepreneurial intention have been proposed (Bird, 1988; Boyd & Vozikis, 1994; Krueger et al., 2000; Shapero, 1985; Shapero & Sokol, 1982). Furthermore, entrepreneurial intention has long since been identified as a reliable indicator of entrepreneurial behaviour (Krueger, 1993; Thompson, 2009). Based on the planned behaviour theory (Ajzen & Fishbein, 1980), Krueger (2000) proposes that entrepreneurial intentions emerge out of perceptions of convenience. As a consequence, the perceived risk and other precedents, including self-effectiveness and resilience, may have significant impacts on these perceptions and correspondingly shaping whether or not the actual self-recognition arises in individuals as to their own intentions to embark on business ventures. We might state that entrepreneurial intention refers to the typical behaviours resulting in the launching of new firms, whether in isolation or as part of a team (Ajzen & Fishbein, 1980; Krueger, 1993). For such reasons, research on education and entrepreneurial knowledge has advanced significantly in recent years.

20.3 Methodology

20.3.1 *Measuring Instruments*

The instrument applied was the Entrepreneurial Orientation Questionnaire (EOQ) (Sánchez, 2010), which involved the measuring of the following traits on a Likert scale of 1–7: Internal attitude (11 items), Self-efficacy (9 items), Proactiveness (10 items), Personal attitude (5 items), Perceived control (6 items), Standard (3 items), Feasibility (9 items), Entrepreneurial intention (9 items), Labor intention (4 items), Motivations for setting up a company (10 items), Important resources for setting up a company (13 items), Important obstacles to setting up a company (10 items),

Importance of setting up a company (8 items), Social value of entrepreneurship (8 items) and Specific capacities to becoming an entrepreneur (6 items), Individualist (2 items), Collectivist (5 items) and Mixed (3 items).

20.3.2 *Statistical Methods*

We started out by evaluating the validity of the constructs and correspondingly analysing the reliability, the factorial, convergent and discriminant validities. In this research, we evaluated the level of construct validity through: (1) composite reliability (CR), ($CR > 0.70$) as this does not get influenced by the number of items existing in each construct contrary to Cronbach's Alpha that applies the loads of items extracted from the model estimated; (2) factorial validity (factor loads of greater than 0.5 and ideally greater than 0.7); (3) convergent validity through Average Variance Extracted (AVE), and assuming convergent validity exists whenever ($AVE > 0.50$); and (4) discriminant validity in which the square route of the AVE of the two constructs should be greater than the correlation between these respective two factors (Barroso, Carrión, & Roldán, 2010; Hair, Black, Babin, Anderson, & Tatham, 2010).

Following instrument validation and with the objective of testing the hypotheses included in the conceptual model, we made recourse to Structural Equation Modeling (SEM), estimated through the Partial Least Squares (PLS) method. The application of PLS-SEM as an alternative to SEM based on covariance (CB-SEM) stemmed from the high number of constructs incorporated into this study and the existence of non-normal data, an assumption over data distribution in CB-SEM (Hair et al., 2010; Hair, Ringle, & Sarstedt, 2011, 2012; Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014).

Given that there are no appropriately reliable measures for overall adjustments to PLS estimated models as in the case of the structural equation methodologies based on covariance, the structural models estimated by PLS are evaluated through recourse to analysis of the R^2 determined coefficient values for the endogenous construct and the value of the Standardized Root Mean Residual (SRMR) (Hair et al., 2011). To evaluate the constructs potentially generating multicollinearity, we also subjected the Variance Inflation Factors (VIF) to evaluation.

In estimating the structural models in order to determine the t statistics and their respective statistical significance, we deployed 1000 replicas of our sample.

Finally, in order to analyse differences in the parameters in relation to students from each of the three countries included in the sample (Brazil, Spain, Portugal), we drew upon multigroup analysis given that any difference may stem from unobserved heterogeneity, hence, not susceptible to attributing to one or more of the pre-specified variables (Sarstedt, Henseler, & Ringle, 2011). In order to determine the statistically significant differences among the path coefficients for the models for Portugal, Spain and Brazil, we adopted Henseler's approach (Sarstedt et al., 2011).

For all the estimates calculated, we applied SmartPLS software version 3.0 (Ringle, Wende, & Becker, 2014).

20.4 Results

20.4.1 Sample Characteristics

Table 20.1 features all of the results regarding the characteristics of the 418 study respondents. In overall terms, 61.9% of respondents were female with an average age of 26.6 ± 6.0 years, 23.9% and 39.1% of their parents were either self-employed or business owners or worked for private sector firms respectively with 29.4% of mothers working for the state or state owned entities. Specifically as regards the Spanish sample ($n=140$), 73.7% were female with their average age 24.9 ± 2.0 years with 30.8% and 32.6% of fathers and mothers working for the state respectively. In the Portuguese sample ($n=153$), 67.3% of respondents were female with an average age of 26.3 ± 7.0 and 51.1% and 34.5% of fathers and mothers working for private companies respectively. Finally, as regards the Brazilian sample ($n=125$), we find that 42.4% were female with an average age of 27.8 ± 7.3 years and with 40.0% of respondent fathers working for the private sector whilst 37.6% of mothers were self-employed or running businesses.

Table 20.2 features the results stemming from the descriptive statistics (averages and standard deviations) including AVE, CR, Cronbach's Alpha, Pearson's correlations for the constructs and the squared root of AVE to evaluate the validity and reliability of the constructs alongside VIF applied with the objective of ascertaining the potential origins of multicollinearity in the SEM estimates. All the constructs tested return acceptable levels of robustness ranging from the acceptable ($FC=0.675$) to the very high ($FC=0.934$). As regards factorial validity, the factorial weightings returned were greater or equal to 0.545 and hence attaining factorial validity. The AVE results were equal to or greater than 0.496 and the respective square root was

Table 20.1 Sample characteristics

		Spain (n=140)		Portugal (n=153)		Brazil (n=125)		Total (n=418)	
		N	%	N	%	N	%	N	%
Gender	Male	36	26.3	50	32.7	72	57.6	158	38.1
	Female	101	73.7	103	67.3	53	42.4	257	61.9
Age (mean \pm SD)		24.9 \pm 2.0		26.3 \pm 7.0		27.8 \pm 7.3		26.6 \pm 6.0	
Profession— father	Self-employed/owner	35	26.9	18	12.9	41	32.8	94	23.9
	Private company	33	25.4	71	51.1	50	40.0	154	39.1
	Public company	40	30.8	22	15.8	3	2.4	65	16.5
	Not working/unemployed	22	16.9	28	20.1	31	24.8	81	20.6
Profession— mother	Self-employed/owner	16	12.1	19	12.8	47	37.6	82	20.2
	Private company	33	25.0	51	34.5	35	28.0	119	29.4
	Public company	43	32.6	42	28.4	5	4.0	90	22.2
	Not working/unemployed	40	30.3	36	24.3	38	30.4	114	28.1

Note: SD—standard deviation

Table 20.2 Average, standard deviation (SD), average variance extract (AVE), composite reliability (CR), variance inflation factor (VIF) and Pearson's correlations between the constructs (with the squared root of AVE diagonally in bold)

Construct	Mean	SD	VIF	AVE	CR	Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1 Entrepreneurial intention	4.51	1.36		.644	.934	.917	.802																		
2 Labor intention	2.68	2.44		.534	.712	.706	.731																		
3 Locus of internal control	5.47	0.81	1.87	.538	.891	.857	.451*																		
4 Self-efficacy	5.15	0.83	3.21	.513	.904	.880	.659*																		
5 Pro-activeness	5.06	0.80	2.76	.496	.873	.830	.543*																		
6 Personal attitude	5.15	1.21	2.77	.702	.920	.890	.754*																		
7 Perceived control	3.59	1.23	2.17	.691	.931	.911	.494*																		
8 Standard	5.35	1.16	1.39	.684	.864	.765	-.041																		
9 Feasibility	4.74	1.13	4.31	.538	.919	.901	.830*																		
10 Motivations for setting up a company	5.60	0.94	1.84	.504	.890	.859	.515*																		
11 Important resources for setting up a company	6.16	0.62	1.56	.499	.856	.801	.145*																		
12 Important obstacles to setting up a company	4.47	1.23	1.30	.502	.797	.791	-.240*																		
13 Importance of setting up a company	5.32	0.85	1.51	.514	.808	.789	.238*																		
14 Social value of entrepreneurship	4.04	1.08	1.59	.516	.839	.762	.570*																		
15 Specific capacities to becoming an entrepreneur	5.02	1.01	2.23	.560	.884	.844	.597*																		
16 Individualist	5.15	0.82	1.66	.547	.710	.700	.308*																		
17 Collectivist	4.27	2.56	1.30	.555	.732	.727	.361*																		
18 Mixed	5.67	0.75	1.23	.516	.675	.665	.194*																		

*p < 0.05

always greater than the correlation between the respective construct and the remainder and thereby confirming both convergent validity and discriminant validity. These results attest to the validity, reliability and robustness of the data collection and processing instruments.

20.4.2 Analysis of Results

The VIF results were below or equal to 4.31 indicating the absence of multicollinearity in the estimated results. The SEM based modelling enables us to affirm an acceptable level of adjustment standing at SMRM=0.068 and the R^2 was 0.767 and 0.406 for the endogenous constructs Entrepreneurial Intention and Labor Intention, respectively.

Table 20.3 and Fig. 20.1 present the results referring to the structural model estimated. We may correspondingly report how the constructs *Personal attitude* ($\beta=0.21$; $p<0.01$), *Standard* ($\beta=-0.08$; $p<0.05$), *Feasibility* ($\beta=0.47$; $p<0.01$), *Social value of entrepreneurship* ($\beta=0.13$; $p<0.01$) and *Specific capacities to becoming an entrepreneur* ($\beta=0.09$; $p<0.05$) generate a statistically significant impact on the construct *Entrepreneurial intention*. Furthermore, the higher the level of the score returned by the constructs *Personal attitude*, *Feasibility*, *Social value of entrepreneurship* and *Specific capacities to becoming an entrepreneur*, the higher the result for the *Entrepreneurial intention* construct and the greater the level of the *Standard* construct, the lower the score for the *Entrepreneurial intention* construct.

As regards the *Labor intention* construct, the *Personal attitude* ($\beta=-0.28$; $p<0.01$), *Perceived control* ($\beta=-0.25$; $p<0.01$), *Standard* ($\beta=-0.22$; $p<0.01$), *Important obstacles to setting up a company* ($\beta=-0.10$; $p<0.05$) and *Specific capacities to becoming an entrepreneur* ($\beta=-0.18$; $p<0.01$) constructs have a statistically significant effect on *Labor intention*. In these cases, the higher the level of the scores for the *Personal attitude*, *Perceived control*, *Standard*, *Important obstacles to setting up a company* and *Specific capacities to becoming an entrepreneur* constructs, the lower the results returned by the *Labor intention* construct.

20.4.3 Multigroup Analysis

Finally, multigroup analysis served to test for the existence of statistically significant differences between the three countries in relation to the standardized path coefficients. We summarise the results in Table 20.4 (Entrepreneurial intentions) and Table 20.5 (Labour intentions).

In terms of entrepreneurial intention (Table 20.4), Spanish students return the following constructs with a statistically significant positive impact on entrepreneurial intention: Pro-activeness ($\beta=0.24$; $p<0.01$), Personal attitude ($\beta=0.30$; $p<0.01$), Perceived control ($\beta=0.17$; $p<0.05$), Feasibility ($\beta=0.37$; $p<0.001$) and the

Table 20.3 Standardized path coefficients of estimated SEM, standard error (SE), T statistics and P-value of bootstrapping estimation

	Entrepreneurial intention (R ² = 0.767)					Labor intention (R ² = 0.406)				
	Original sample	Bootstrapping	SE	T	p	Original sample	Bootstrapping	SE	T	p
Locus of internal control	-0.01	-0.01	0.04	0.39	0.699	0.08	0.08	0.05	1.52	0.130
Self-efficacy	0.05	0.04	0.05	0.94	0.346	0.05	0.05	0.07	0.66	0.509
Pro-activeness	0.09	0.09	0.05	1.91	0.057	0.04	0.05	0.07	0.66	0.511
Personal attitude	0.21	0.21	0.05	4.71	0.000**	-0.28	-0.28	0.07	3.91	0.000***
Perceived control	0.00	0.01	0.04	0.03	0.974	-0.25	-0.25	0.06	4.36	0.000***
Standard	-0.08	-0.08	0.03	2.58	0.010*	-0.22	-0.22	0.05	4.46	0.000***
Feasibility	0.47	0.47	0.06	8.57	0.000**	-0.02	-0.02	0.09	0.22	0.826
Motivations for setting up a company	0.02	0.02	0.04	0.57	0.572	0.01	0.01	0.06	0.14	0.891
Important resources for setting up a company	-0.09	-0.08	0.05	1.78	0.076	0.03	0.02	0.05	0.61	0.542
Important obstacles for setting up a company	-0.03	-0.04	0.03	1.15	0.250	-0.10	-0.10	0.05	2.04	0.042*
Importance of setting up a company	0.04	0.04	0.03	1.30	0.195	-0.04	-0.04	0.06	0.64	0.521
Social value of entrepreneurship	0.13	0.13	0.04	3.53	0.000**	0.09	0.09	0.05	1.70	0.090
Specific capacities to becoming an entrepreneur	0.09	0.10	0.04	2.34	0.020*	-0.07	-0.07	0.06	1.22	0.223
Individualist	-0.02	-0.01	0.03	0.49	0.627	-0.17	-0.18	0.05	3.35	0.001***
Collectivist	0.02	0.02	0.03	0.57	0.568	-0.06	-0.06	0.05	1.17	0.244
Mixed	-0.01	-0.01	0.04	0.41	0.679	0.02	0.02	0.06	0.36	0.717

*p < 0.05
 **p < 0.01
 ***p < 0.001

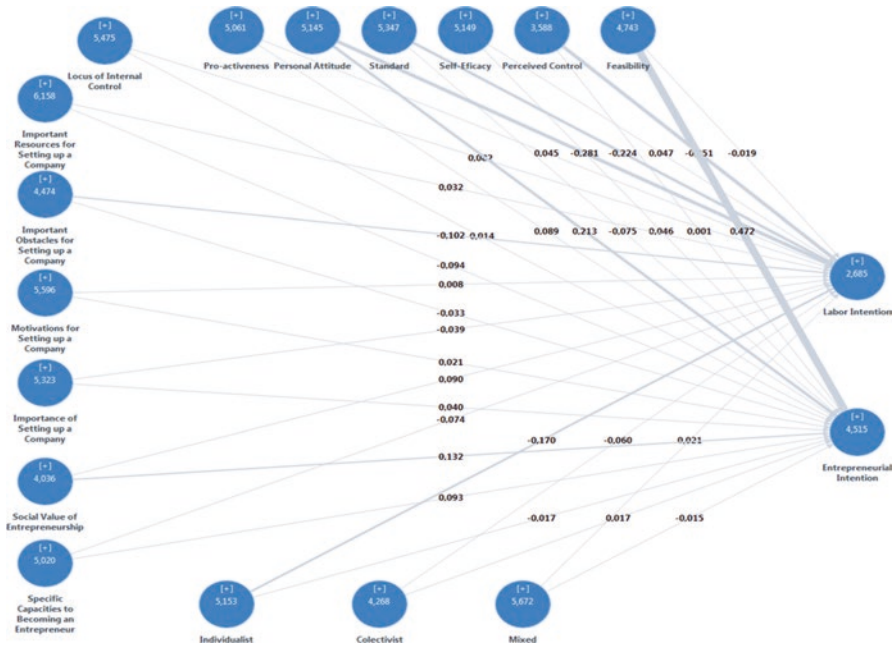


Fig. 20.1 Standardized estimated SEM path coefficients (construct averages)

Importance of setting up a company ($\beta=0.12$; $p<0.05$). In the Portuguese student sample, the constructs generating statistically significant positive impacts on entrepreneurial intention are: Personal attitude ($\beta=0.15$; $p<0.05$), feasibility ($\beta=0.50$; $p<0.01$) and Social value of entrepreneurship ($\beta=0.17$; $p<0.01$). Finally, as regards the Brazilian respondents, the constructs reporting this same statistically significant positive impact on entrepreneurial intention are: Pro-activeness ($\beta=0.20$; $p<0.05$), Motivations for setting up a company ($\beta=0.23$; $p<0.05$) and Individualist ($\beta=0.17$; $p<0.05$).

As regards labor intention (Table 20.5), in the case of the Spanish student group, the constructs Personal attitude ($\beta=-0.30$; $p<0.05$) and Feasibility ($\beta=-0.33$; $p<0.05$) report a statistically significant negative impact on labor intention. In the Portuguese sample, the Self-Efficacy ($\beta=-0.27$; $p<0.05$) and Feasibility ($\beta=-0.48$; $p<0.01$) constructs return a statistically significant negative impact on labor intention even while the Pro-activeness ($\beta=0.39$; $p<0.01$) construct generates a statistically significant positive impact on labor intention.

Tables 20.6 and 20.7 set out the results of the comparisons between the peer groups (pairwise group comparisons) for the estimated Path Coefficients (Spain vs. Portugal; Spain vs. Brazil, Portugal vs. Brazil) for both the Entrepreneurial intention and Labor intension constructs respectively.

As regards entrepreneurial intention (Table 20.6), the comparison between the Spanish and Portuguese samples identifies the existence of statistically signifi-

Table 20.4 Entrepreneurship intension: standardized path coefficients of estimated SEM and p-value of bootstrapping estimation by country

	Spain (R ² =0.773)			Portugal (R ² =0.787)			Brazil (R ² =0.675)		
	Original sample	Bootstrapping	p	Original sample	Bootstrapping	P	Original sample	Bootstrapping	P
	Locus of internal control	-0.07	-0.06	0.296	0.05	0.05	0.472	0.11	0.10
Self-efficacy	-0.11	-0.10	0.127	0.14	0.13	0.117	0.13	0.13	0.090
Pro-activeness	0.24	0.22	0.002**	-0.12	-0.11	0.106	0.20	0.20	0.043*
Personal attitude	0.30	0.29	0.000**	0.15	0.13	0.040*	0.14	0.14	0.059
Perceived control	0.17	0.16	0.031*	0.04	0.03	0.607	-0.01	-0.02	0.865
Standard	-0.03	-0.03	0.584	0.00	-0.01	0.933	0.04	0.02	0.634
Feasibility	0.40	0.41	0.000**	0.50	0.52	0.000**	0.13	0.14	0.247
Motivations for setting up a company	0.05	0.04	0.355	-0.10	-0.08	0.080	0.23	0.19	0.048*
Important resources for setting up a company	-0.07	-0.04	0.308	-0.12	-0.11	0.071	0.00	0.02	0.965
Important obstacles to setting up a company	0.01	0.02	0.791	0.03	0.01	0.496	0.05	0.03	0.587
Importance of setting up a company	0.12	0.11	0.032*	0.01	0.01	0.887	-0.07	-0.03	0.330
Social value of entrepreneurship	0.08	0.08	0.178	0.17	0.18	0.003***	0.01	0.00	0.911
Specific capacities to becoming an entrepreneur	0.00	-0.02	0.952	0.16	0.16	0.056	0.15	0.16	0.102
Individualist	-0.03	-0.01	0.634	0.07	0.08	0.295	0.17	0.15	0.012*
Collectivist	0.03	0.04	0.588	0.00	0.04	0.998	-0.12	-0.08	0.125
Mixed	0.03	0.04	0.613	-0.05	0.00	0.424	0.10	0.11	0.306

*p<0.05
 ***p<0.01

Table 20.5 Labour intention: standardized path coefficients of estimated SEM and p-value of bootstrapping estimation, by country

	Spain (R ² =0.563)			Portugal (R ² =0.561)			Brazil (R ² =0.364)		
	Original sample	Bootstrapping	p	Original sample	Bootstrapping	p	Original sample	Bootstrapping	p
Locus of internal control	0.00	0.00	0.999	-0.01	-0.01	0.907	0.10	0.09	0.379
Self-efficacy	0.06	0.07	0.498	-0.27	-0.25	0.027*	-0.21	-0.17	0.151
Pro-activeness	-0.15	-0.14	0.121	0.39	0.36	0.001**	0.09	0.08	0.417
Personal attitude	-0.30	-0.30	0.014*	-0.16	-0.15	0.147	-0.12	-0.08	0.315
Perceived control	0.02	0.02	0.864	0.10	0.10	0.383	-0.19	-0.11	0.228
Standard	-0.15	-0.14	0.022	-0.02	-0.01	0.749	-0.07	-0.06	0.524
Feasibility	-0.33	-0.32	0.011*	-0.48	-0.49	0.003**	0.11	0.05	0.493
Motivations for setting up a company	0.03	0.03	0.687	-0.04	-0.04	0.706	-0.12	-0.09	0.537
Important resources for setting up a company	0.05	0.02	0.582	0.08	0.05	0.348	0.25	0.25	0.017*
Important obstacles for setting up a company	0.00	-0.02	0.987	-0.11	-0.08	0.191	0.17	0.05	0.317
Importance of setting up a company	-0.12	-0.11	0.125	0.02	0.00	0.880	0.26	0.18	0.052
Social value of entrepreneurship	-0.04	-0.05	0.648	0.05	0.04	0.518	0.05	0.08	0.749
Specific capacities to becoming an entrepreneur	-0.08	-0.07	0.432	-0.20	-0.17	0.082	0.07	0.08	0.531
Individualist	-0.05	-0.06	0.561	-0.16	-0.18	0.120	-0.02	0.00	0.821
Collectivist	-0.01	-0.01	0.843	0.00	-0.03	0.948	0.17	0.15	0.126
Mixed	0.02	0.00	0.769	-0.05	0.03	0.609	0.01	-0.01	0.947

cant differences between the effects of the Self-efficacy (Spain < Portugal), Pro-activeness (Spain > Portugal) and Motivations for setting up a company (Spain < Portugal) on Entrepreneurial intention. Comparing Spain with Brazil returned statistically significant differences in the effects caused by the constructs Locus of internal control (Spain < Brazil), Self-efficacy (Spain < Brazil), Feasibility (Spain > Brazil) and Individualist (Spain < Brazil) on the Entrepreneurial intention construct. Through a comparison of the Portuguese and Brazilian samples, we encounter statistically significant differences in the impact of the Pro-activeness (Portugal > Brazil), Feasibility (Portugal < Brazil) and Motivations for setting up a company constructs on Entrepreneurial intention (Portugal < Brazil).

As regards labor intension (Table 20.7), there are statistically significant differences between the Portuguese and Spanish samples in the Self-efficacy

Table 20.6 Standardized path coefficient differences, Henseler's multigroup analysis (entrepreneurial intention)

	Spain— Portugall	p	Spain— Brazill	p	Portugal— Brazill	p
Locus of internal control	0.12	0.108	0.18	0.035*	0.06	0.281
Self-efficacy	0.25	0.013*	0.24	0.010*	0.01	0.466
Pro-activeness	0.35	0.000**	0.04	0.369	0.31	0.005**
Personal attitude	0.15	0.083	0.16	0.074	0.01	0.467
Perceived control	0.13	0.128	0.18	0.060	0.05	0.318
Standard	0.02	0.369	0.06	0.236	0.04	0.319
Feasibility	0.09	0.247	0.28	0.020*	0.37	0.004**
Motivations for setting up a company	0.15	0.030*	0.18	0.094	0.33	0.008**
Important resources for setting up a company	0.05	0.297	0.07	0.285	0.12	0.147
Important obstacles to setting up a company	0.02	0.398	0.04	0.357	0.02	0.422
Importance of setting up a company	0.11	0.076	0.19	0.024	0.08	0.188
Social value of entrepreneurship	0.09	0.135	0.07	0.282	0.16	0.095
Specific capacities to becoming an entrepreneur	0.17	0.071	0.16	0.093	0.01	0.473
Individualist	0.10	0.140	0.20	0.019*	0.10	0.152
Collectivist	0.03	0.351	0.15	0.068	0.12	0.114
Mixed	0.08	0.182	0.06	0.283	0.15	0.101

*p < 0.05

**p < 0.01

Table 20.7 Standardized path coefficient differences, Henseler’s multigroup analysis (labour intension)

	Spain— Portugall	p	Spain— Brazill	p	Portugal— Brazill	p
Locus of internal control	0.01	0.470	0.10	0.222	0.11	0.234
Self-efficacy	0.33	0.014*	0.27	0.068	0.06	0.399
Pro-activeness	0.54	0.000**	0.23	0.053	0.30	0.025*
Personal attitude	0.14	0.201	0.18	0.137	0.04	0.396
Perceived control	0.08	0.285	0.21	0.129	0.29	0.075
Standard	0.13	0.107	0.08	0.262	0.05	0.356
Feasibility	0.15	0.234	0.44	0.021*	0.60	0.008**
Motivations for setting up a company	0.07	0.290	0.16	0.225	0.09	0.336
Important resources for setting up a company	0.02	0.428	0.19	0.083	0.17	0.097
Important obstacles to setting up a company	0.11	0.178	0.17	0.191	0.28	0.091
Importance of setting up a company	0.14	0.142	0.38	0.018	0.24	0.083
Social value of entrepreneurship	0.08	0.216	0.08	0.301	0.00	0.498
Specific capacities to becoming an entrepreneur	0.13	0.206	0.15	0.161	0.27	0.042
Individualist	0.11	0.202	0.03	0.411	0.14	0.166
Collectivist	0.01	0.455	0.19	0.072	0.18	0.080
Mixed	0.07	0.287	0.01	0.453	0.06	0.355

*p < 0.05
 **p < 0.01

(Spain < Portugal) and Pro-activeness (Spain < Portugal) constructs. Comparing the Spanish student sample with their Brazilian peers, we observe statistically significant differences in terms of the impact generated by the Feasibility (Spain > Brazil) construct on that of Labour intention. Finally, when comparing the Portuguese and Brazilian student samples, we may report statistically significant differences in the impact of the constructs for Pro-activeness (Portugal > Brazil) and Feasibility (Portugal > Brazil) on the Labor intention construct.

20.5 Conclusions

There is widespread consensus around the need to study the personal and social variables that influence the entrepreneurial intentions of persons and especially university students given the importance these educational establishments play in the creation of knowledge in conjunction with the need for such knowledge to reach markets and be placed in the service of society.

In this research, we opted to study those variables capable of explaining entrepreneurial intentions based upon psychological characteristics, motivations and the individual and collective values of university students. To this end, we selected a sample of university students from Portuguese, Spanish and Brazilian universities with the objective of evaluating the differences prevailing in these respectively different international environments.

When observing entrepreneurial intention and in the comparison between the Spanish and Portuguese samples, we encountered the existence of statistically significant differences in the effects caused by the constructs Self-efficacy, Pro-activeness (with these the most important to Spanish students) and Motivations for setting up a company (in this case, holding greater importance to Portuguese students). On contrasting the Spanish and Brazilian students, we may report the existence of statistically significant differences in the impacts caused by the constructs Locus of internal control, Self-efficacy and Individualist (all attributed greater importance by the Brazilian students) and Feasibility (with this factor attributed greater importance by Spanish students). Finally, in the comparison between the Portuguese and Brazilian samples, we encounter statistically significant differences in the impact of the constructs for Pro-activeness (more important to Portuguese students than to their Brazilian peers), Feasibility and Motivations for setting up a company (attributed higher levels of importance by Brazilian respondents than their Portuguese counterparts).

As regards labor intention, we identified statistically significant differences between the Portuguese and Spanish samples across the constructs for Self-efficacy and Pro-activeness (and of greater importance to the Portuguese than the Spanish). In terms of contrasting the Spanish and the Brazilian samples, we return statistically significant differences in the Feasibility (and of higher importance to Spanish than Brazilian students) construct whilst the Portuguese and Brazilian samples display differences in both the constructs for Pro-activeness and Feasibility, with these of particularly greater importance to Brazilian students.

Our results convey the relevance of identifying the different entrepreneurial intentions prevailing in different countries alongside the respective sources of such influences. This requires wide reaching research even while common sense leads to the conclusion that the first step should involve working on policies able to strengthen and deepen the innovative and creative spirit of a society. Within this framework, public policies should clearly target entrepreneurship and launching academic programs stimulating and empowering entrepreneurial spirits.

References

- Acs, Z. J., Audretsch, D. B., Braunerhjelm, P., & Carlsson, B. (2006). *The knowledge spillover theory of entrepreneurship*. CESIS Electronic Working Paper Series.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.
- Andersson, M., & Hellerstedt, K. (2009). Location attributes and start-ups in knowledge-intensive business services. *Industry & Innovation, 16*(1), 103–121.
- Audretsch, D. B., & Lehmann, E. E. (2005). Does the knowledge spillover theory of entrepreneurship hold for regions? *Research Policy, 34*(8), 1191–1202.
- Barroso, C., Carrión, G. C., & Roldán, J. L. (2010). Applying maximum likelihood and PLS on different sample sizes: Studies on SERVQUAL model and employee behavior model. In *Handbook of partial least squares, Springer handbooks of computational statistics* (pp. 427–447). London, UK: Springer.
- Bird, B. (1988). Implementing entrepreneurial ideas: The case for intention. *Academy of Management Review, 13*(3), 442–453.
- Boyd, N. G., & Vozikis, G. S. (1994). The influence of self-efficacy on the development of entrepreneurial intentions and actions. *Entrepreneurship Theory and Practice, 18*(4), 63–77.
- Davidsson, P., & Honig, B. L. (2003). The role of social and human capital among nascent entrepreneurs. *Journal of Business Venturing, 18*(3), 301–331.
- Douglas, E. J., & Shepherd, D. A. (2002). Self-employment as a career choice: Attitudes, entrepreneurial intentions, and utility maximization. *Entrepreneurship Theory and Practice, 26*, 81–90.
- Feller, I., Ailes, C., & Roessner, J. (2002). Impacts of research universities on technological innovation in industry: Evidence from engineering research centres. *Research Policy, 31*(3), 457–474.
- Gartner, W. B. (1989). Who is an entrepreneur? Is the wrong question. *Entrepreneurship Theory and Practice, 13*(4), 47–68.
- Hair, J. F., Black, B., Babin, B., Anderson, R. E., & Tatham, R. L. (2010). *Multivariate data analysis* (7th ed.). London, UK: Pearson Prentice Hall.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *The Journal of Marketing Theory and Practice, 19*(2), 139–152.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2012). Partial least squares: The better approach to structural equation modeling? *Long Range Planning, 45*(2012), 312–319.
- Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review, 26*(2), 106–121. Retrieved from <http://doi.org/10.1108/EBR-10-2013-0128>.
- Howells, J. R. L., & Tether, B. S. (2004). *Innovation in services: Issues at stake and trends*. Brussels, Luxembourg: European Commission.
- Katz, J. A. (2003). The chronology and intellectual trajectory of American entrepreneurship education 1876–1999. *Journal of Business Venturing, 18*(2), 283–300.
- Koch, A., & Stahlecker, T. (2006). Regional innovation systems and foundation of knowledge intensive business services. *European Planning Studies, 14*(2), 123–146.
- Krueger, N. (1993). The impact of prior entrepreneurial exposure on perceptions. *Entrepreneurship Theory and Practice, 18*(1), 5–22.
- Krueger, N. F. (2000). The cognitive infrastructure of opportunity emergence. *Entrepreneurship Theory and Practice, 24*(3), 5–23.
- Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing, 15*(5/6), 411–432.
- Martin, F. (1998). The economic impact of Canadian university R&D. *Research Policy, 27*, 677–687.
- Muller, E. (2001). *Innovation interactions between knowledge intensive business and small and medium sized enterprises*. Heidelberg: Physica-Verlag.

- Riddel, M., & Schwer, R. (2003). Regional innovative capacity with endogenous employment: Empirical evidence from the US. *The Review of Regional Studies*, 33(1), 73–84.
- Ringle, C. M., Wende, S., & Becker, J.-M. (2014). *SmartPLS 3*. Hamburg: SmartPLS. Retrieved from <http://www.smartpls.com>.
- Sánchez, J. C. (2010). Evaluation of entrepreneurial personality: Factorial validity of entrepreneurial orientation questionnaire (COE). *Revista Latinoamericana de Psicología*, 42(1), 75–90.
- Sarstedt, M., Henseler, J., & Ringle, C. M. (2011). Multigroup analysis in partial least squares (PLS) path modeling: Alternative methods and empirical results. *Advances in International Marketing*, 22, 195–218.
- Schumpeter, J. A. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.
- Schumpeter, J. A. (1939). *Business cycles*. New York: McGraw-Hill.
- Schumpeter, J. A. (1942). *Capitalism, socialism and democracy*. New York: Harper & Row.
- Shapiro, A. (1985). The entrepreneurial event. *Enterprise, February*, 5–9.
- Shapiro, A., & Sokol, L. (1982). The social dimensions of entrepreneurship. In C. A. Kent, D. L. Sexton, & K. H. Vesper (Eds.), *Encyclopaedia of entrepreneurship* (pp. 72–90). Englewood Cliffs, NJ: Prentice Hall.
- Souitaris, V. (2002). Technological trajectories as moderators of firm-level determinants of innovation. *Research Policy*, 31, 877–898.
- Steffensen, M., Rogers, E., & Speakman, K. (2000). Spin-offs from research centres at a research university. *Journal of Business Venturing*, 15(1), 93–111.
- Thompson, E. R. (2009). Individual entrepreneurial intent: Construct clarification and development of an internationally reliable metric. *Entrepreneurship Theory and Practice*, 33(3), 669–694.
- Toivonen, M. (2004). *Expertise as business: Long-term development and future perspectives of knowledge intensive business services (KIBS)*. Doctoral dissertation Series 2004/2, Helsinki University of Technology, Department of Industrial Engineering and Management.
- Varga, A. (2000). Local academic knowledge spillovers and the concentration of economic activity. *Journal of Regional Science*, 40, 289–309.
- Varga, A. (2002). Knowledge transfers from universities to the regional economy: A review of the literature. In A. Varga & L. Szerb (Eds.), *Innovation, entrepreneurship and regional economic development: International experiences and Hungarian challenges* (pp. 147–171). Pécs: University of Pécs Press.

Index

A

- Administrative and Service Staff, 50
- AHP. *See* Analytical hierarchy process (AHP)
- Analytical hierarchy process (AHP)
 - advantages, 201
 - degree of consistency, 202
 - GP, 202
 - inconsistencies, 202
 - solid multi-criteria analysis method, 201
 - trade-offs, 201
- Anglo-Saxon terms Portfolio Assessment, 186
- Archimedean GP method, 203
- Autonomous learning, 201
 - AHP (*see* Analytical hierarchy process (AHP))
 - dimensions and criteria, 207
 - e-LEARNING, 200
 - examples development and solved exercises, 208
 - Fuzzy methods, 201
 - hierarchical structure, 206
 - inconsistent matrices, 207
 - index of closeness, 208, 209
 - individual assessments, 206
 - international benchmark organizations, 198
 - issues, 198
 - MCDA, 200 (*see also* Moodle platform)
 - multi-criteria analysis, 199
 - participative evaluation systems, 200
 - quality of education, 198
 - skills, 198
 - subject modules, 199
 - weight factors, 207
- AVE. *See* Average Variance Extracted (AVE) method
- Average Variance Extracted (AVE) method, 290

B

- Bartlett's Test of Sphericity, 40
- Bayh-Dole Act, 110
- Bologna Declaration in 1999, 215
- Bologna process, 215
- Bottom-up programs, 137
- Business administration
 - double degrees, 263
 - flipped teaching, 263
 - number of internships, 263
 - in Spain, 263
- Business Administration and Management (ADE), 199, 203
- Business angels, 57, 58, 60
- Business Center
 - entrepreneurship, 159–160
 - innovation, 159–160
- Business pull strategy, 136
- Business sector
 - social science and legal sectors, 216
 - student after University learning period, 216

C

- CEGI. *See* Centre for Employment Guidance and Information (CEGI)
- Centre for Employment Guidance and Information (CEGI), 244
- Centre for Technology Transfer (CTT), 244
- CETYS University
 - Baja California state, 251
 - basic data about Mexico, 251
 - competitiveness, 251
 - early-stage entrepreneurs, 251

- CETYS University (*cont.*)
 innovation and entrepreneurship initiatives, 250
 MBA (*see* Master in Business Administration (MBA))
 Moocs, 250
 Competence profile
 leader's, 190
 member's, 193
 secretary's, 191
 spokesperson's, 192
 Complex systems theory
 academic settings, 100
 Bunge's systemism, 100
 description, 84
 social sciences, 85
 Conceptual research model, 22
 Consistency Index Calculation, 202
 Contingency tables, 274
 Creation technology-based companies, 240
 CTT. *See* Centre for Technology Transfer (CTT)
- D**
- Degree of autonomy, spin-offs, 144
 Degree of Public Administration and Management (PAM), 181
 Doctoral programs, 106, 108, 113, 118
- E**
- Economic development
 and social development, 84
 creative destruction, 88
 ECTS credits, 217
 Educational development
 Bologna process, 215
 communication skills and human resource management, 219
 current academic, design of, 216
 EEES implementation, 215
 EHEA objective, 215
 evaluation, control and regularization, 218
 general assessment, activity, 223
 learning process, 219
 mental and emotional, 218
 motivational aspects, activity, 223
 questionnaire structure, 221
 research phases, 219
 results, 224, 225
 skills, 216
 student distribution according to groups, 222
 teacher requirements, 217
 teaching of teacher-based classes, 217
 team work, 219
 technical data file, 222
 training requirements, 215
 Educational innovation approach
 educational models, 109
 European Union (EU), 108
 frameworks, 107
 learning performance, 109
 policy makers, 107
 EHEA. *See* European Higher Education Area (EHEA)
 Eigenvectors technique, 203
 e-LEARNING, 200
 Entrepreneurial education programmes, 71
 Entrepreneurial initiatives
 and Business Center - Sergio i + E, 159–160
 economic and social development, 152
 economic uncertainty, 153
 education, 152
 factors and requirements, 157–158
 HEI role, Colombia, 155–156
 job placement, 153
 substantive activities, 152
 in universities, 154–155
 within universities, 153–154
 Entrepreneurial orientation (EO)
 academic inventors' personal traits, 36
 commercialisation, 36
 context conditions, 42, 44
 dimensions, 38
 dimensions, context-specific conditions, 38
 external and internal variables, 36
 factors, 40
 measures, 39–40
 multidimensional construct, 37
 no-profit organizations, 37
 online questionnaire, 39
 patents and spin-offs, 37
 pattern matrix, 41
 and performance, 42, 43
 samples, 39
 social and discursive practices, 36
 technology transfer process, 36
 unconventional fundraising, 40
 unconventional networking, 40
 Entrepreneurial Orientation Questionnaire (EOQ), 289
 Entrepreneurial university, 111–113, 126
 Basque Country (2004–2012), 115
 economic growth and social progress, 106
 (*see also* Educational innovation approach)
 OECD innovation strategy, 106

- profile, 116 (*see also* Technology transfer approach)
- third mission activities, 106
- training, research and transfer activities, 107
- UPV/EHU (*see* University of the Basque Country (UPV/EHU))
- Entrepreneurship education
 - ability, 20
 - behavioural traits, 20
 - business ventures, 20
 - conceptual research model, 22
 - decision making abilities, 20
 - demographics
 - age, 23
 - employment occupation, 22
 - gender, 22
 - graduation, 23
 - hypotheses analysis, 26–28
 - hypotheses and statistical techniques, 26
 - person's propensity, 24
 - proactiveness, 23
 - proxy, 20
 - public policy planners and government bodies, 19–20
 - sample characterization, imprint research, 25
 - self-efficacy, 23
 - statistical tool validation, 26
 - theory of planned behaviour, 21
 - uncertainty avoidance, 24
 - variables, 25
- Entrepreneurship research
 - business and management, 124
 - connection, 131
 - discovery process and opportunities, 124
 - domestic and international oriented chapters, 128
 - impact factor, 131
 - journals with Spanish signing authors, 130
 - network, 127
 - number of authors, 128
 - number of chapters, 127
 - phases of
 - discussion about entrepreneurship, 126
 - entrepreneurial university, 126
 - fragmentation of the research, 126
 - take-off phase, 126
 - research institutions, 127
 - signing authors per university, 129
 - Springer book series, 124, 125
 - universities, 128
 - WOS, 124
- Entrepreneurship support programmes (ESPs), 240
- Entre-U scale, 42
- EOQ. *See* Entrepreneurial Orientation Questionnaire (EOQ)
- ESPs. *See* Entrepreneurship support programmes (ESPs)
- European Higher Education Area (EHEA), 55, 198, 231
- Exploratory factor analysis, 40
- F**
- Faculty of Business Administration and Management (FBAM), 181
- Favorable environment/high-quality university, 148
- Favorable environment/low-quality university, 147, 148
- FBAM. *See* Faculty of Business Administration and Management (FBAM)
- Finpin* network, 52
- Fuzzy methods, 201
- G**
- GEM. *See* Global Entrepreneurship Monitor (GEM) project
- Generic competences, 180
- Global Entrepreneurship Monitor (GEM) project, 113
- Global University Entrepreneurial Spirit Student's Survey (GUESSS), 72
- Goal programming (GP)
 - average sum of deviations, 202
 - linear programming technique, 202
 - paired matrices, inconsistencies, 202
- GP. *See* Goal programming (GP)
- Growth oriented spin-offs, 141
- GUESSS. *See* Global University Entrepreneurial Spirit Student's Survey (GUESSS)
- H**
- Henseler's multigroup analysis, 298
- Higher education institutions (HEIs), 155–156
- High-Quality Accreditation, 159, 162
- I**
- ICDE. *See* Institute for Creation and Development of Enterprise (ICDE)
- ICT. *See* Information and communication technologies (ICT)
- IDP. *See* Institutional Development Plan (IDP)

- IHE. *See* Institutions of higher education (IHE)
- II. *See* Inconsistency index (II)
- Impact factor, 131, 132
- Inconsistency index (II), 202
- Incubators
- commercial banks, 170
 - entrepreneurial implementation, 172
 - entrepreneurship education, 169
 - external entrepreneurship support system, 169
 - fosters community/community of practice, 168
 - functions, 167
 - higher education institutions, 169
 - in community, 166
 - NBIA, 166 (*see also* Networks)
 - OECD countries public policy, 169
 - participatory cultures, 170
 - performance assessment, 173–174
 - public money investment, 166
 - social network theory, 168
 - tangible outputs and intangible outcomes, 169
 - technology-based firms, 168
 - TIP, 167
 - university research/private sector, 166
- Information and communication technologies (ICT), 217
- Innocentre network, 52
- Innovation and entrepreneurship
- academic innovation, 4
 - academic revolutions, 2
 - activities related to, 11–12
 - characteristics, 3, 7–8
 - commercial opportunity/social demand, 6
 - commercial utilization, 10
 - creative destruction, 6
 - economic and social development, 3, 5
 - entrepreneurial university, 5
 - indication, 9–10
 - instruments, 13
 - realignments, 2
 - soft and hard activities, 13
 - sustainability, 4
 - theoretical and practical contributions, 3
 - triple helix of innovation, 2
 - university entrepreneurship, 5
- Institute for Creation and Development of Enterprise (ICDE), 244
- Institutional Development Plan (IDP), 93–98
- Institutional Pedagogical Project (IPP), 94, 95, 97, 98
- Institutions of higher education (IHE), 55–58
- Central Executive and regional Governments, 59
 - education system, 52
 - and entrepreneurship, 49–51
 - European Union (EU), 48
 - Finpin* network, 52
 - foster entrepreneurship, 54
 - Kaospilots* initiative, 53
 - research and applied research, 48
 - second academic revolution, 48
 - SMEs, 53
 - in Spain
 - BBVA-IVIE report, 55
 - foster entrepreneurship, 58
 - geographical areas, 57
 - Innogestiona programme, 56
 - Redemprendia network, 56
 - RUVID, 57
 - spin-offs creation, 55
 - University Entrepreneur Program, 55
 - technical, business and post-degrees, 59
 - traditional teaching, 59
 - training program, 52
 - transfer of knowledge, 48
 - Tumentrepreneurship*, 53
 - Tut Innovation and Business Center*, 53
 - unemployment, underemployment and labour over-qualifications, 48
 - university researchers, 60
 - wage employment, 48
 - Zentrum Für Entrepreneurship*, 54
- International Center for Entrepreneurial Studies*, 53
- International Business Incubation Association (NBIA), 166
- Intrapreneurship, 260
- IPP. *See* Institutional Pedagogical Project (IPP)
- Israeli Technology Incubator Program (TIP), 167
- K**
- Key incubator performance statistics, 173
- Knowledge society, 91, 95, 101
- L**
- Leader's competency profile, 190
- Learning commitments
- collaborative learning, 186
 - evidence-based assessment, 186
 - work group, portfolios, 186
- Lifestyle oriented spin-offs, 141

M

- Master in Business Administration (MBA)
 - business plans, 253
 - communication skills, 254
 - educational partnerships, 252
 - entrepreneurship educators, 252
 - participation, 254
 - teamwork, 253–254
- MBA. *See* Master in Business Administration (MBA)
- MCDA. *See* Multi-criteria decision analysis (MCDA)
- Member's competency profile, 193
- Moodle platform
 - aggregate matrix, 205
 - Archimedean GP method, 203
 - Eigenvectors technique, 203
 - index of closeness, 205
 - Likert type survey, 205
 - objective, dimensions and criteria, 203
 - Saaty type questionnaire, 203
 - students' group, 203
- Multi-criteria decision analysis (MCDA), 200

N

- NBIA. *See* International Business Incubation Association (NBIA)

Networks

- early stages, venture development, 171
- entrepreneurial activity, 170
- knowledge evaluations, 171
- market knowledge, 170
- and universities, 171–172

O

- Offices for Transfer of Research Results (OTRIs), 57
- Offices of Technology Transfer (OTT), 50
- OTRIs. *See* Offices for Transfer of Research Results (OTRIs)
- OTT. *See* Offices of Technology Transfer (OTT)

P

- PAM. *See* Degree of Public Administration and Management (PAM)
- Partial least squares (PLS) method, 67, 72–74, 290
- Perceived desirability, 270
- Perceived viability, 270
- Planned behavior theory, 21

- PLS. *See* Partial least squares (PLS) method
- PoliformaT, UPV's training platform, 189
- Portfolio process, 186
- Postgraduate Training Centre (PTC), 244
- PTC. *See* Postgraduate Training Centre (PTC)
- Public Administration and Management (PAM), 185

R

- Random Consistency Index (RI), 202
- Regression analysis, 40
- Research mobilization, 38, 40, 43
- Research Results Transfer Offices, 111
- Rey Juan Carlos University, 199
- RI. *See* Random Consistency Index (RI)

S

- Saaty type questionnaire, 203
- Second academic revolution, 48
- Secretary's Competency Profile, 191
- Self-efficacy
 - definition, 23
 - roles, 23
- SEM. *See* Structural equation modeling (SEM)
- SERC. *See* Socioeconomic Environment Relations Centre (SERC)
- Small and medium-sized enterprises (SMEs), 53
- SMEs. *See* Small and medium-sized enterprises (SMEs)
- Social development
 - local, regional/national scale, 8
 - regional economic and, 5
 - regions, states and countries, 5
 - triple helix of innovation, 84
 - universities, 2
 - viability of resources, 94
- Socioeconomic Environment Relations Centre (SERC), 244
- Specific competences, 180
- Spokesperson's competency profile, 192
- SRMR. *See* Standardized Root Mean Residual (SRMR) method
- Standardized Root Mean Residual (SRMR) method, 290
- Stock market, 220
- Structural equation modeling (SEM), 290
- Student EOs
 - AVE, 290
 - CB-SEM and PLS-SEM, 290
 - correlations between constructs, 292
 - entrepreneurial intentions, 289
 - entrepreneurship, 288, 293, 296

- Student EOs (*cont.*)
- Henseler's multigroup analysis, 295, 298, 299
 - instruments, 289–290
 - knowledge development, 288
 - labour intension, 295, 297
 - planned behaviour theory, 289
 - sample characteristics, 291–293
 - SEM path coefficients, 295
 - standardized path coefficients, 294
 - VIF, 290
- Sustainability, 84
- Systemism
- agency-structure/structure-agency relations, 93
 - complex systems, 84
 - concepts, 86
 - destruction, 88
 - economic, political and social context, 90
 - individualism and holism, 88
 - knowledge creation, 88
 - methodological prescription, 90
 - projects, 85
 - regional economic performance, 86
 - research, 86
 - social systems, 90, 91
 - structure of system, 91
 - sustainability, 87
 - system elements, 89
 - system's structure, 89
 - systemic conceptual framework, 92
 - teaching and/or research, 86
 - triple helix of innovation, 84
 - university context, 84 (*see also* University of Southern Santa Catarina (Unisul))
- T**
- TAM. *See* Technology Acceptance Model (TAM)
- TBCs. *See* Technology-based enterprises (TBCs)
- Teaching and Research Faculty, 50
- Technology Acceptance Model (TAM), 200
- Technology push strategy, 136
- Technology transfer approach
- Bayh-Dole Act, 110
 - intellectual property rights, 110
 - OTRIs, 111
 - scientific research and technology transfer mechanisms, 110
 - university education, role of, 109
- Technology-based enterprises (TBCs), 55
- Theory of planned behaviour, 21
- TIP. *See* Technology Incubator Program (TIP)
- Top-down programs, 137
- Total Entrepreneurial Activity Index (TEA index), 113
- Total Quality Management (TQM), 200
- Tourism Degree Program
- business start-up
 - obstacles, 279
 - reasons, 278
 - categorical variables, 275
 - contingency tables, 274
 - desirability, viability and intentionality, 274
 - entrepreneurial intention models, 271
 - entrepreneurs among students, 279–281
 - entrepreneurship training, 281
 - high unemployment rates, 268
 - hypothesis, 272
 - index-TEA, 274
 - perceived desirability, 270
 - perceived viability, 270
 - personal characteristics, 280
 - personal factors, 280
 - psychological approach, 269
 - questionnaires, 273
 - samples, 270
 - sociological approach, 269
 - students attitude, 268
 - universities, role in, 268
 - variable gender, family history
 - and desirability, 275
 - intentionality, 276
 - viability, 276
- TQM. *See* Total Quality Management (TQM)
- Transversal competences
- application and practical thinking, 182
 - communication, 184
 - comprehension and integration, 182
 - critical thinking, 184
 - definition, 181
 - design and project, 183
 - ethical, environmental and professional responsibility, 183
 - innovation, creativity and entrepreneurship, 183
 - instruments, 185
 - life-long learning, 184
 - problem analysis, 182
 - project, 182
 - teacher, role of, 181
 - time management, 184
 - time planning, 184
 - work and lead teams, 183
- Triple helix of innovation, 84

U

- Unfavorable environment/high-quality university, 147
- Unfavorable environment/low-quality university, 145
- Unisul's Innovation and Entrepreneurship Agency (Agetec), 85, 98
- Universidad Politècnica de València, 264
- Universitat Politècnica de València (UPV)
 - characteristics, 240, 247
 - Clark model, 246
 - entrepreneurial university, 240, 242, 245–246
 - ESPs, 240
 - funding sources, 241
 - higher education systems, 241
 - historical development, 244–245
 - modern entrepreneurial organisation, 241
 - non-traditional sources, 242
 - Spanish universities, 243
 - universities, types of, 241
- University context
 - attitudes, 66
 - beliefs, 69
 - entrepreneurial development, 66
 - entrepreneurial education, 69–70
 - entrepreneurial intention, 69
 - entrepreneurial undertakings, 68
 - environmental factors, 76
 - formal factors, 76
 - goal-oriented planned behaviour, 67
 - GUESSS, 72
 - human behaviour, 69
 - hypotheses significance, 75
 - informal factors, 67
 - institutional economics, 66
 - limitations, 77
 - measures, 72
 - PLS and SEM, 73
 - predictive relevance, 74
 - public and private spheres, 66
 - questionnaire, 72
 - reliability and discriminant validity, 73
 - research model and hypotheses, 68
 - structural model, 75
 - technical data sheet, 72
- University governance, 106, 107, 118
- University of Southern Santa Catarina (Unisul)
 - academic and administrative documents, 95
 - Agetec regulation, 98
 - Brazilian community universities, 93
 - didactic-pedagogic organization, 97
 - educational policies, 97
 - entrepreneurial attitude and community integration, 96
 - financial sustainability, 94
 - IDP, 93
 - internal and external stakeholders, 94
 - mechanisms, 99
 - mission and vision, 96
 - physical resources, 95
 - public funding, 93
 - research and extension, 98
 - social responsibility policies, 94
 - structure, 96
- University of the Basque Country (UPV/EHU)
 - characteristics and survival rate, 117
 - EHEA, 112
 - programmes, 112, 113
 - teaching and research institution, 111
 - traditional university system, 112
- University of Valencia and entrepreneurship
 - agents, 232
 - business creation, 234–235
 - business development, 235
 - promotion, 232–233
 - special inputs, 231
 - stages, 232
 - support, 233–234
 - innovation, social commitment and entrepreneurship, 230
 - organizational learning, 230
 - second academic revolution, 230
 - Spanish universities, 230
 - traditional university system, 230
- University spin-off support programs
 - area of activity, 138
 - bottom-up programs, 137
 - business pull strategy, 136
 - degree of integration, 143–144
 - economic development, 139
 - financial risk, 149
 - funding/financial gain, 139
 - generic models of organization, 142
 - government funding, 140, 141
 - growth oriented, 141
 - independent programs, 145
 - licensing activities, separation of, 143
 - lifestyle oriented, 141
 - local conditions, 136
 - quantity and quality, 136
 - research-to-company conversion rates, 138
 - self-employment, 139
 - self-financing, 140
 - social benefits, 139

University spin-off support programs (*cont.*)
 specialized departments within public
 research organizations, 144
 subsidiary organisations, 144
 support to another mission, 139
 technology push strategy, 136
 technology transfer unit, 140
 top-down programs, 137
 types
 favorable environment/high-quality
 university, 148
 favorable environment/low-quality
 university, 147, 148
 unfavorable environment/high-quality
 university, 147
 unfavorable environment/low-quality
 university, 145
 uncertainty, 140
 university research results, 136
 venture-capital-backed spin-offs, 148
 UPV/EHU. *See* University of the Basque
 Country (UPV/EHU)

V

Valencia Polytechnic University (UPV)
 academic-professional profiles, 181
 Bloom's taxonomy, 179
 challenges, 181
 collaborative learning, 186
 competences, defined, 180
 FBAM, 181
 generic competences, 180
 Human Resources Management, 186
 member's competency profile, 193
 objectives, 181
 PAM, 181, 185

portfolios
 competency levels, 187
 evidence-based assessment, 186
 leader role, 187
 leader's competency profile, 190
 member role, 189
 secretary role, 188
 secretary's competency
 profile, 191
 spokesperson role, 188
 work group, 186
 Spanish University Degree courses, 180
 specific competences, 180
 spokesperson's competency profile, 192
 transversal competences (*see* Transversal
 competences)

Variance inflation factors (VIFs), 40, 290

Venture-capital-backed spin-offs, 148

VIFs. *See* Variance inflation factors (VIF)

Virtual business internships, 263–264.

See also Business administration

business traineeships, 260

data, 261

industry-relevant experience, 262

and relation to new technologies, 262

sample of studies, 261

site supervisor and co-workers, 262

social networking, 263

telecommuting and telework, 260

web log, 262

W

Web of Science (WOS)

academic journals, 131

description, 124

WOS. *See* Web of Science (WOS)