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The effectiveness of knowledge and technology transfer through university-business collaboration in science parks

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Abstract

Science and Technology Parks (STPs) facilitate the flow of knowledge and technology among universities; R & D institutions; companies and markets, and foster the creation and growth of innovation-based companies. Among the diversities of STPs, it is possible to identify two types:

1. Science Parks (SPs), which involve university shareholding and
2. Technology Parks (TPs), which are not owned by universities.

This study will take into account only SPs since they are closely linked to the university, and they are the bridge between a University and companies in the process of Knowledge and Technology Transfer (KTT). The evaluation of the firms' performance in Science Parks results determinant to identify the needs of the companies and the feasibility of the University-Business Collaboration (UBC). The firms' real needs also are of interest for Universities and Science parks, since they face the challenge of designing strategies that best help them to transfer the knowledge more effectively. While previous studies have been focused on tenants innovation performance on-Park and off-Park, very little research has taken into account the Parks heterogeneity that may affect the firms' performance. This research paper focuses on SPs in Spain and Mexico due to data availability.

This thesis (i) aims to identify the Key Performance Indicators (KPIs) in UBC used by co-located companies at SPs, and (ii) explore the performance measure (KPIs) in UBC and critical success factors of SPs. For this study, data was collected through fifty eight online company surveys in Spain and forty two in Mexico. This empirical analysis uses fourteen semi-structured interviews, addressed to SPs directors in order to explore (KPIs) and success factors of SPs in both countries.

Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1 Approach of the Dissertation

The seeding idea of this research arose when I was working on my master's degree thesis at the University of Barcelona (UB). The project consisted of opening a centre for innovation and technology transfer at the Universidad Autónoma de Hidalgo (UAEH) (México). The main objective of this project was connecting the business sector of the region with academia, intending to integrate companies in innovation projects and therefore increasing their competitiveness. This project was based on the theory of the knowledge-based economy. This theory states that knowledge is widely acknowledged to be one of the main engines for economic and social development of a country, Harris (2001); Hitt et al. (2000), and both universities and research centres, either public or private, play a crucial role in both generating and disseminating this knowledge, Etzkowitz et al. (2000); Porter and van Opstal (2001). Additionally, as is known to all, universities were created to fulfil three main missions: first: teach, second: research and third: contribute to the welfare and economic development of society. Through the research mission, universities lead to cutting-edge discoveries, expand the boundaries of science, and ultimately by the *third mission* contribute to social growth and economic development by implying the dissemination and exploitation of this gathered knowledge. Agrawal and Henderson (2002); DEste and Patel (2007); Schartinger et al. (2002). Moreover, the ecosystem of innovation that is generated through knowledge spillovers stimulates other research institutions to commercialise their research findings resulting in the acceleration of economic growth. Therefore, the establishment of University-Business Collaboration (UBC) is central in the process of facilitating this knowledge flow from academia to industry, Cohen and Levinthal (1989).

1. INTRODUCTION

Due to the importance of University-Business Collaboration (UBC), many universities have tried to narrow the gap between science and industry and have created specific units and designed specific programs to assist in this endeavour. Technology Transfer Offices (TTOs) and Science and Technology Parks (STPs) are two examples. Acting as knowledge brokers, and bring together academics, businesses and venture capitalists. They seek to facilitate the transfer of knowledge from academia to the industry while infusing an entrepreneurial culture of innovation, Caldera and Debande (2010).

This research is focused on the Science and Technology Parks because they play a crucial role in knowledge and technology transfer process because of the primary function as contributors to the regional economic development as well as promoters of the culture of the innovation. These objectives are reflected in the definition of science parks created by the International Association of Science Parks: *Science and Technology Park stimulates the flow of knowledge and technology between universities, research institutions, companies and markets while also facilitating the creation and growth of companies based on innovation through incubation and spin-off processes*, IASP, 2002[1]. Among the diversity of Science and Technology Park, it is possible to identify two types; Science Parks (SPs), which involves university shareholding and Technology Parks (TPs), which are not owned by universities, Albahari et al. (2013).

Regarding the types of Science and Technology Parks, this research will take into account only **Science Parks** because they are closely linked to the university, while also acting as the bridge between universities and companies in the process of knowledge and technology transfer (KTT). In addition, Friedman and Silberman (2003), define KTT, as the process by which the invention or intellectual property (IP) resulting from academic research is licensed or transferred through rights of use to an entity with the intention of profit and eventually led to its commercialisation or exploitation.

Another point to emphasise that when both knowledge and technologies are transferred to companies, there is an improvement in their production processes, services or business models, and also their process of adapting to new situations and demands of the market in which they compete. One of the best ways to achieve this growth is to increase its *absorptive capacity*Cohen and Levinthal (1989). Companies with more significant strengths in the field of innovation will be better prepared to extend its presence both regionally and internationally in markets and be able to face and adapt to an environment of global competition.

[1] https://www.iasp.ws

According to De Oslo (2005) Manual, Innovation is defined as: *The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations*.

The Manual of De Oslo (2005) also defines innovative activities as: *All scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. Some innovation activities are themselves innovative; others are not new activities but are necessary for the implementation of innovations. Innovation activities also include R& D that is not directly related to the development of a specific innovation*.

Additionally, the benefits or impacts of innovation on the results of the companies range from the effects on sales and market share to the improvement of productivity and efficiency. The most significant impacts are the evolution towards international competitiveness and productivity as well as the overflow of knowledge arising from innovations made by companies.

Because the Science and Technology Parks (STPs), are a key factor in the innovation process and the transfer of knowledge and technology as well as the implications that they have in the economy, society and the development of a country, several authors have been interested in investigating these organisations from different perspectives. The most representative studies in Spain about STPs are focused on the firms' innovation performance on-Park and off Park location. Vásquez-Urriago et al. (2014) show a positive effect on innovation outputs of firms collocated in Spanish STPs and, in most recent studies, Vásquez-Urriago et al. (2015) also demonstrated the increase in the probability of cooperation for innovation in companies co-located in STPs. Similarly, Díez-Vial and Montoro-Sánchez (2016) present a case study of Madrid Science Park showing that the innovative capacity increases when the firms have formal collaboration with the university and go on to show that when firms focus on internal knowledge networks, there is an increase in the innovative outputs. In comparison, Albahari et al. (2013) find that the more involved the university in the STPs, the more of a negative impact the firms have on innovations outputs; however, the number of patent applications are positively affected.

Despite the extensive literature on the Science and Technology Parks and the knowledge and technology transfer processes (KTT), there is a gap in a fundamental issue: **How effective are the Knowledge and Technology Transfer through University-Business Cooperation in Science Parks?** Agilize, the technology transfer processes, is crucial to exploiting the most modern technologies and the latest discoveries made by research groups and then applying them in the production system to solve the real problems that companies face day after day. In Europe, the gap between high levels of scientific productivity on the one hand and its minimal contributions to industrial competitiveness, on the other hand, seems extremely wide. This gap, also known as *The European Paradox*, has been attributed to a low intensity of linkage between science and industry and to asymmetric information between industry and science regarding the value of innovations. Science and industry operate differently. Their daily activities are highly tied to specific organisational culture, mission and corporate practices, Siegel et al. (2003). Accordingly, goals might signal three opposite directions. First, companies cannot evaluate the quality of the invention *a priori*, and researchers may have difficulties in assessing the commercial profitability of their inventions, Macho-Stadler et al. (2007). Second, poor communication channels and low interest of the companies in academic research are other reasons that prevent universities and businesses from cooperating, Baldini et al. (2007). On the other hand, industries seek solutions that make their operations and processes more competitive, their products more attractive, and this consequently enable them to become more profitable, Iqbal et al. (2011b); Rohrbeck and Arnold (2009). Third, time-span is another critical factor. University research projects tend to require long periods, while industry demands short cycles to compete in the market and achieve a competitive advantage, Bodas Freitas et al. (2008); Bruneel et al. (2010); Dunowski et al. (2010).

It is worth noting that the USA was the first country to take the initiative in articulating technology transfer processes between universities and business. This was through the enacted of Bayh-Dole Act in 1980, which allowed universities to own patents arising from federal research grants. In the same line, researchers working on federal research were stipulated to disclose their inventions to the technology licensing office, Mowery et al. (2004); Popp Berman (2008). This Act fostered the commercialisation of university research, Kenney and Patton (2009); Link and Siegel (2005); Link et al. (2007), and since this relevant Act, other countries outside of the USA such as Denmark, Germany, Austria, and Norway have reformed their IP laws to grant IPRs to universities, in a similar way to the Bayh Dole Act, So et al. (2008). However; a report for Economic Co-operation and Development (2003) OECD, shows that despite many countries modifying the intellectual property regulations for universities in order to be the owners of research results and therefore, being able to market them, there are still significant impediments limiting their potential.

Taking in account what was previously mentioned about the economic and social impact that University-Business Collaboration (UBC) has in the development of a country and the key role that play the Science Parks in knowledge and technology transfer (KTT) process as well as their implications in the increase of global competition, employment and productivity, the present dissertation aims to investigate **companies co-located at Science Parks**, (SPs) and, identify:

1. the criteria to select an SP,
2. the business objectives to select an SP and,
3. to identify the evaluation metrics, **Key Performance and Innovation Indicators** (KPIs), used by companies co-located at SPs.

For this last objectives, KPIs in UBC will be used, which are based on the principal UBC activities found in the literature.

The evaluation of the companiess performance in Science Parks is decisive to identify the needs of the companies and the feasibility of this University-Business Collaboration. companiess real needs also are of interest of universities, due to the challenges they face designing strategies that best help them to transfer the knowledge more effectively. In addition to studying companies co-located in SPs, this research will be also taking to account the Science Parks exploring their critical success factors through semi-structured interviews with Science Parks directors.

As mentioned above, the exchange of knowledge between science and industry is a prerequisite for innovation, Kauffmann and Tödtling (2001); however, this type of collaboration has not been an easy task despite the great support that governments have given to this situation. Although participating in a knowledge and technology transfer project provides benefits for science and industry, some barriers hinder this process. It is therefore fundamental that the different stakeholders involved in this process (*i.e.* the universities, companies, individual researchers and government entities), understand the roles and motivations of the other party to establish fruitful cooperation.

1. INTRODUCTION

Chapter 2

Theoretical Framework

2.1 Importance of the University-Business Collaboration

As mentioned earlier, it is widely known that there are three core missions of the university: the first is to teach; the second is the generation of knowledge through research; and the third, (with active participation)is to contribute to economic growth and social development through the transfer of this knowledge to society. This transfer of knowledge between universities and industry occurs through a variety of mechanisms, DEste and Patel (2007); Geuna and Muscio (2009). The following are among the most representative activities: The hiring of university graduates, the exchanges of personnel (academics/students), joint research (university-company), research contracts, consulting, patents and publications (co-authorship), spin-off companies, and laboratories financed by industries and other physical facilities, also including informal contacts such as meetings and conferences. In this way, companies can collaborate with universities in a wide range of possibilities. *To carry out this critical mission of transferring knowledge to society, it is essential that universities or Higher Education Institutions (HEIs) develop support mechanisms at all levels of the organisation.*

2.2 Support mechanisms in the University-Business Collaboration

According to Galan-Muros et al. (2015), the support mechanisms in the University-Business Collaboration (UBC), can be classified into two groups, at the strategic level and operational level. At the strategic level, we can distinguish the support from university board to strengthen the links between the companies on campus, (*i.e* invite business people to be part of the university board) and incentive programs, (*i.e* academic projects with companies, guest lecturer from industry, etc.), which are well-known mechanisms for developing UBC, Frey and Neckermann (2009); Stephan (2008). On the other hand, at an operational level, we can distinguish Science Parks, innovation centres, incubators, TTOs and liaison offices. Finally, promotion and communication at all levels of the organisation.

2.2.1 Science and Technology Parks

The Science Parks (SPs) are an essential support mechanism used by universities mainly to facilitate the transfer of knowledge generated by the university and act as key actors to link companies with the university and research centres. These parks are established to facilitate the commercialisation of technologies, while stimulating the promotion and development of new technology-based firms (NTBs), Malairaja and Zawdie (2008). Since the establishment of the first Science Park at Standford University in the 1950s, and the later success of the Silicon Valley cluster, STPs have been spreading worldwide. According to The World Alliance for innovation (WAINOVA), in 2009, there were close to 1500 STPs extended across 76 countries in the five continents of the world, Albahari et al. (2017).

There are various concepts used interchangeably to define Science and Technology Parks (Science Park, Science and Technology Park, Research Park, University Research Park, Technology Park, Technopole, Technopark, Innovation Centre, etc.); however, the most accepted definitions used in the literature are those proposed by these three internationally recognised Science and Technology Parks associations: (1)The International Association of Science Parks and Areas of Innovation (IASP); (2)The United Kingdom Science Park Association (UKSPA); (3)The Association of University Research Parks (AURP).

1. The International Association of Science Parks and Areas of Innovation (IASP) define a Park as: *An organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. (STP) Stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets. It also facilitates the creation and growth of innovation-based companies through incubation and spin-off processes, while providing*

other value-added services together with high-quality space and facilities (IASP,2002). [1].

2. The United Kingdom Science Parks Association (UKSPA) defines a science park as: *A business support and technology transfer initiative that encourages and supports the start-up and incubation of innovation-led, high-growth, knowledge-based businesses; provides an environment where more extensive and international businesses can develop specific and close interactions with a particular centre of knowledge creation for their mutual benefit; has formal and operational links with centres of knowledge creation such as universities, higher education institutes and research organisations* (UKSPA, 2010)[2].

3. (3) The Association of University Research Parks (AURP) states that a university research park is: *A property-based venture, which: Master plans property designed for research and commercialisation; creates partnerships with universities and research institutions; encourages the growth of new companies; translates technology; Drives technology-led economic development* (AURP, 2010).[3]

We can notice from the above definitions that not only do they emphasise the importance of STPs as a key factor in the innovation system but also as an intermediary in the University-Industry-Government relations, Triple Helix Model, Etzkowitz and Leydesdorff (1998).

2.2.2 Types of Science and Technology Parks

The great variety of models, shareholders and founders involved in the establishment of Science and Technology Parks (STPs), have caused heterogeneity in these types of organisations, Phan et al. (2005); however, in broad terms, we can identify two types of STPs: Science Parks (SPs), which involve university shareholding; and Technology Parks (TPs), which are not owned by universities, Albahari et al. (2013). As previously stated in the introduction, regarding the particular types of Science and Technology Parks, this research will only take into account Science Parks, due to the fact that they are closely linked to the university, while also acting as the bridge between universities and companies in the process of knowledge and technology transfer (KTT).

[1] https://www.iasp.ws
[2] http://www.ukspa.org.uk
[3] https://www.aurp.net

2.3 University-Business Collaboration Activities

Currently, HEIs carry out a diversity of activities that facilitate the transfer of knowledge to society through university-business collaboration, UBC. The forms of establishing a partnership at an institutional level between university-industry, which are mostly discussed in the literature are Joint Ventures, Networks, Consortia, Alliances, Trade Associations, and linkages through counsellors, Barringer and Harrison (2000). These different forms vary according to the level of collaboration of the participants; however, showing all possible kinds of partnerships or links that could occur between universities and industry is extremely broad.

At the same line,Davey et al. (2011), classify seven activities that strengthen the collaboration among universities and industries: (1) Joint Curriculum design and delivery, CDD, (*i.e*.the joint development of a programme of courses); (2) Lifelong learning, LLL, (*i.e*.continuing education to business); (3) Student mobility, SM, (*i.e*.from HEIs to business); (4) Professional mobility PM (*i.e*.from HEIs to business and from business to HEIs); (5) Joint research R&D; (6) R&D Commercialisation of joint R&D, COM,(*i.e*.disclosures of inventions, patenting, licenses, etc.), and (7) Entrepreneurship, ENT, (*i.e*.the creation of start-ups and spin-offs). All these activities are classified within the three core missions of the University: Education, Research and Valorisation.

Alternatively, Santoro and Gopalakrishnan (2000) define that the most frequent interactions between universities and industry, takes place within these four components: (1) research support (government funding), (2) joint research group (institutional arrangements) (3) knowledge transfer (*i.e.* recruitment of recent graduates, personal interactions, institutional programs, joint education) and (4) technology transfer activities (*i.e.* development and commercialisation of products through the universities research centres). In comparison, Bonaccorsi and Piccaluga (1994a) focus on the interpersonal relationships that may exist between members and also at organisational level and classify the different forms of UBC in six main categories: (1) personal informal relationships, (2) personal formal relationships (3) third parties,(4) formal targeted agreements, (5) formal non-targeted agreements, (6) the creation of focused structures. This classification can also be analysed regarding three dimensions a) participation in the organisation of the resources of the university; b) duration of the contract; and (c) the degree of formalisation. The formalisation agreement is essential because it formalises relations between universities and industry and helps to avoid conflict and mistrust between the parties, Ring and Van De (1994). However, informal interactions and the creation of networks between scientists and engineers from universities and private companies are an essential component and a standard process of the transfer of knowledge and technology between universities and companies, Cohen et al. (1998).

2.3.1 Joint Research & Development, (R&D)

The most development activity of knowledge exchange between universities and companies are through joint R&D projects, Fontana et al. (2006). There are many motivations for companies to make a partnership or start a collaborative project with a university. I will mention the two main ones: Firstly, they want to increase their competitiveness or market share, and secondly, they have the desire to acquire new technologies and new knowledge stock, which is crucial for regional economic performance, Deste and Perkmann (2011). According to Iqbal et al. (2011b), to implement joint R&D projects, universities depend on financial support from both the government and the industrial sectors. Most of the funds are received from the government, and the amount of funds to support university R&D projects from the industrial sectors is still small, Hall (2001). In developing countries this situation is worst. Usually, larger firms have enough resources to invest at an institutional level (industry labs on campus), or in various type of interactions with university researchers, while the small and medium-sized enterprises, (SME), have somewhat limited resources and capacity for direct involvement with academics, Geuna and Muscio (2009). Regarding the collaborative projects funded by the industry, there is a positive impact on the likelihood of academics to interact with the private sector, Ponomariov (2008). In broad terms, the companies that carry out this type of joint R&D projects with universities, usually co-locate part of their R&D staff at Science Parks offices in order to work more closely with the academic staff.

2.3.2 Co-location: Companies at University Science Parks

Co-location is defined as the positioning of departments and offices of R&D personnel close to each other, Song et al. (2007); Xie et al. (2003). This definition also can be used when companies decide to move a strategic business unit or part of its R&D staff at the university, with the aim to increase their knowledge stock and innovation capacity. Usually, these staffs establish offices at University Science Parks.

Co-location helps to reduce communication and cultural barriers while building trusted relationships, which encourages more knowledge dissemination, Van der Bij et al. (2003). This knowledge dissemination can occur both formally and informally, and both horizontally and vertically. Moreover, Song et al. (2007) confirm that co-location is positively associated with the level of knowledge dissemination in technology development. Additionally, geographical proximity is important to companies because of the potential to increase the rate of knowledge and technology transfer activities, Abramovsky and Simpson (2011); Santoro and Gopalakrishnan (2001).

Among the benefits of Co-location,the most significant are the following:

- Contributes to the dissemination of tacit knowledge through spontaneous interaction.
- Helps build trust in the academia-industry relationship, reducing uncertainty. This is necessary, particularity in the first phases of research projects.
- Reduces communication barriers in face-to-face interactions and facilitates more opportunities for new ideas or creative problem-solving.
- Higher levels of accountability between researchers from academia and industry, creating new synergies.

2.4 Motivations for University-Business Collaboration

2.4.1 University Perspective

Reasons for engaging in UBC have been widely documented in the literature. From the standpoint of universities, an essential body of the literature has examined, the incentive programs to commercialise university research, and the studies confirm that when academic and commercial rewards are linked, incentives for patenting are increased, Owen-Smith and Powell (2001), as well as the importance of training the technology transfer officers in topics such as business and marketing, these skills, have a positive impact on commercialisation of research results, Lockett and Wright (2005); Siegel et al. (2003). Other studies have shown that research productivity is positively related to academic engagement in the industrial domain, Bekkers and Bodas Freitas (2008); Gulbrandsen and Smeby (2005); Haeussler and Colyvas (2011). Going a step further, several works also found the importance of funding start-ups, in the early stages, by business angels, governmental entities and universities themselves, which can be catalysts for new business formation and economic development, Di Gregorio and Shane (2003); O'shea et al. (2005); Sine et al. (2003).

One of the most cited studies that take into account both perspectives comes from Oliver (1990), which define six critical determinants to establish an inter-organisational relationship: (1) necessity, (2) reciprocity, (3) efficiency, (4) stability, (5) legitimacy and (6) asymmetry. From an university perspective, necessity: the need for an institutional policy; reciprocity: employment opportunities for graduates; stability: obtain a better vision of the development of study plans; efficiency: the exploitation of research capabilities and results trough intellectual property rights (IPRs) to get patents; legitimacy: contribute to the regional or national economy. From a business perspective, necessity: the need for an institutional policy; reciprocity: access for students for summer internships or hiring faculty members; efficiency: commercialise university-based technologies for financial gain; stability: growth; and the development of human capital, among others. Additionally, Granowicz (2012) states that collaborating with universities offers companies multiple benefits. Universities provide companies with a flexible and profitable cost of R & D resources (experience, use of equipment, and facilities). Also, they receive first hand all the new potential business opportunities that will improve and update their internal capabilities while building a positive corporate image and helping them win the *war for talent*. Companies need more and more people to cover specific required skills.

2.4.2 Business Perspective

As mentioned above, the motivations that have influenced universities to collaborate with industries differ from the motives that have shaped the industry to work with universities. Industry sectors concentrate on creating the benefits they will receive from research activities, while universities focus more on generating new knowledge, Iqbal et al. (2011b); Rohrbeck and Arnold (2009). To leverage markets and improve their competitive advantage, companies need to be constantly aware of any new developments. In this respect, universities offer firms full access to a variety of research expertise, research infrastructure and cutting-edge technologies, which can shorten life cycles for industrial products, Santoro and Chakrabarti (2002); Welsh et al. (2008); Yusuf (2008). Partnering with universities not only provides firms with a flexible and cost-effective extension of the R&D resources (expertise, equipment, facilities) but also helps firms notice emerging potential business opportunities, benchmark the quality of the companys in-house research and update internal capabilities and skills, Granowicz (2011). Partnering with university scientists is also beneficial for companies, as this form of an alliance gives legitimacy to research results Jain et al. (2009). Furthermore, universities can also conduct new research in specific fields that are of interest for firms, Bramwell and Wolfe (2008).

2.5 Specific fields of frequent University-Business Collaboration

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According to Bodas Freitas et al. (2013), the food industry is willing to develop institutional interactions, while companies that work in the textile industry are less likely to do so. On the other hand, large companies that invest internally in innovation through R & D (Absorptive Capacity), but do not invest in the application of knowledge and know-how (Technological openness) are more likely to interact institutionally than through research contracts. Companies that only engage in personal contractual interactions tend to be smaller companies, and they only participate in technology strategies and open innovation. That is, firms that interact with universities through only private contractual agreements tend to be smaller than companies that cooperate institutionally. Companies with highly innovative and research capacities - high absorptive capacity - are more likely to interact institutionally with the universities. The small technology-closed companies, on the other hand, seem unable to participate in any interaction with the universities.

Chapter 3

Literature Review

3.0.1 A Bibliometric overview of University-Business Collaboration between 1980-2016

For this research, it was deemed relevant to review the literature on UBC trough a bibliometric study taking into account not only the most productive authors but also, the most influential journals, the most cited papers, the most influential institution and the wealthiest countries.

Bibliometrics is a research field that analyses bibliographic material from a quantitative perspective. Aiming at providing a comprehensive overview, this study scrutinises the academic literature in the University-Business Collaboration (UBC) and the Knowledge and Technology Transfer (KTT) research during the period after the Bayh-Dole Act (1980-2016). The study employs the Web of Science as the central database from where information is collected. Bibliometric indicators such as the number of publications, citations, productivity or H-index are used to analyse the results.

The literature on University Business Collaboration is abundant. The different stakeholders involved in this process (*i.e.*, the universities, firms, and individual researchers) might explain this vast corpus of both theoretical and empirical studies, as different approaches, and different points of view have been explored DEste and Patel (2007). Another explanation for this diversity relies on the variety of forms in which University Business Collaboration materialize, ranging from informal contacts such as meetings, conferences, recruitment of university graduates, or staff mobility, to more sophisticated agreements such as cooperative joint research, contract research, consulting, consortia, alliances, trade associations, interlocking directorates, industry-funded laboratories or other physical facilities, Barringer and Harrison (2000); DEste and Patel (2007). Although this list is quite exhaustive, scholars converge on the difficulties of categorising all potential mechanisms for UBC to take place, Blackman and Segal (1991). All these mechanisms had been classified into six categories: casual personal relationships, personal relationships, third party, formal targeted agreements, formal non-targeted agreements and creation of focused structures, (Bonaccorsi and Piccaluga, 1994b). Similarly, had been distinguished seven tools through which to strengthen UBC: joint curriculum design and delivery, lifelong learning, student mobility, professional mobility, joint R&D, commercialisation of joint R&D, and entrepreneurship, Davey et al. (2011). Whatever the mechanism used, the formalisation agreement is an essential step, as it monitors and regulates the relationship, avoiding conflict and mistrust between the parties, Santoro and Gopalakrishnan (2000).

Today, research in UBC enjoys good health and can be considered a well-established scientific field, with thousands of researchers studying different theoretical and practical facets. Many research institutions; associations and international networks have also been created based on UBC at their core. Some examples include the Triple Helix Association (TH) and the University-Industry Interaction Network (UIIN). These associations organise seminars and conferences that constitute unique, vibrant forums where academics and practitioners discuss the newest advances in this field. Similarly, specific journals and conferences have emerged, aiming at providing a forum for discussion. Some specific journals that explicitly deal with this topic include Research Policy, Technovation, Journal of Technology Transfer, Journal of Engineering and Technology Management, R&D Management and the International Journal of Technology Management.

Given the amount of research generated around the different mechanisms through which to articulate technology transfer processes between universities and business, there is an urgent need for reviewing the state of the art from its theoretical inception, in the early 1980s, to the present. This analysis begins in 1980, the year that the Bayh-Dole Act was enacted in the USA, which allowed universities to own patents arising from federal research grants. In the same line, researchers working on federal research were stipulated to disclose their inventions to the technology licensing office, Mowery et al. (2004); Popp Berman (2008). This Act fostered the commercialisation of university research, Kenney and Patton (2009); Link and Siegel (2005); Link et al. (2007), and since this relevant Act, other countries outside of the USA such as Denmark, Germany, Austria, and Norway have reformed their IP laws to grant IPRs to universities, in a similar way to the Bayh Dole Act, So et al. (2008).

By using a wide range of bibliometric indicators, this study identifies the most influential journals, authors and papers and analyses which countries and research institutions are taking a leading role in this particular field. The information was collected from the Web of Science (WoS) database, regarded as one of the most influential databases in academic research. Some prior studies have adopted a similar approach but concentrate on specific geographical areas. Calvert presented a review based on joint scientific publications between universities and industry in the UK, covering two decades (1980-2000),Calvert and Patel (2003). Similarly, there is an analysis that examines public and private research collaboration between universities and industry in Italy during the period (2001-2003),Abramo et al. (2009). In the same line, but without using bibliometric indicators, had been analysed academic articles in the field of UBC, starting in 1990 and ending in 2014,Ankrah and Omar (2015). This study differs from previous ones by considering all the modern tools available for representing an area with bibliometric indicators, and by adopting a global geographical perspective, Hirsch (2005); Podsakoff et al. (2008).

3.0.2 Methodology

The search process takes as a basis the Web of Science (WoS) database. Despite there being other databases that could have been used (e.g. Scopus, EconLit, Google Scholar) was selected this database as it has been acknowledged to be of high quality and one of the major sources of citation information in the world, Podsakoff et al. (2008); Yu and Shi (2015).WoS includes more than 15,000 journals and 50,000,000 articles that encompass all the known sciences, Merigó et al. (2015). Information is classified into research categories, research areas, articles, authors, journals, institutions and countries. Today WoS distinguishes 250 categories that are grouped in 150 areas. For this study, the focus is given to the WoS Core Collection, which covers 12,000 of the highest impact journals worldwide, including Open Access journals in the sciences, social sciences, arts, and humanities, with coverage since 1900. Even though the Social Science Citation Index (SSCI) has received some criticism about ideological bias in journals' inclusion, it could be just a result of chance, Klein and Chiang (2004).

The first step in the search process was the identification of meaningful keywords that unequivocally return papers that fall within the topic of interest: technology transfer links between academia and industry. All papers that contained at least two different ideas: a collaboration or partnership agreement (mechanism articulating the technology transfer process), and the actors involved –industry and university– were selected. Because literature has referred to these concepts using a variety of terms, It was elaborated a list containing all potential synonyms (see

Table 3.1: List of keywords

Actors Involved	Technology Transfer Agreement
University Business	Collaboration
University-Business	Cooperation
University-Industry or University Industry	Partnership
Industry-Science or Industry Science	Link
Science to Business or Science 2 Business	Technology Transfer

Table 3.1). This step was essential to determine the inclusion/exclusion criteria to apply in the bibliometric study.

The search was conducted during July and August 2016. The inclusion criteria for accepting papers were: a) document type: article or review, b) language: English, c) timespan: all years, d) indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH and ESCI. This research strategy returned an initial set of 696 records, of which 6673 were articles in scientific journals and 23 reviews. It is important to note that these publications refer to the period comprising 1980 to 2016 (see Figure 3.1), coinciding with the enactment of the Bayh-Dole Act in 1980. This reform introduced Important modifications to universities about commercialisation new technologies and research developments created in the university setting, having profound managerial and policy implications for those involved in university research commercialisation, Siegel et al. (2007).

Aiming at identifying the most influential journals, the most relevant articles, the most productive authors, as well as the leading institutions and countries researching in this particular field, Several key indicators were used for measuring the bibliographic material. The main objective is to provide a general informative overview of the bibliographic data Bonilla et al. (2015).

3.0.2.1 Bibliometric Analysis

First, the analysis relied on the citations/paper ratio, Merigó et al. (2015), which permits the identification of the number of articles that have a certain level of influence. Second, the *h*-index was used, a measure that integrates publications and citations in the same formulation, by connecting the number of papers ”n” that has received”n” citations, Hirsch (2005). This index measures the productivity of a researcher and the total impact of the papers. Thus, researchers with a similar H-index are comparable in terms of their overall scientific impact,

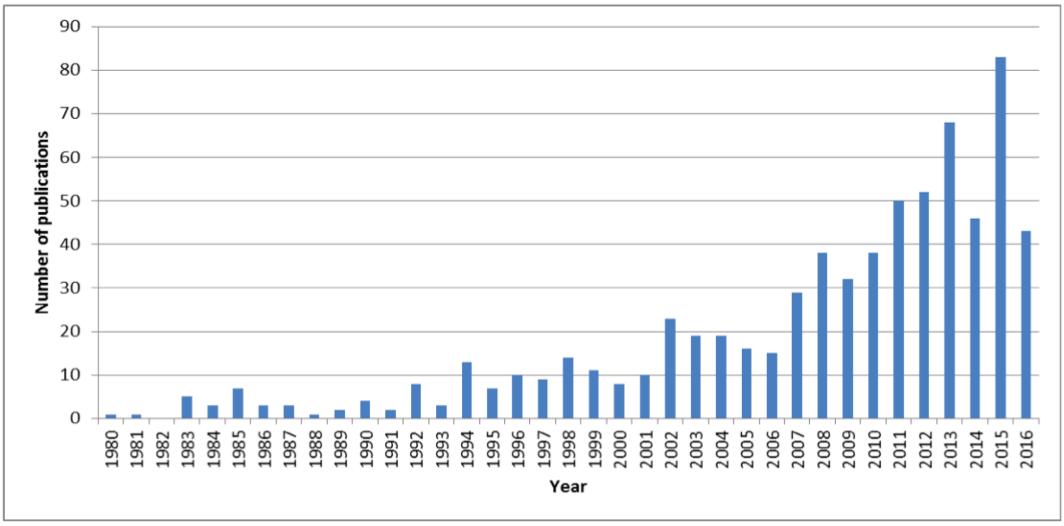


Figure 3.1: Evolution of papers published by year in university-business collaboration and knowledge and technology transfer from 1980 to 2016.

even if their total number of papers or their total number of citations are very different (e.g. if an author or a set of papers has an H-index of 50, it means that the author has 50 papers that have received at least 50 or more citations. The H-index can be applied to articles, journals, authors, countries and universities. Thus it allows making a holistic analysis of a certain field of research, taking into account several different items Blanco-Mesa et al. (2017). The Impact Factor (IF) for the year 2015, of each journal has been included in Table 3 as a measure of the quality of the journal. Impact factor analyses the value of a journal by dividing the number of citations received in the year *n*-1 and *n*-2 from year n by the total number of papers published in the year *n*-1 and *n*-2. It is worth noting that the impact factor has received many criticisms during the last years because it has been argued that it has many limitations because it is easy to manipulate general result using self-citations or related techniques (Cancino et al., 2017). The Impact Factor considers only the two previous years. However a less current impact factor could take into account longer periods of citations and/or sources, but then the measure would be less updated Garfield (2006). The percentage of papers in UBC of any given journal (TP-UBC/TP) in Table 3 is also included. To evaluate the citation rate of papers in UBC, in Table 7, the general citation structure of all the papers is presented, classified by several thresholds concerning the number of citations, > 250¿ 100,$> 50 citations$.

To map the bibliometric material,the method of science mapping was employed. This science can be described as a specific science, where scientific domains or fields of research are structured in conceptual, intellectual and social ways Cobo et al. (2011). Additionally, the study uses VOS viewer software which provides easy-to-interpret graphical representations of the bibliographic material and has the functionality to construct maps based on citation, co-citation co-authorship, bibliographic coupling and co-occurrence data Merigó et al. (2016); van Eck and Waltman (2010). Bibliographic coupling occurs when two documents cite the same third documentKessler (1963). Co-occurrence analyses the most common keywords used in the papers. This list of keywords usually appears on the first page of the paper Laengle et al. (2017). Figure 3 and Figure 4 present the mapping of the most cited authors between 1980-2016 and 1917-1918 respectively. The mapping is focused on authors, so we look for a citation, co-citation and co-authorship with a threshold of fifty cites and one paper. Citation analysis counts the number of times that document A cites document B and vice versa Merigó et al. (2018). Co-citation occurs when two studies receive a citation from the same third study Small (1973). Co-authorship measures the most productive set of documents and those that have the highest degree of joint publications Martínez-López et al. (2018). The graphical visualisation is showed through a network where the size of the node increases with the number of publications and the network connection shows the relationship between them. VOS viewer is freely available, and further information can be found at www.vosviewer.com.

Table 3.2 shows the research categories in which the 696 records have fallen. Only the top 25 research categories are displayed. However, they cover almost the entire sample (95.97%). The category with the highest number of articles is in Management (334 articles), followed by Development Planning (137 articles), Industrial Engineering (105 articles) and Business (89 articles). Concerning the research areas, (see Figure 3.2) we can see that Business and Economics accounts for 57.47% of the total volume, followed by Engineering (26.72%), Public administration (20.69%), and Education & Educational Research (11.92%). Overall, these results mirror the Triple Helix model of university-industry-government relationships Etzkowitz and Leydesdorff (1998). Indeed, the most recurrent categories are business (industry), education (university) and public administration (government).

3.0.2.2 Bibliometric Results

This Section summarises the main results of this review. First, we provide a comprehensive analysis of the most influential journals in the domain of technology transfer processes aimed

Table 3.2: Twenty-five main categories according to the web of science core collection report.

Rank	**Category**	**Number of records**	**% of 696 records**
1	Management	334	47.989
2	Planning development	137	19.684
3	Engineering industrial	105	15.086
4	Business	89	12.787
5	Operations research management science	70	10.057
6	Economics	65	9.339
7	Information science library science	63	9.052
8	Engineering multidisciplinary	58	8.333
9	Education educational research	56	8.046
10	Computer science interdisciplinary applications	45	6.466
11	Geography	27	3.879
12	Environmental studies	27	3.879
13	Education scientific disciplines	27	3.879
14	Multidisciplinary sciences	26	3.736
15	Public administration	20	2.874
16	Urban studies	16	2.299
17	Engineering electrical electronic	14	2.011
18	History philosophy of science	10	1.437
19	Social sciences interdisciplinary	9	1.293
20	Computer science information systems	8	1.149
21	Social issues	7	1.006
22	Materials science multidisciplinary	7	1.006
23	Ethics	7	1.006
24	Chemistry multidisciplinary	7	1.006
25	Health care sciences services	6	0.862

Ranking is development according to the percentage of university-business collaboration (UBC) and Knowledge and technology transfer (KTT) papers in the Journals published between 1980-2016 at Web of Science Core Collection. The total records found during this period were 696.

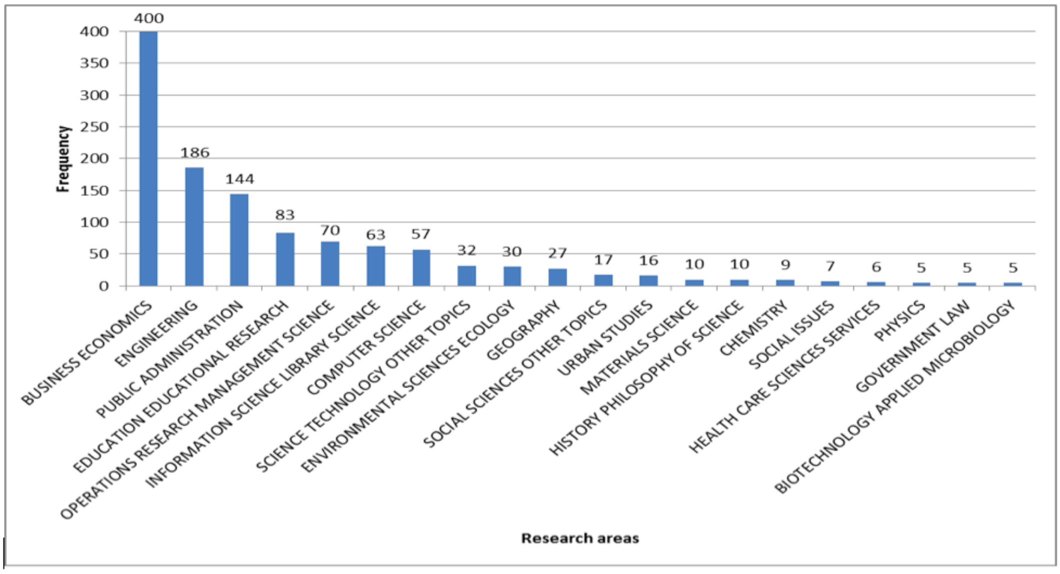


Figure 3.2: Top-20 Research areas in university-business collaboration and knowledge and technology transfer from 1980 to 2016.

at fostering university-business collaborations. The review is limited to the top-20 journals. Second, following a similar strategy, we concentrate on the most cited articles. Next, we focus on the most prolific authors. Lastly, we study which institutions and countries act as drivers in this particular field.

The most influential journals were selected according to the h-index and the percentage of publications during the period 1980-2016. The impact factor was also included as a proxy for the relative importance of the journal within its field. Information was gathered from the Journal Citation Reports. The Impact Factor indicator is computed by dividing the number of citations the journal received during the two preceding years by the total number of papers published in that journal during the same period. The 20 most influential journals in this field are shown in Table 3.3. However, as it can be inferred, the most representative ones are those in the top 10, because their impact factor, H-index and total citations are relatively high compared to the total volume. This list includes Research Policy, Technovation, Journal of Technology Transfer, Scientometrics, Higher Education, International Journal of Technology Management, World Development, IEEE Transactions on Engineering Management, Technological Forecasting and Social Change and R&D Management. These journals are also the target journal outlets where the most productive authors publish their research.

To rank journals, we used the number of citations. This indicator serves as a proxy for the relevance and impact of an article within the academic community. A total of 25 articles were selected. The citations/papers ratio was also used to complement the information for relevance Merigó et al. (2015). Table 3.4 displays the list of top articles. Remarkably, the majority of these papers had been published in Research Policy. Authors that appear in high positions are D.S. Siegel, D. Waldman, A. Link, B. Bozeman, H. Etzkowitz, K. Lausen, A. Salter, P. DEste, P. Patel, M. Perkmann, and K. Wash, all with more than 200 citations.

The most cited papers were published during the first decade of the beginning of the millennium. As it will be later shown in Tables 5 and 6, the most cited articles are authored by those authors listed as the most influential ones and belong to leading institutions in this area. For instance, Perkmann and Salter are affiliated to the Imperial College London (UK); Cassiman, Debackere and Veugelers to KU Leuven (Belgium); Frenken and Bekkers to the Eindhoven University of Technology (The Netherlands); D'Angelo, Abramo, and Solazzi to the University of Rome Tor Vergata (Italy) and Freitas and Geuna to University of Turin (Italy).

Table **??** presents a list of the 25 most productive authors in UBC. As shown, Perkmann leads the ranking with 10 papers; DEste and Muscio tied with 8 papers each, followed by Salter and Leydesdorff, with 7 publications. Looking at the citations record, Siegel achieves the highest number (687). This figure suggests that despite not being the most productive author in this area, his research is impactful, as other authors have widely cited his works. DEste obtains the second position in terms of citations (641) followed by Perkmann (561), Geuna (523) and Salter (521). To provide a complete view, several additional columns have been added, providing information about the total number of papers published and total citations beyond UBC production (also recorded in WoS). Besides, the number of top papers of each of the authors listed in the table according to the web of Science Essential Science indicators is also shown. All of these columns provide meaningful information on how influential and active an author is. It is relevant to identify whether the authors have concentrated their research efforts on UBC or have made significant contributions in other research areas. This is the case with Leydesdorff (163 papers in WoS and 13 top papers), Brostrom (115 papers in WoS, and 5 top papers), Siegel (103 papers in WoS, 10 top papers), DAngelo (83 papers in WoS, 1 top paper), Abramo (77 papers in WoS, 1 top paper), Salter (62 papers in WoS, 4 top papers) and Welsh (45 papers in WoS, 4 top papers).

Table 3.3: Twenty most influential journals in university business collaboration and technology transfer.

R	Journal	H-UBC	TC-UBC	TP-UBC	% P-UBC	TP	TC	IF 2015	H
1	Research Policy	39	5,271	91	13.075	3,026	116,959	3.470	155
2	Technovation	15	677	31	4.454	1,933	29,328	2.243	68
3	Journal of Technology Transfer	12	512	50	7.184	433	3,042	2.213	26
4	Scientometrics	12	371	38	5.460	4,587	55,466	2.084	82
5	Higher Education	10	209	21	3.017	3,602	24,583	1.207	59
6	International Journal of Technology Management	8	137	30	4.310	1,982	10,530	0.867	35
7	World Development	6	179	6	0.862	5,844	100,326	2.438	116
8	IEEE Transactions on Engineering Management	6	115	6	0.862	2,024	26,011	1.454	61
9	Technological Forecasting and Social Change	5	62	9	1.293	4,013	33,163	2.678	65
10	R & D Management	5	107	9	1.293	1,972	19,145	1.190	61
11	Industrial and Corporate Change	5	134	6	0.862	723	14,295	1.327	55
12	European Planning Studies	4	45	12	1.724	1,645	10,874	1.056	39
13	Technology Analysis & Strategic Management	4	53	10	1.437	1,105	9,903	0.845	41
14	Papers in Regional Science	4	219	5	0.718	930	7,324	1.144	39
15	Journal of Engineering and Technology Management	4	195	5	0.718	482	6,491	1.474	41
16	International Journal of Engineering Education	3	24	15	2.155	2,453	7,833	0.559	25
17	Science and Public Policy	3	27	12	1.724	532	1,605	1.233	15
18	Industry and Innovation	3	30	11	1.580	296	1,686	0.87	20
19	Research Evaluation	3	53	10	1.437	475	3,661	1.467	26
20	Science Technology and Society	2	13	6	0.862	119	124	0.231	6

Abbreviations: R, rank; H-UBC, H-index only with University-Business Collaboration (UBC) and Knowledge and Technology Transfer (KTT); TC-UBC, Total Citations of papers in the area of University-Business Collaboration (UBC) and Knowledge and Technology Transfer (KTT); TP-UBC, Total Production of papers on the topic of University-Business Collaboration (UBC) and Knowledge and Technology Transfer (KTT); % P-UBC, percentage of papers published in a given journal in the specific topic of University-Business Collaboration (UBC) and Knowledge and Technology Transfer (KTT); TP, Total number of papers; TC, Total number of citations; H, H-index; IF 2015, impact factor for the year 2015. Journals are ranked according to the H-index and percentage of TC-UBC.

Table 3.4: Twenty-five most cited papers in in university business collaboration and technology transfer.

R	J	TC	Title	Author/s	Year	C/Y
1	RP	379	Assessing the impact of organizational practices on the relative productivity of university technology transfer offices: an exploratory study	Siegel et al.	2003	27.07
2	RP	336	Technology transfer and public policy: a review of research and theory	Bozeman et al.	2000	19.76
3	RP	303	The norms of entrepreneurial science: cognitive effects of the new university-industry linkages	Etzkowitz et al.	1998	15.95
4	RP	240	Searching high and low: what types of firms use universities as a source of innovation?	Laursen et al.	2004	18.46
5	RP	232	University-industry linkages in the UK: What are the factors underlying the variety of interactions with industry?	D'Este et al.	2007	23.2
6	IJMR	200	University-industry relationships and open innovation: Towards a research agenda	Perkmann et al.	2007	20
7	RP	193	Resources, capabilities, risk capital and the creation of university spin-out companies	Lockett et al.	2005	16.08
8	RP	176	University patenting and its effects on research: The emerging European evidence	Geuna et al.	2006	16
9	RP	172	Networks of inventors and the role of academia: An exploration of Italian patent data	Balconi et al.	2004	13.23
10	RP	169	The role of academic technology transfer organizations in improving industry science links	Debackere et al.	2005	14.08
11	RP	168	'Technology transfer' and the research university: A search for the boundaries of university-industry collaboration	Lee, Y.S.	1996	8
12	MS	167	A comparison of US and European university-industry relations in the life sciences	Owen-Smith et al.	2002	11.13
13	PRS	160	The geographical and institutional proximity of research Collaboration	Pond et al.	2007	16
14	JETM	160	Toward a model of the effective transfer of scientific knowledge from academicians to practitioners: qualitative evidence from the commercialization of university technologies	Siegel et al.	2004	12.31
15	RP	152	Factors affecting university-industry R&D projects: The importance of searching, screening and signalling	Fontana et al.	2006	13.82
16	RP	150	Knowledge interactions between universities and industry in Austria: sectoral patterns and determinants	Schartinger, et al.	2002	10
17	JBV	148	The effects of business-university alliances on innovative output and financial performance: a study of publicly traded biotechnology companies	George et al.	2002	9.87
18	RP	144	Bottom-up versus top-down policies towards the commercialization of university intellectual property	Goldfarb et al.	2003	10.29
19	IJIO	142	R&D cooperation between firms and universities. Some empirical evidence from Belgian manufacturing	Veugelers et al.	2005	11.83
20	RP	136	How effective are technology incubators? Evidence from Italy	Colombo et al.	2002	9.07
21	RP	121	Investigating the factors that diminish the barriers to university-industry collaboration	Bruneel et al.	2010	17.29
22	MS	117	Equity and the technology transfer strategies of American research universities	Feldman et al.	2002	7.8
23	RP	113	Analysing knowledge transfer channels between universities and industry: To what degree do sectors also matter?	Bekkers et al.	2008	12.56
24	RP	96	Academic engagement and commercialisation: A review of the literature on university-industry relations	Perkmann et al.	2013	24
25	JEG	88	Innovation, spillovers and university-industry collaboration: an extended knowledge production function approach	Ponds et al.	2010	12.57

Abbreviations: R, rank; J, Journal; TC, Total Citations; Year, Year of Publication; C/Y, Average of citations per year. Rank according to the results from WoS Core Collection for the period 1980-2016, with 696 records; Sum of Times Cited 11553; Average Citations per item 16.6; H-index 51. RP, Research Policy; IJMR, International Journal of Management Reviews; MS, Management Science; PRS, Papers in Regional Science; JETM, Journal of Engineering and Technology Management; JBV, Journal of Business Venturing; IJIO, International Journal of Industrial Organization; JEG, Journal of Economic Geography.

Table 3.5: Twenty-five most productive authors in University- Business Collaboration and Knowledge and Technology Transfer.

R	Author/s	Affiliation	Country	TP	TC	H	T25	TP	TC	ESI
1	Perkmann, M.	Imperial College London	England	10	561	7	5	17	567	2
2	DEste, P.	Universitat Politcnica de Valncia	Spain	8	641	7	4	19	591	4
3	Muscio, A.	University of Foggia	Italy	8	123	4	1	0	0	0
4	Salter, A.	Imperial College London	England	7	521	5	4	62	1,763	4
5	Leydesdorff, L.	University of Amsterdam	The Netherlands	7	222	5	1	163	3,282	13
6	Geuna, A.	University of Turin	Italy	6	523	5	4	17	581	2
7	Brostrom, A.	Royal Institute of Technology	Sweden	6	156	5	1	115	1,867	5
8	Park, H.W.	Yeungnam University	South Korea	6	109	3	1	0	0	0
9	Frenken, K.	Eindhoven University of Technology	The Netherlands	5	265	3	2	41	1,710	11
10	Freitas, I.M.B.	University of Turin	Italy	5	149	4	1	0	0	0
11	DAngelo, C.A.	University of Rome Tor Vergata	Italy	5	83	5	0	83	873	1
12	Abramo, G.	University of Rome Tor Vergata	Italy	5	83	5	0	77	793	1
13	Fernandez-Esquinas, M.	CSIC	Spain	5	25	3	0	0	0	0
14	Siegel, D.S.	University at Albany	USA	4	687	4	4	103	3,524	10
15	Veugelers, R.	KU Leuven	Belgium	4	381	4	2	30	794	1
16	Walsh, K.	Georgia Institute of Technology	USA	4	339	4	3	0	0	0
17	Debackere, K.	KU Leuven	Belgium	4	277	4	1	29	760	0
18	Cassiman, B.	KU Leuven	Belgium	4	191	4	1	13	618	2
19	Bekkers, R.	Eindhoven University of Technology	The Netherlands	4	132	2	1	42	572	1
20	Tartari, V.	University of Bath	England	4	119	2	1	0	0	0
21	McKelvey, M.	University of Gothenburg	Sweden	4	110	3	1	0	0	0
22	Solazzi, M.	University of Rome Tor Vergata	Italy	4	74	4	0	0	0	0
23	Welsh, R.	Clarkson University	USA	4	59	2	0	45	2,492	4
24	Biscotti, D.	University of California Davis	USA	4	59	2	0	0	0	0
25	Thune, T.	University of Oslo	Norway	4	43	4	0	0	0	0

Abbreviations: R, rank; H-UBC; H-index only with University-Business Collaboration (UBC) and Knowledge and Technology Transfer; TC-UBC and TP-UBC, Total Citations (TC) and Total Production (TP) in UBC; T25, number of papers in the top 25 list shown in Table 4; TP and TC, total papers and total citations in all publications indexed in WoS Essential Science Indicators for the past 2 years; ESI, top 1% papers of WoS (past 2 years).

In order to study the evolution of the UBC field between 2017-2018 period, ten authors with the highest presence and influence were chosen to compare their scientific contribution over a period from the last two years, (from January 2017 to February 2018). In order to analyse this data set, it was used Web of Science (WoS) and Google Scholar databases. These databases were selected due to having been acknowledged to be of high quality and one of the primary sources of citation information in the world Klein and Chiang (2004); Owen-Smith and Powell (2001). For the searching process, the focus was on the total number of articles and the total number of citations of each author in both databases.

Table 3.6 presents the Evolution of the 10 Most productive authors between 2017-2018. As we can see, Leydesdorff, is the most productive author with 15 papers; Frenken, 9 papers, Salter 4 and Muscio, 3 followed by Perkmann, Brostrom, Freitas, with 2 publications and D'Este with 1 article. Finally, Geuna and Park had not published papers during this period in spite of those authors had been very active the previous years. Looking at the citations records, we observed that Frenken and Leydesdorff have received more citations in WoS with 9 and 15 new publications each. The leading authors in Google Scholar also are Frenken, with 21 papers and 106 citations and Leydesdorff, with 20 articles and 80 quotes.

To provide a complete picture of the results, the information found in the WoS database and Google Scholar were compared, and both are quite similar. In general, most of the authors present an increase in papers and citations in Google Scholar database due to it includes papers, books and conference proceedings as well. Especially in the case of Leydesdorff and Frenken, who have also made contributions in other areas and show significative increments.

To compare the 2016 and 2018 rankings of the most productive authors, Table 3.7 summarises and show the main changes. Note that DEste with one article and Park and Geuna with no publications are the authors have lost positions in the classification. On the other hand, Leydesdorff and Frenken have moved up places due to the number of papers published and citations obtained. Most authors kept their position in the ranking. It is worth noting that of nine out of ten leading authors in UBC field are from Europe; this could mirror high interest of European researchers in the market application of their inventions through the engagement with the industry.

In an effort to complement the information of the most productive authors (See Table3.5) and their evolution (See Table 3.6). The bibliographic material was mapped using concepts such as citation, co-citation and co-authorship with a threshold of fifty cites and one paper. Figure 3 and Figure 4 show the social network and identify their professional ties between

Table 3.6: Evolution of 10 most productive authors in University-Business Collaboration between 2017-2018 according to Web of Science and Google Scholar databases.

R	Author	Affiliation	C	TP UBC WoS 2016	TC UBC WoS 2016	H UBC WoS 2016	TP UBC WoS 17-18	TC UBC WoS 17-18	H UBC WoS 17-18	TP-G Scholar 17-18	TC-G Scholar 17-18	H-G Scholar 17-18
1	Perkmann, M.	Imperial College London	UK	10	561	7	2	1	1	3	0	0
2	DEste, P.	Universitat Politcnica de Valncia	ES	8	641	7	1	0	0	5	1	1
3	Muscio, A.	University of Foggia	IT	8	123	4	3	0	0	4	1	1
4	Salter, A.	Imperial College London	UK	7	521	5	4	4	1	6	13	1
5	Leydesdorff, L.	University of Amsterdam	NL	7	222	5	15	13	2	20	80	6
6	Geuna, A.	University of Turin	IT	6	523	5	0	0	0	1	0	0
7	Brostrom, A.	Royal Institute of Technology	SE	6	156	5	2	2	1	3	5	2
8	Park, H.W.	Yeungnam University	KR	6	109	3	0	0	0	0	0	0
9	Frenken, K.	Eindhoven University of Technology	NL	5	265	3	9	17	3	21	106	6
10	Freitas, I.M.B.	University of Turin	IT	5	149	4	2	0	0	3	29	2

Abbreviations: R, rank; C, Country; H-UBC; H-index only with University-Business Collaboration (UBC) and Knowledge and Technology Transfer (KTT); TC-UBC and TP-UBC, Total Citations (TC) and Total Production (TP) in UBC indexed in Web of Science. Essential Science Indicators: TP and TC, total papers and total citations in all publications indexed in Google Scholar during the period from January 2017 to February 2018. NL, The Netherlands; UK, United Kingdom; IT, Italy; ES, Spain; SE, Sweden; KR, South Korea.

Table 3.7: Evolution of 10 most productive authors in UBC between 2016-2018, according to Web of Science database.

R	**Author**	**Affiliation**	**Country**	**TP-UBC WoS (16-18)**	**TC-UBC WoS (16-18)**	**H-UBC WoS (16-18)**
1	Leydesdorff, L.	University of Amsterdam	NL	22	235	5
2	Frenken, K.	Eindhoven University of Technology	NL	14	282	3
3	Perkmann, M.	Imperial College London	UK	12	562	7
4	Muscio, A.	University of Foggia	IT	11	123	4
5	Salter, A.	Imperial College London	UK	11	525	5
6	DEste, P.	Universitat Politcnica de Valncia	ES	9	641	7
7	Brostrom, A.	Royal Institute of Technology	SE	8	158	5
8	Freitas, I.M.B.	University of Turin	IT	7	149	4
9	Geuna, A.	University of Turin	IT	6	523	5
10	Park, H.W.	Yeungnam University	KR	6	109	3

Abbreviations: R, rank; H-UBC; H-index only with University-Business Collaboration (UBC) and Knowledge and Technology Transfer (KTT); TC-UBC and TP-UBC, Total Citations (TC) and Total Production (TP) in UBC Indexed in Web of Science Essential Science Indicators, during the period from January 2016 to February 2018. NL, The Netherlands; UK, United Kingdom; IT, Italy; ES, Spain; SE, Sweden; KR, South Korea.

them. As we can see, the typology of the network showed in both figures follow a power-law connectivity distribution, implying that most of the nodes only have a few links, held together by a few highly connected hubs Abramo et al. (2009).

Figure 3.3 shows Perkmann with the most massive network; He keeps links with 120 authors out of a total sample of 134. Perkmann, as the central hub in this network, takes part in many representative clusters who hold the network connected. i.e. (Perkmann, Grimaldi, Tartari and Boardman), (Perkmann, DEste, Salter, Geuna, Muscio and Frenken) and (Perkmann, Tartari, Etzkowitz). These strong connections confirm why Perkmann is the most recognised author in the UBC field.

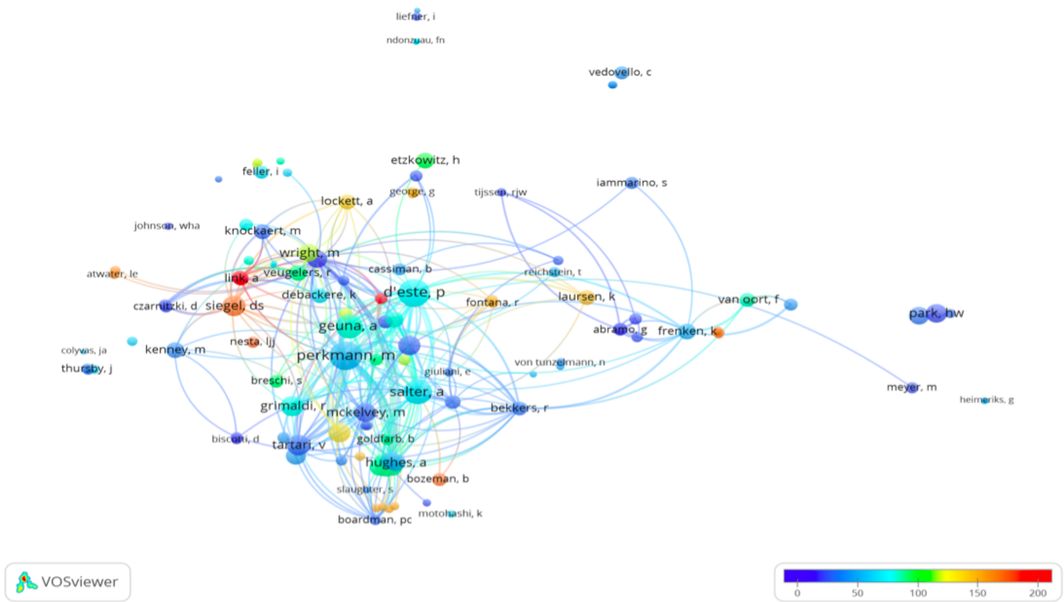


Figure 3.3: The Most cited authors from 1980 to 2016. Colours indicate the citation impact of different authors,The size of the node, the productivity of them. The link width shows the citations frequency between authors.

Figure 3.4 shows, Leydesdorff, Frenken, Salter, Brostrom and Perkmann as important names for the period of 2017 - 2018. In this period, Leydesdorff and Frenken appear as the authors with the most connections due to higher productivity in the last two years.

TTable 3.8 presents the list of the leading institutions that published papers in the field of UBC. Ranked according to the H-index obtained in the 10 journals considered to be the most influential ones (see Table 3). Also, two other factors have been considered: (a) the total

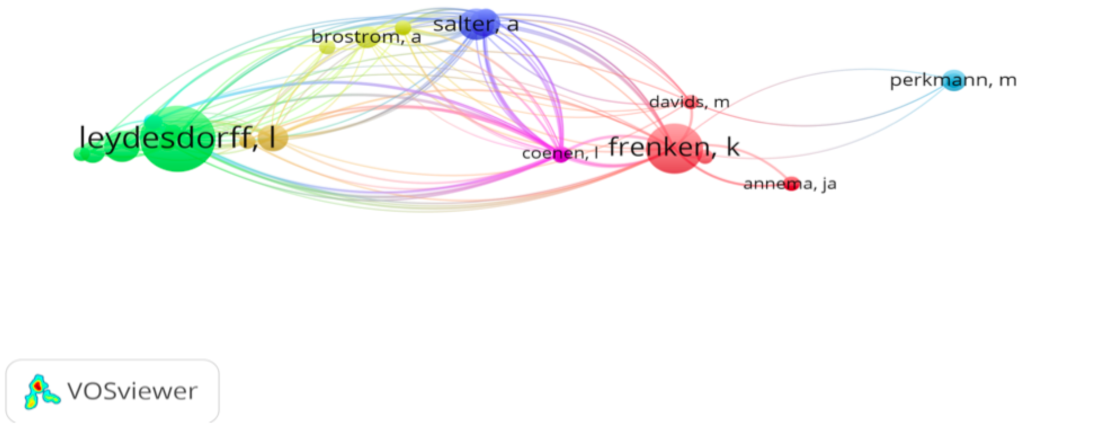


Figure 3.4: The Most cited authors from 2017-2018. Colours indicate the citation impact of different authors. The size of the node, the productivity of them. The link width shows the citations frequency between authors.

volume of publications for the period under analysis (since 1980), and the production over the last 10 years.

The Consejo Superior de Investigaciones Cientficas (CSIC) leads the ranking with 20 papers, all of them published in the last 10 years, and more than half of them (11) were published in the 10 most influential journals in this area. KU Leuven is in the second position with 17 papers, followed by the Imperial College of London (16 papers). It is remarkable to see the leading role of UK institutions. After adding the citations received by three of them, (Imperial College, University of Sussex and University of Nottingham) they account for 2,580 citations.

The relevant role of KU Leuven as a leading centre in this area is supported by the findings of the study elaborated by Debackere and Veugelers (2005). These authors report that among Belgian universities, KU Leuven received the most significant investment for R&D activities. In fact, data corroborate that this university is very active in terms of granted patents and spin-offs, compared to the average level of European universities. This high volume of output is aligned with the mission statement of the university, which posits that KU Leuven is *an academic institution where research and knowledge transfer are both essential and complementary* (KU Leuven, Mission Statement, 2002). Therefore, the inclusion of this university in this list is not by accident. Likewise, three of the most prolific authors are affiliated to KU Leuven,

Table 3.8: Most influential institutions in university-business collaboration and Knowledge and technology transfer.

R	Institution	Country	TP UBC	TC UBC	H UBC	TP (Y-10)	TC (Y-10)	H	TP (J-10)	TC (J-10)	H
1	CSIC Spain	Spain	20	511	10	20	511	10	11	428	8
2	KU Leuven	Belgium	17	609	10	13	233	6	9	395	7
3	Imperial College London	England	16	912	12	14	646	10	9	743	8
4	University of Sussex	England	13	859	10	11	804	8	8	681	6
5	Universitat Politcnica de Valncia	Spain	13	469	8	13	469	8	9	400	6
6	University of London	England	12	173	5	10	169	5	2	58	2
7	University of Cambridge	England	11	249	7	8	197	5	6	195	5
8	Penn State University	USA	10	209	5	7	65	3	4	66	4
9	University of Tokyo	Japan	9	179	6	5	85	4	4	143	4
10	University of Manchester	England	9	82	4	7	48	3	3	40	2
11	University of California Davis	USA	9	271	6	9	271	6	9	271	6
12	Copenhagen Business School	Denmark	9	473	6	8	231	5	7	418	5
13	University of North Carolina	USA	8	592	5	1	3	1	3	409	3
14	University of Foggia	Italy	8	124	4	8	124	4	2	11	1
15	Loughborough University	England	8	341	4	8	341	4	2	75	2
16	Georgia Institute of Technology	USA	8	432	5	8	432	5	6	421	4
17	Bocconi University	Italy	8	418	8	6	236	6	6	389	6
18	University of Nottingham	England	7	809	5	4	164	2	6	737	4
19	University of Amsterdam	The Netherlands	7	222	5	7	809	5	2	87	2
20	Royal Institute of Technology	Sweden	7	161	5	7	161	5	4	148	4
21	CNRS France	France	7	44	4	6	44	4	2	19	2
22	Yeungnam University	South Korea	6	109	3	6	109	3	2	87	2
23	University of Utrecht	The Netherlands	6	321	6	6	321	6	2	49	2
24	University of California Berkeley	USA	6	106	4	5	103	4	6	106	4
25	Newcastle University	England	6	37	3	6	37	3	0	0	0

Abbreviations: R, rank; H-UBC, H-index only with University-Business Collaboration (UBC) and Knowledge and Technology Transfer (KTT); TC-UBC and TP-UBC, Total Citations and papers only with UBC; TP-UBC10, TC-UBC10 and H-UBC10; Total Papers and citations, and H-index by institutions in the last 10 years in UBC; TP-UBC (J-10), TC-UBC (J-10) and H-UBC (J-10), Total Papers, citations and H-index in UBC in the first 10 Journal shown in the Table 3. 10 journals include Higher Education, IEEE Transactions on Engineering Management, International Journal of Technology Management, Journal of Technology Transfer, R&D Management, Research Policy, Scientometrics, Technological Forecasting and Social Change, Technovation, and World Development.

corroborating that this university is highly productive in terms of technology transfer outputs. It is also worth noting that KU Leuven has a critical mass of researchers investigating UBC practices.

This section presents the geographical distribution of the research published in UBC. The focus is on publications signed under the name of the institution or a team inside the country and not based on the nationality of the researcher. Table 3.9 displays the results ranked according to the H-index, total papers and citations. The USA is the most productive country, with 190 papers. Half of this production corresponds to the last ten years (97 papers). The UK is the next country in the ranking, with 103. The third position is for Italy, with 63, papers followed by Spain, with 50 papers. The Netherlands appears in the fifth position after Germany and Japan.

By adopting a bibliometric approach, this study contributes to the current literature by providing a global picture of the academic research in technology transfer mechanisms through which University Business Collaboration (UBC) can be established. This study overcomes the limitations of previous studies that adopted a similar approach by not only focusing on a specific country or territory but also adopting an international perspective. The period of analysis considers publications from 1980 up to 2016 since in 1980 the Congress of USA enacted the Bayh-Dole Act, which eased the commercialization of university research and thus university-business collaboration as well (Kenney and Patton, 2009; Mowery et al., 2004; So et al., 2008).

The results indicate that the USA, England, Italy Spain and the Netherlands are the leading countries in this area, and all of them have shown a significant increase in their production over the last 10 years. The analysis also reveals that the major categories in which these publications fall have a strong focus on business, public administration and education. The logic behind this lies in the fact that these areas are the ones more closely related to growth and economic development.

Regarding the study of the leading institutions, the countries hosting them are Spain, the USA, Belgium, and the UK. Top institutions include the Consejo Superior de Investigaciones Cientficas (Spain), followed by The Imperial College London (UK) and KU Leuven (Belgium). All these institutions have a similar h-index. Thus the productivity and impact factor of these institutions are reasonably comparable. Concerning the analysis of the most cited researchers, Perkmann, DEste, Muscio, Salter and Leydesdorff (co-author of triple helix model) stand as important big names in this area, publishing their works in some of the highest standing journals in this field, such as Research Policy, Technovation and the Journal of Technology Transfer.

Table 3.9: Most productive countries in university business collaboration and technology transfer.

R	Country	TP-UBC	% Of 696 records	TC UBC	H UBC	>250 UBC	>100 UBC	>50 UBC	TP-UBC (Y-10)	TC-UBC (Y-10)	H-UBC (Y-10)
1	USA	190	27.30	4043	31	3	6	7	97	1,369	22
2	England	103	14.80	3442	30	1	8	11	84	2,179	23
3	Italy	63	9.05	1477	16	0	4	5	57	976	15
4	Spain	50	7.18	926	14	0	2	3	45	668	12
5	The Netherlands	44	6.32	980	18	0	2	4	40	871	16
6	Germany	37	5.32	600	12	0	1	2	31	365	10
7	Japan	34	4.89	414	11	0	0	1	23	252	9
8	Canada	30	4.31	253	8	0	0	0	19	154	8
9	South Korea	29	4.17	245	9	0	0	1	25	225	8
10	France	29	4.17	532	11	0	1	2	25	524	11
11	Australia	28	4.02	305	7	0	1	0	21	81	6
12	Belgium	27	3.88	916	15	0	2	4	22	465	10
13	China	26	3.74	104	6	0	0	0	26	103	6
14	Sweden	24	3.45	425	9	0	1	1	19	242	7
15	Denmark	16	2.30	510	7	0	2	1	15	268	6
16	Taiwan	13	1.89	68	4	0	0	0	12	67	4
17	Switzerland	11	1.58	113	5	0	0	0	10	95	4
18	Ireland	11	1.58	56	5	0	0	0	10	55	5
19	Norway	10	1.44	58	4	0	0	0	10	58	4
20	Finland	10	1.44	133	5	0	0	1	9	115	5
21	Singapore	9	1.29	60	3	0	0	0	7	48	3
22	Scotland	8	1.15	117	5	0	0	1	6	43	4
23	Portugal	8	1.15	131	3	0	0	1	7	49	3
24	India	7	1.01	18	2	0	0	0	4	6	1
25	Hungary	7	1.01	99	3	0	0	1	6	48	3

Abbreviations: R, rank; H-UBC, H-index only with University Business Collaboration (UBC) and Technology Transfer; TC-UBC and TP-UBC, Total Citations and Papers only with UBC; ¿250, ¿100, ¿50, number of papers with more than 250, 100 and 50 citations in UBC; TP-10, TC-10, and H-10, Total Papers, Total Citations and H-index in the last 10 years in UBC.

Chapter 4

Case Study of Companies co-located at Science Parks in Spain and Mexico

Science and Technology Parks (STPs) facilitate the flow of knowledge and technology among universities; R&D institutions; companies and markets, and foster the creation and growth of innovation-based companies. Among the diversities of STPs, it is possible to identify two types: (i) Science Parks (SPs), which involve university shareholding and (ii) Technology Parks (TPs), which are not owned by universities. This study will take into account only SPs since they are closely linked to the university, and they are the bridge between a University and companies in the process of Knowledge and Technology Transfer (KTT). The evaluation of the firms' performance in Science Parks results determinant to identify the needs of the companies and the feasibility of the University-Business Collaboration (UBC). The firms' real needs also are of interest for Universities and Science parks, since they face the challenge of designing strategies that best help them to transfer the knowledge more effectively. While previous studies have been focused on tenants innovation performance on-Park and off-Park, very little research has taken into account the Parks heterogeneity that may affect the firms' performance. This research paper focuses on SPs in Spain and Mexico due to data availability. This paper (i) aims to identify the Key Performance Indicators (KPIs) in UBC used by **Companies co-located** at SPs, and (ii) explore the performance measure (KPIs) in UBC and critical success factors of **Science Parks**. For this study, data was collected through fifty eight online company surveys in Spain and forty two in Mxico. This empirical analysis uses fourteen semi-structured interviews, addressed to SPs directors in order to explore (KPIs) and success factors of SPs in both countries.

4.1 Related studies

Given the importance of STPs in the innovation process, several authors have been interested in investigating these organizations from different perspectives. The most representative studies are focused on the firm's innovation performance on-Park and off Park location, and very little research has taken into account the Parks heterogeneity that may affect the firm's performance. Albahari et al. (2017). Regarding studies in Spain about firm's innovation performance, Vásquez-Urriago et al. (2014) prove the increase in the probability of being an innovator, in firms co-located in Spanish STPs and, show a positive effect on innovation outcomes, specially in small firms. Alternatively, Díez-Vial and Montoro-Sánchez (2016) present a case study of Madrid Science Park in which the innovative capacity increases when the firms have long-term relationship with the university, and go on to show that when firms focus on internal knowledge networks with other co-located firms, there is an increase in the innovative outputs. In comparison, Albahari et al. (2017) finds that the more involved of the university in the STPs, the firms have a negative impact on innovations outputs but a positive effect on the number of patent applications.Moreover, in most recently studies Albahari et al. (2018) find that firms co-located at new and consolidated STPs have a positive impact on innovations outcomes, and the size and management of STPs are positively related to this innovation outcomes.

In Mexico, Science and Technology Parks (STPs) are in a stage of development and in recent years, new STPs with different characteristics and typologies have been opened; studies show that there are two hundred and fifty R&D centres linked to public universities, and most of them funded by The National Council of Science and Technology of Mexico, (CONACyT). These centres carry out the knowledge and technology transfer process with universities and companies; however, only there are around twenty-four STPs in Mexico, which we can mention the most emblematic as Parque de Investigación e Innovación Tecnológica de Monterrey, (PIIT), Parque de Innovación Tecnológica BioHelis and Centro del Software in the state of Jalisco,Rodíguez and Guevara (2014);Villegas and Pérez-Hernández (2010).

Regarding Science Parks (SPs), it is worth highlighting the work of Instituto Tecnológico y de Estudios Superiores de Monterrey, (ITESM) and other private universities who have taken the initiative to promote the Science Parks model by supporting companies on campus as well as start-ups since the incubation and acceleration stages. These SPs are focused mainly on technological sectors, Molina et al. (2011).

Similar studies in other countries compare the effects of park location on firms. For example, Colombo and Delmas-tro (2002) (Italy, 45-on and 45-off Park), the study showed no significant effect on patents and found that on-park firms have more educated workforce and therefore more *absorptive capacity*; The results from Siegel et al. (2003) (UK, 89-on and 88-off Park) showed slightly positive effects on R&D and patents; Squicciarini (2008) (Finland, 48-on and 72-off Park) found a positive effect on patents and in most recent studies only taking into account on-park firms Squicciarini (2009) the study showed that the more firms on-park, the better patents activity for tenants and therefore more knowledge spillover; Fukugawa (2006)(Japan, 74-on and 138-off Park) observed a positive impact on collaborative research with universities but no enough UBC; Yang and Lee (2000) (Taiwan, 57-on and 190-off Park)also found a positive effect on R&D productivity and finally, Ferguson and Olofsson (2004) (Sweden, 30-on and 36-off Park) found a positive effect on survival rate, but no significant effect on growth, See Table 4.1.

Table 4.1: The most representative studies focus on firms innovation performance on-Park and off-Park location.

Authors	Country	On-Park	Off-Park	Results: Firms on Park
Squicciarini (2009)	Finland	252	-	The more firms on-Park, the better patents activity for tenants +knowledge spillover
Vazquez-Urriago et al. (2014)	Spain	653	-	+ Impact on innovation outputs, specially small firms
Dez-Vial and Montoro-Snchez (2016)	Spain	76	-	+ Innovative capacity when the firms have long-term relationship with university
Albahari et al. (2018)	Spain	849	-	+ Impact in new and consolidated STPs, and size of STP +impact on innovation outputs.
Colombo and Delmastro (2002)	Italy	45	45	+ Educated workforce + absorptive capacity
Fergunson & Olofsson (2004)	Sweden	30	36	+ Impact on survival rate
Fukuwaga (2006)	Japan	74	138	+ Impact on join R&D but not enough UBC
Squicciarini (2008)	Finland	48	72	+ Impact on patents
Yang et al. (2009)	Taiwan	57	190	+ Impact on R&D productivity significantly higher than off-park

It is important to note that co-locate a company at Science Park helps to reduce communication and cultural barriers while building trusted relationships, which encourages more knowledge dissemination,Van der Bij et al. (2003). This knowledge dissemination can occur both formally and informally, and both horizontally and vertically. Moreover, Song et al. (2007), confirm that co-location is positively associated with the level of knowledge dissemination in technology development. Additionally, geographical proximity is essential to companies because of the potential to increase the rate of knowledge and technology transfer activities, Abramovsky and Simpson (2011);Santoro and Gopalakrishnan (2001).

Despite the extensive literature about the critical role that plays the Science and Technology Parks in knowledge and technology transfer process between universities and companies, several empirical studies have not found a significant correlation between tenants of SPs and higher education institutions (HEIs), and weak interaction between business and HEIs also suggests weak spillover effects and therefore low R&D agglomeration, Fukugawa (2006). For the above, it is essential that HEIs know about the objectives and needs of companies in order to develop new strategies, tools and communication channels to strength UBC and, in this manner to contribute to economic growth and social development through the transfer of knowledge to society.

The transfer of knowledge between (HEIs) and industry occurs through a variety of mechanisms,DEste and Patel (2007). The following are among the most representative activities: the hiring of university graduates, the exchanges of personnel, university joint research -company, research contracts, consulting, patents and publications, licenses, spin-off companies, and laboratories financed by industry and other physical facilities. It also includes informal contacts such as meetings and conferences. Using the activities above, companies can collaborate with universities in a wide range of possibilities.

It is important to highlight that knowledge and technology transfer processes is crucial to exploiting the most modern technologies and the latest discoveries made by research groups and then applying them in the production system to solve the real problems that companies face day after day. In Europe, the gap between high levels of scientific productivity on the one hand and its minimal contributions to industrial competitiveness, on the other hand, seems extremely wide. This gap, also known as The European Paradox has been attributed to a low intensity of linkage between science and industry and to asymmetric information between industry and science regarding the value of innovations. Science and industry operate differently. Their daily activities are highly tied to specific organisational culture, mission and corporate practices, Siegel (2003). Accordingly, goals might signal three opposite directions. First, companies cannot evaluate the quality of the invention *a priori*, and researchers may have difficulties in assessing the commercial profitability of their inventions, Macho-Stadler et al. (2007). Second, poor communication channels and low interest of the companies in academic research are other reasons that prevent universities and businesses from cooperating, Baldini et al. (2007). On the other hand, industries seek solutions that make their operations and processes more competitive, their products more attractive, and this consequently enable them to become more profitable, Iqbal et al. (2011a); Rohrbeck and Arnold (2007). Third, time-span is another critical factor. University research projects tend to require long periods, while industry demands short cycles to compete in the market and achieve a competitive advantage, Bruneel et al. (2010); Dunowski et al. (2010); Bodas Freitas et al. (2008). Taking into account what was previously mentioned about the economic and social impact that University-Business Collaboration (UBC) has in the development of a country and the key role that play Science Parks in knowledge and technology transfer (KTT) process as well as their implications in the increase of global competition, employment and productivity, the present study aims to investigate companies co-located at Science Parks, (SPs) and, identify:

1. the criteria to select an SP,
2. the business objectives to select an SP and,
3. to identify the evaluation metrics, **Key Performance and Innovation Indicators** (KPIs), used by companies co-located at SPs,to evaluate the company performance on campus.

The evaluation of the firms' performance in Science Parks results in determinant to identify the needs of the companies and the feasibility of this University Business Collaboration. Firms real needs also are of interest of universities, because they face the challenge of designing strategies that best help them to transfer the knowledge more effectively.

For this objectives, KPIs in UBC will be used, which are based on the principal UBC activities found in the literature,Davey et al. (2018),Barnes et al. (2002), Seppo and Lilles (2012), Perkmann et al. (2011), Langford et al. (2006),Iqbal et al. (2011a), and Tijssen et al. (2009). The activities of UBC used in this study are embedded within the three missions of the universities, and their importance is derived from this. The purpose of this study is to cover the main activities of knowledge and technology transfer between the university and industry with their respective KPIs.

Since performance metrics are used for firms to measure and monitor the achievement of objectives at different levels, Chiesa et al. (2009). The main objective of this research is to examine the level of importance of each KPI in UBC for companies co-located at SPs and, identify what matters to them, in terms of business objectives (i.e. long-term R&D, consulting, hire talent) and needs (i.e. human capital, technological, research, funding). Moreover, this research will also be taking to account Science Parks, exploring their KPIs and critical success factors through semi-structured interviews with Science Parks directors. All this in order to identify those SPs indicators that measure UBC and in this manner, explore those that are aligned with co-located companies KPIs.

In summary, this study adds to the literature on UBC by utilizing KPIs in UBC, such it is a scalable and straightforward diagnostic tool and useful for universities and SPs.

4.2 Qualitative Methodology

This study uses both a qualitative and quantitative research approach. With respect to qualitative research, it has been conducted through fourteen semi-structured interviews with the directors of Science Parks in Spain and Mexico; seven directors from each country were interviewed. The interviews in Spain were conducted by June 13, 2018, while in Mexico they took place between October 2018 and January 2019. The questionarie was designed to cover two main categories: (i) the main KPIs in UBC of the SPs and (ii) critical success factors of SPs. The information was coded into these two groups using *Atlas.ti* software tool. The interview is a directed conversation,Lofland and Lofland (1995) and a useful tool for interpretative research, as it allows a more in-depth exploration on a particular topic,Charmaz (2006). The study used content analysis to study the data,Bardin (1991), the interpretive data was done applying the qualitative research process, Walsham (2006). The interviews were designed based on the International Association of Science Parks (IASP) Strategigram Questionnaire,Vikström (2006), which examines different strategic approaches and creates a profile for each science park taking into account strategic issues such as the target markets, target companies and the degree of specialization. Experts on the board of the IASP have validated the questionnaire.

4.3 Quantitative Methodology

Regarding quantitative research, a survey was designed with the objective of identifying the main KPIs in the University-Business Collaboration (UBC) and innovation indicators, used by companies co-located at SPs. For this purpose, a literature review of the most representative studies on this topic was carried out. Twenty-one KPIs in UBC and innovation indicators were selected for the survey. Additionally, all these KPIs in UBC were classified into the three primary missions of the Universities: Education, Research and Valorisation, Davey et al. (2011). The online *SurveyMonkey* platform was used to send the survey and collect data. A total of nine SPs took part in this research, five from Spain and four from Mexico,(See table 4.2). From an original dataset of 430 firms, we obtained 138 responses. The response rate is thus 32.09%; from this sample, 38 questionnaires with incomplete responses were removed and we obtained 100 valid responses,(See figure 4.3), shows the data collected at Science Parks.

In addition to designing and validating the online survey, two frameworks were developed with the main KPIs, taking into account university and company perspectives. These university-company frameworks show the objectives, strategies and long-term KPIs, as well as process KPIs, and they are a useful guide to evaluate the accomplishments and alignment of goals in UBC, (See Figure 4.2 and Figure 4.1). The university-company frameworks were developed from September 2017 to March 2018 in a collaborative work with the firm CA Technologies, which has been co-located at the Universitat Politcnica de Catalunya, Spain, for eight years. This collaborative work is a result of the Science2Society project, which has received funding from the European Unions Horizon 2020 research and innovation program under the grant agreement N 693651.

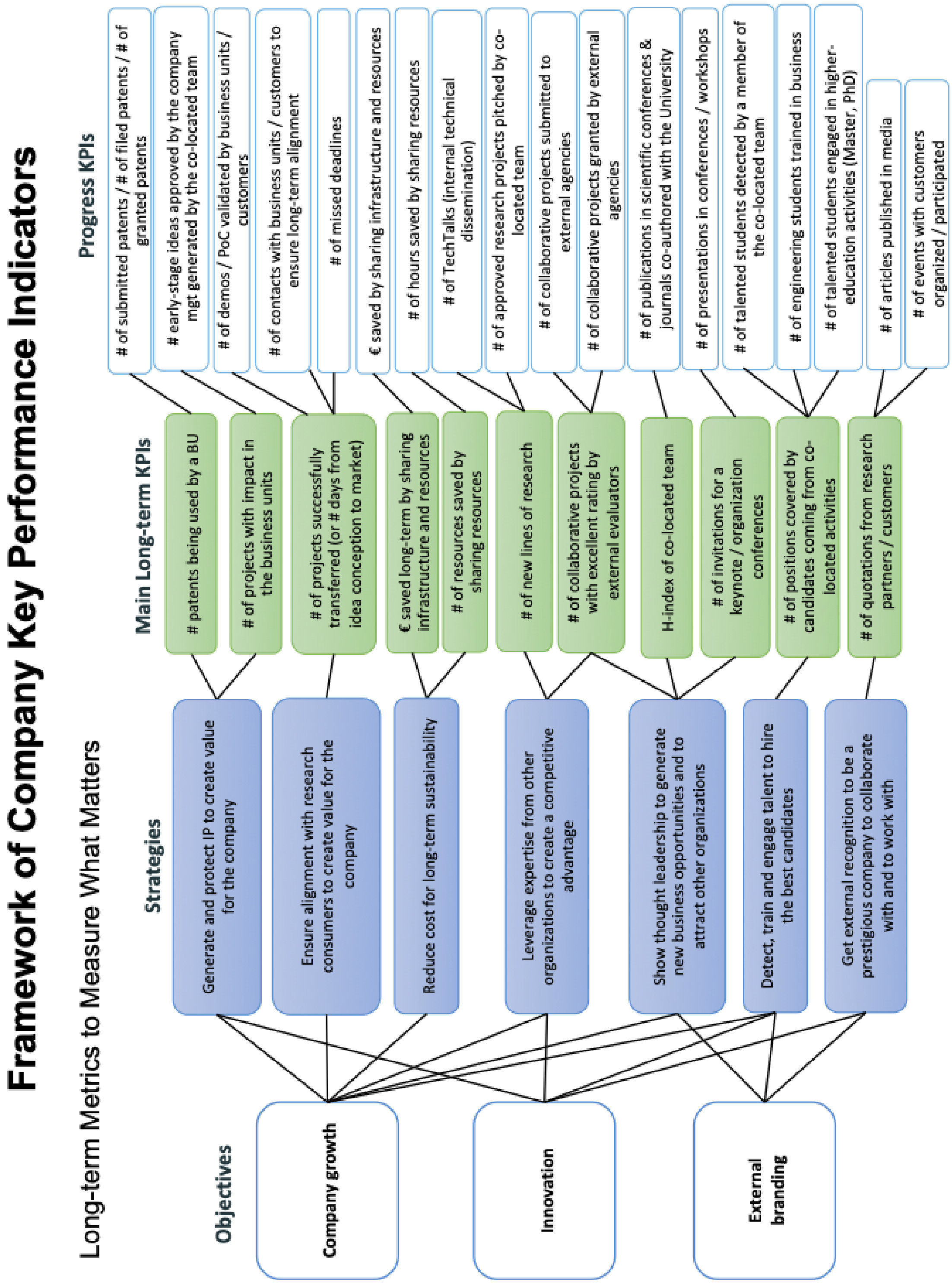


Figure 4.1: Framework of Company Key Performance Indicators (KPIs)

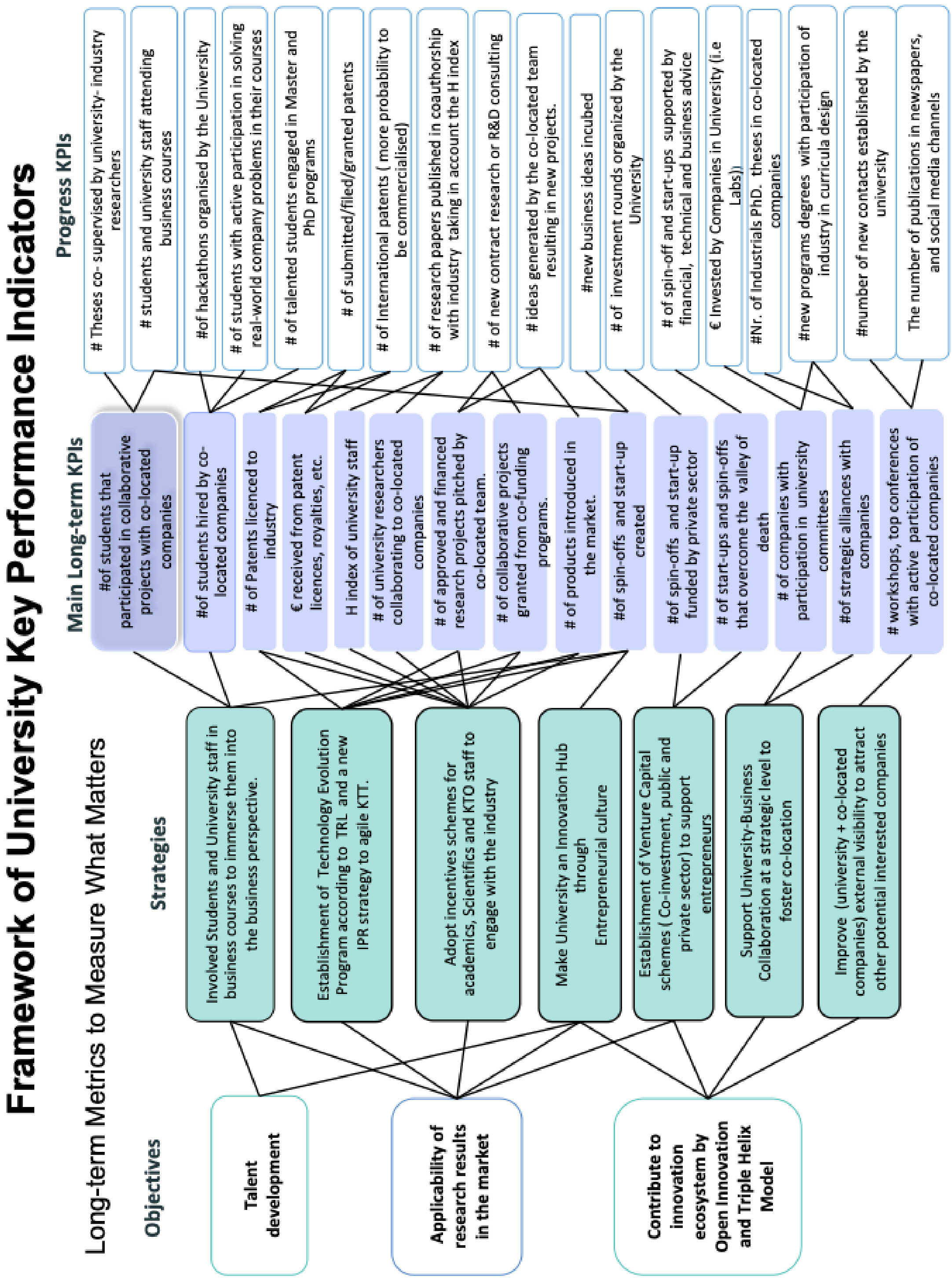


Figure 4.2: Framework of University Key Performance Indicators (KPIs)

Table 4.2: Science Parks included in the study.

Science Park	Country	Shareholders Type*	Num. of Tenants	Num. of Firms in the study
Parque Cientfico de la Universidad Miguel Hernndez de Elche	Spain	U	70	12
Parque Cientfico y Tecnolgico de la Universidad de Girona	Spain	U,G,F,P	150	8
Parque Cientfico Universidad Carlos III de Madrid	Spain	U,G,F,P	91	10
La Salle Technova Barcelona	Spain	U	15	9
Parc UPC-Universitat Politcnica de Catalunya-campus Nord - campus Terrasa	Spain	U	22	19
Parque Tecnolgico ITESO	Mexico	U	34	10
Parque Cientfico y Tecnolgico Iberoinnovacin-Universidad Iberoamericana Len	Mexico	U	8	8
Parque Tecnolgico del Tecnolgico de Monterrey- campus Quertaro	Mexico	U	26	15
tecniA Parque Tecnolgico y de Innovacin, Universidad Anhuac Mayab	Mexico	U	14	9

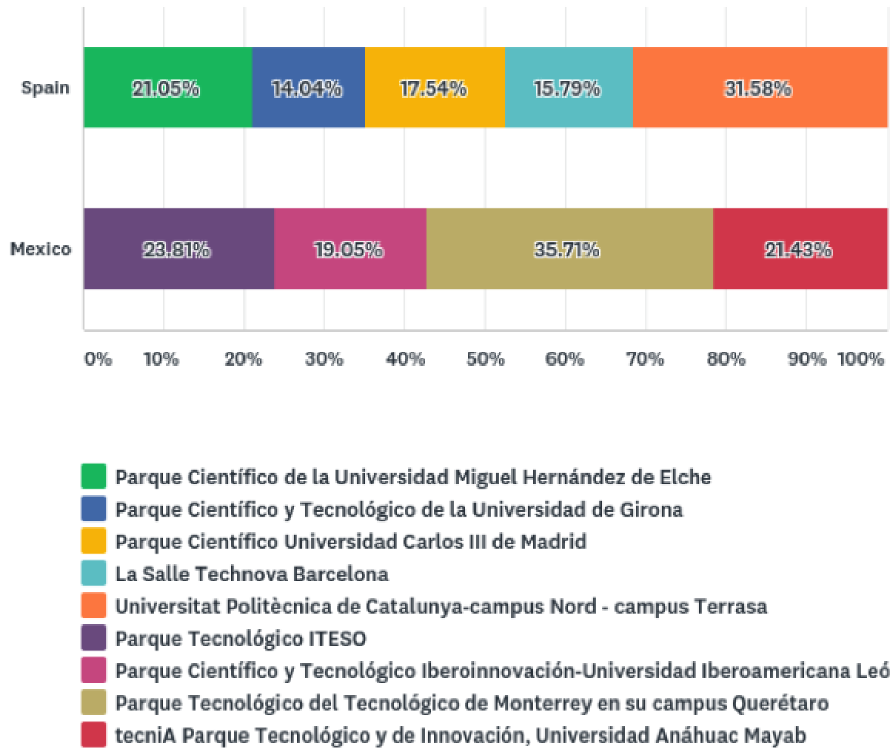


Figure 4.3: Data Collected by Science Park

A comparative approach was used between Spain and Mexico. Dataset was taken from fifty-eight online surveys in Spain and forty-two online surveys in Mexico. First of all, the firms were asked about their criteria to choose the university science park (i.e. university with an entrepreneurial culture, location, previous joint projects, etc.). Secondly, they were inquired on their business objectives to co-locate the company at SP (i.e. R&D, research contract, hire talent, etc.),Frølund et al. (2018).Thirdly, they were asked about the KPIs in UBC and innovation indicators that they use to evaluate the company performance on campus. To measure the level of importance of KPIs, firms have qualified each indicator on a 4-point Likert scale (1=Not important to 4=Very important). The innovation indicators used in this study were based on the Community Innovation Survey (CIS), which is part the EU science and technology statistics and is undertaking every two years by EU member states. Finally, the firms were asked about the support received by the university in funding, business, legal and technological issues.

4.3.1 Statistical Analysis

Concerning the Statistical Method, the Categorical Principal Components Analysis (CATPCA) technique was applied for data analysis, using IBMs SPSS statistical software. The CATPCA technique serves for data reduction by finding homogeneous groups of categorical variables and highlighting their correlation between each other, Greenacre (2008); Abdi and Williams (2010) Abdi. The study uses this statistical technique in order to represent the results graphically, (see Appendix A).

To identify the influence and weight of each KPI, a total of seven CATPCA factor analysis were applied, one for each data subset: (1) Companies Criteria for choosing a SP; (2) Companies Business Objectives for choosing a SP; (3) Education KPIs in UBC; (4) Research KPIs in UBC; (5) Valorisation KPIs in UBC; (6) Innovation KPIs and (7) University Support to companies co-located at SP. Furthermore, the reliability of the test was confirmed with the Cronbachs alpha, all results showing an internal consistency threshold above .80. In addition, to evaluate the statistical significance differences between Spain and Mexico we compute two tests: Chi-squared test, due all variables are categorical and Mann-Whitney U test, because we used ordinal scale,(see Appendix A).

4.4 Comparative analysis of KPIs in UBC between Spain and Mexico

According to data analysis and evaluation, the characteristics of firms in both countries showed significant similarities in relation to industrial sectors, the type of company, size and market. As mentioned before, 100 companies have participated in our survey study, 58% from Spain and 42% from Mexico. The most representative industrial sectors in both countries are information and telecommunications with 31.63% of the full sample, followed by professional and scientific services, 27.55% and other services, 20.41%. Relating to the type of company, 50% are start-ups, 43.62% consolidated companies and 6.38% spin-offs. The distribution by size of companies is as follows: 50.51% with 0 to 10 employees; 36.36% with 11 to 49 employees; 8.08% with 50 to 249 employees; 1.01% with 250 to 499 employees and 4.04% large companies with more than 500 employees. Finally, in terms of the market, 48.39% of companies commercialise their products and services in international markets, 37.63% nationally and only

13.98% in the local market; therefore, both samples are comparable, (see Figures:4.4;4.5;4.6, AND 4.7;

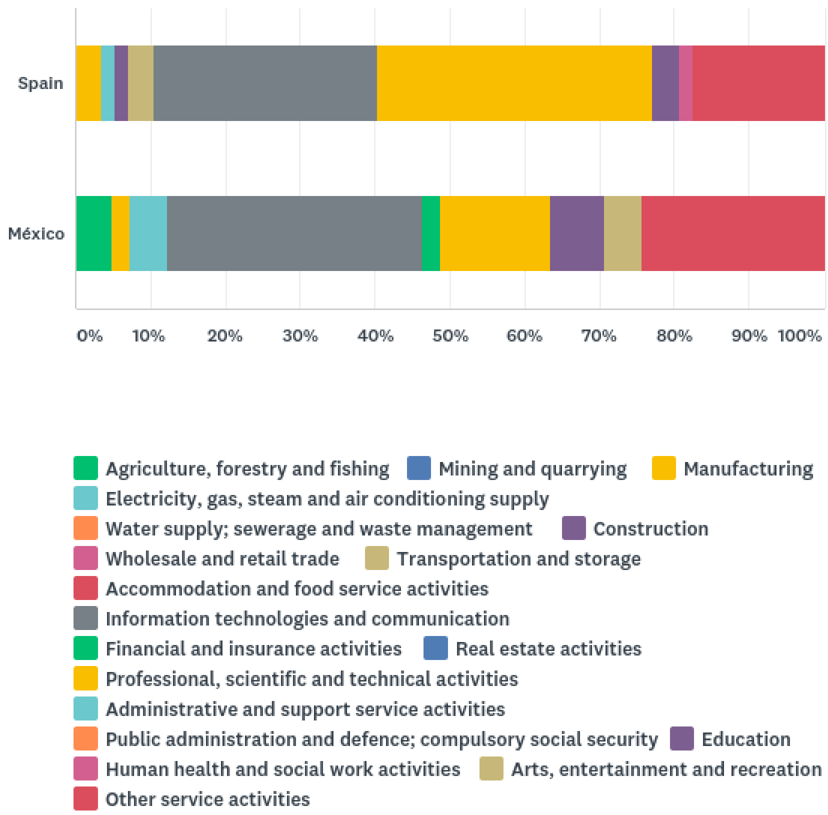


Figure 4.4: The most representative Industrial Sectors by Country

In addition, before the application of the Categorical Principal Components Analysis (CATPCA), the information was classified into seven data subsets following the survey structure: (1) Companies Criteria for choosing a SP; (2) Companies Business Objectives for choosing a SP; (3) Education KPIs in UBC;(4) Research KPIs in UBC; (5) Valorisation KPIs in UBC; (6) Innovation KPIs and, (7) University Support to companies co-located at SP. After that, the data was pondered to the full sample of 430 firms and a total of 38 variables were analysed and presented graphically in two dimensions. Due to the similarities in the responses of the two samples, we decided to highlight in graphs, only the location variables (Spain and Mexico) and analysed those with more weight for both countries, (see Appendix A).

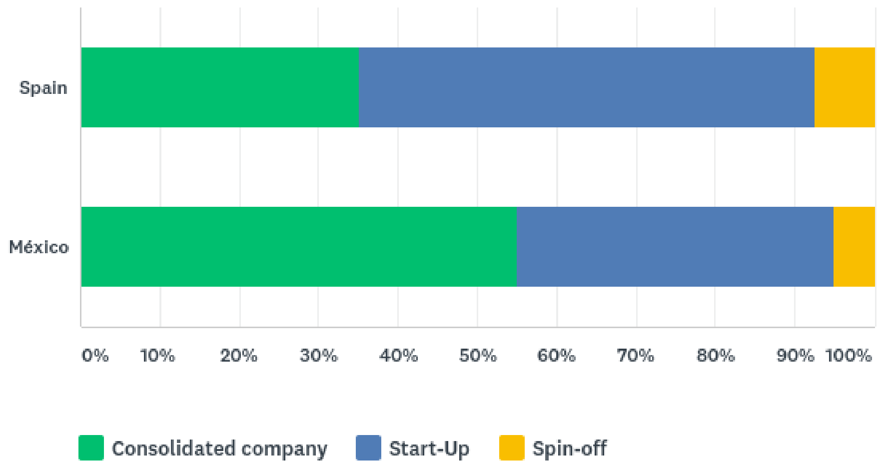


Figure 4.5: Type of Company by Country

4.4.1 Companies' criteria to select a Science Park

Regarding the Criteria used by companies to select a Science Park (SP), our results indicate that for both countries, the innovation ecosystem offered by the university is the most important criteria; however, in this category, there is a significant difference in the importance that Mexican companies give to university excellence (top ranking), this could be due, the Mexican universities included in this study are private universities and are among the best of the country. Spanish companies are on the opposite view, since university excellence was criteria least important, (See Figure 4.8,and Table 4.3).

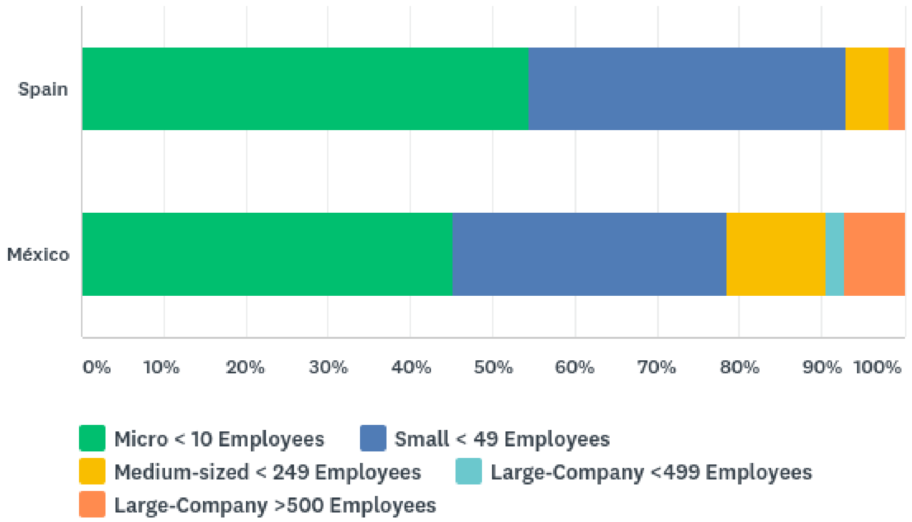


Figure 4.6: Companies' Size by Country

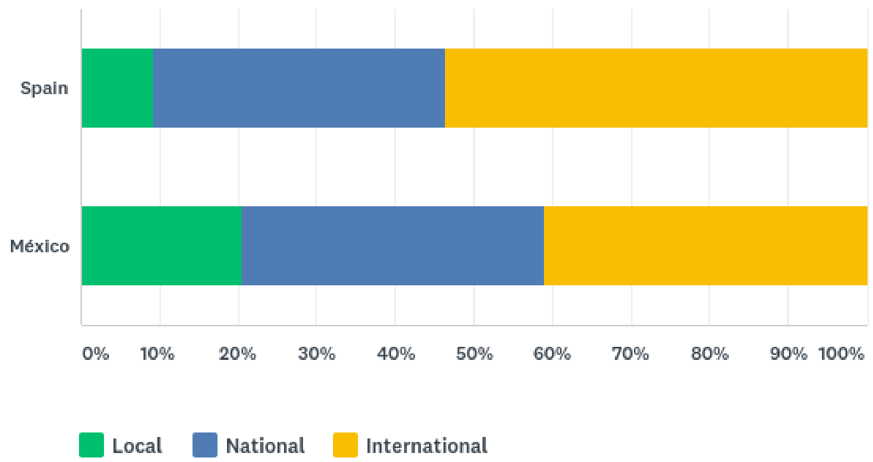


Figure 4.7: Companies Market

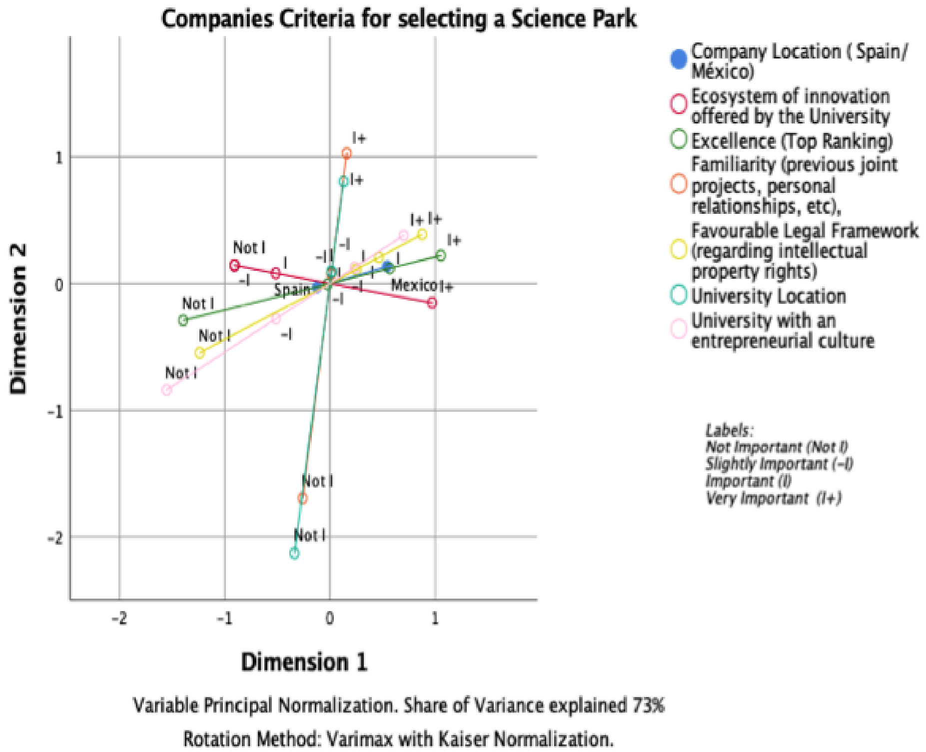


Figure 4.8: Companies Criteria for selecting a Science Park

Table 4.3: Companies Criteria for selecting a Science Park

Companies Criteria for selecting a Science Park	**Rotated Component Loadings**		**Chi-Squared Test X2 0.05,3 =7.815 / U Mann-Whitney**		
(Cronbachs alpha 0.92)	1	2	Value	df	p <0.05
Excellence (Top Ranking)	0.88	0.18	61.3	3	0/0
Ecosystem of innovation offered by the University	0.828	-0.13	21.48	3	0/0
Favourable Legal Framework (regarding intellectual property rights)	0.79	0.35	50.48	3	0/0
University with an entrepreneurial culture	0.73	0.4	10.02	3	0.02/0
Company Location (Spain/ Mexico)*	0.26	0.07			
University Location	0.14	0.88	3.46	3	0.33/0.35
Familiarity (previous joint projects, personal relationships, etc.),	0.13	0.81	36.95	3	0/0

* Supplementary variable

4.4.2 Companies' Business objectives to select a Science Park

In relation to the Companies Business objectives to select a SP, as expected, the main objectives for both countries are hiring talent, as well as collaborate with the university in the short (*i.e.* consultancy services, research contracts) and long-term (R&D: technology development) and for the Mexican companies, the corporate venture (investment in start-ups) is also essential. On the other hand, the acquisition of university licenses and patents is the least relevant business objective for both Spanish and Mexican companies, being this indicator one of the most studied in the literature and the most valued by the universities and SP,(See Figure 4.9 and Table 4.4).

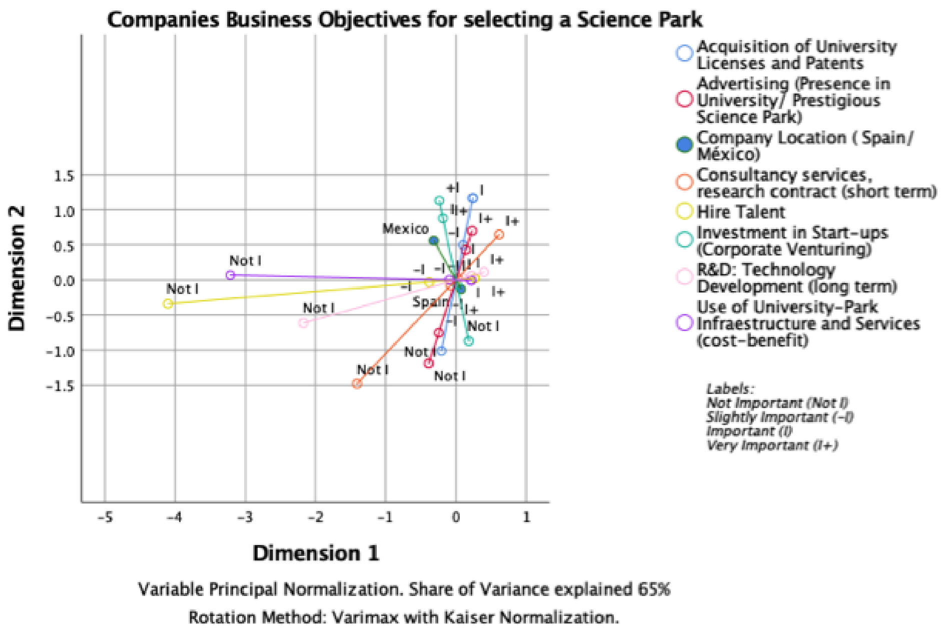


Figure 4.9: Companies Business Objectives for selecting a Science Park

Table 4.4: Companies Business Objectives for Selecting a Science Park

Companies Business Objectives for Selecting a Science Park	**Rotated Component Loadings**		**Chi-Squared Test X2 0.05,3 =7.815 / U Mann-Whitney**		
(Cronbachs alpha 0.90)	1	2	Value	df	p <0.05
Hire Talent	0.84	0.07	18.69	3	0/0
Use of University-Park Infrastructure and Services (cost-benefit)	0.82	-0.02	4.91	3	0.18/0.84
R&D: Technology Development (long term)	0.75	0.21	27.01	3	0.00/0.26
Acquisition of University Licenses and Patents	0.18	0.85	43.16	3	0/0
Investment in Start-ups (Corporate Venturing)	-0.16	0.77	55.76	3	0/0
Advertising (Presence in University/ Prestigious Science Park)	0.228	0.7	10.03	3	0.02/0.29
Consultancy services, research contract (short term)	0.57	0.6	10.36	3	0.02/0
Company Location (Spain/ Mexico)*	-0.15	0.27			

* Supplementary variable

4.4.3 Education KPIs in UBC

About Education KPIs in UBC, besides to hiring talent, two activities stand out for both countries: the number of new courses developed by university-company and the number of positions filled by candidates coming from activities such as *hackathons* and internships. These findings mirror the willingness of companies to collaborate with universities, which could be used to reinforce this type of activities,(See Figure 4.10, and Table 4.5).

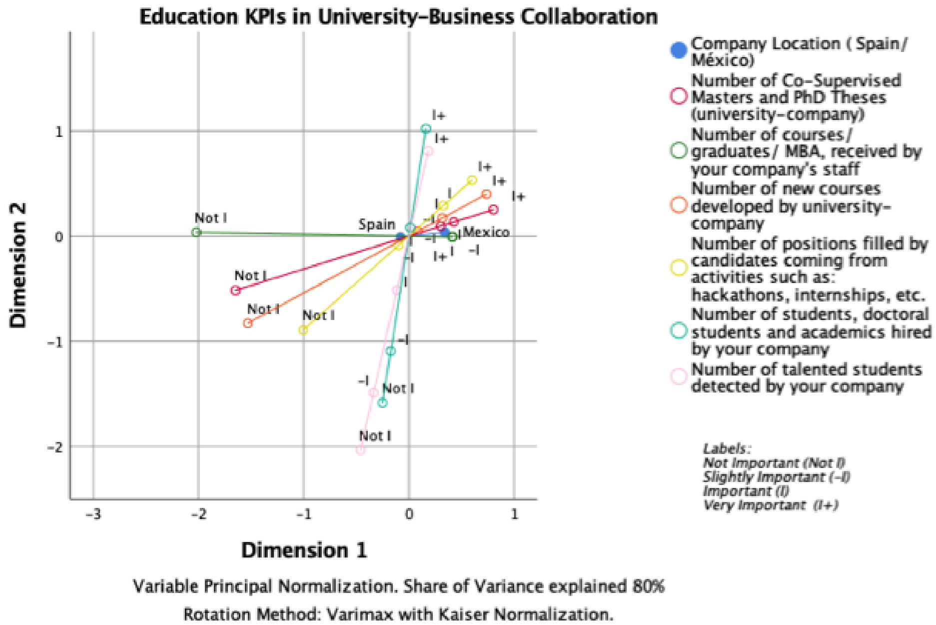


Figure 4.10: Education KPIs in University-Business Collaboration

Table 4.5: Education KPIs in University-Business Collaboration

Education KPIs in University-Business Collaboration	Rotated Component Loadings		Chi-Squared Test X2 0.05,3 =7.815 / U Mann-Whitney		
(Cronbachs alpha 0.93)	1	2	Value	df	p <0.05
Number of courses/ graduates/ MBA, received by your company's staff	0.91	-0.02	7.09	3	0.07/0.0
Number of Co-Supervised Masters and PhD Theses (university-company)	0.85	0.27	4.36	3	0.23/0.60
Number of new courses developed by university-company	0.76	0.41	35.69	3	0/0
Number of positions filled by candidates coming from activities such as: hackathon, internships, etc.	0.65	0.57	19.06	3	0/0
Company Location (Spain/ Mxico)*	0.17	0.02			
Number of students, PhD students and academics hired by your company	0.14	0.91	42.27	3	0.00/0.17
Number of talented students detected by your company	0.2	0.9	3.85	3	0.28/0.08

* Supplementary variable

4.4.4 Research KPIs in UBC

Referring to Research KPIs in UBC, we found concordance with the companies responses about their business objectives, since the companies of both countries are interested in collaborating with the universities in the short and long term,(See Figure 4.11, and Table 4.6).

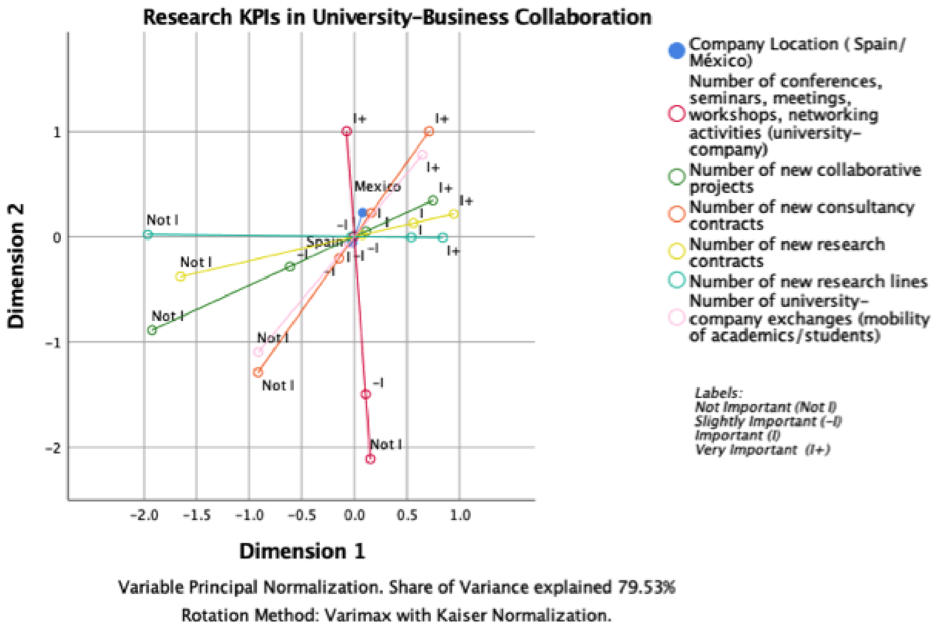


Figure 4.11: Research KPIs in University-Business Collaboration

Table 4.6: Research KPIs in University-Business Collaboration

Research KPIs in University-Business Collaboration	**Rotated Component Loadings**		**Chi-Squared Test X2 0.05,3 =7.815 / U Mann-Whitney**		
(Cronbachs alpha 0.94)	1	2	Value	df	p <0.05
Number of new research lines	0.95	-0.01	2.65	3	0.45/0.37
Number of new research contracts	0.91	0.21	6	3	0.11/0.36
Number of new collaborative projects	0.8	0.37	16.96	3	0/0
Number of conferences, seminars, meetings, workshops, networking activities (university-company)	-0.07	0.94	7.82	3	0.05/0.09
Number of new consultancy contracts	0.5	0.7	23.43	3	0/0
Number of university-company exchanges (mobility of academics/students)	0.5	0.6	4.23	3	0.24/0.33
Company Location (Spain/ Mexico)*	0.04	0.11			

* Supplementary variable

4.4.5 Valorisation KPIs in UBC

With respect to Valorisation KPIs in UBC, our analysis again reflects the slightly importance that Mexican and Spanish companies give to indicators as patents (presented/granted), university patents and licenses as well as papers published in co-authorship with the academy. In addition, this category, point out the interest of Mexican companies to integrating start-ups into their business units,(See Figure 4.12,and Table 4.7).

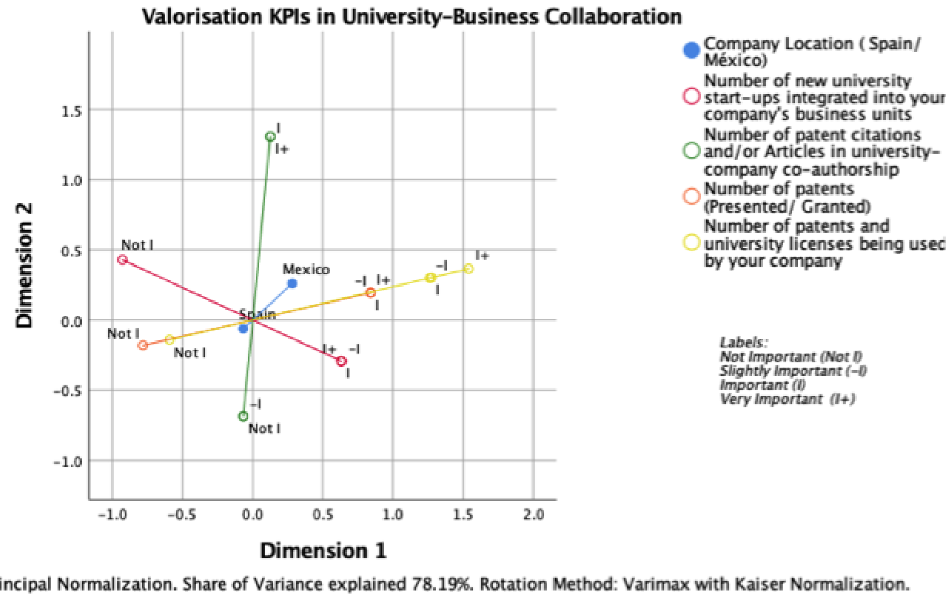


Figure 4.12: Valorization KPIs in University-Business Collaboration

Table 4.7: Valorisation KPIs in University-Business Collaboration

Valorisation KPIs in University-Business Collaboration	**Rotated Component Loadings**		**Chi-Squared Test X2 0.05,3 =7.815 / U Mann-Whitney**		
(Cronbachs alpha 0.90)	1	2	Value	df	p <0.05
Number of patents and university licenses being used by your company	0.88	0.21	18.07	3	0/0
Number of patents (Presented/ Granted)	0.81	0.19	85.19	3	0/0
Number of new university start-ups integrated into your company's business units	0.77	-0.35	18.9	3	0/0
Company Location (Spain/ Mxico)*	0.14	0.13			
Number of patent citations and/or Articles in university-company co-authorship	0.09	0.95	15.57	3	0/0
* Supplementary variable					

4.4.6 Innovation Kay Performance Indicators

Regarding Innovation Indicators, the results indicate that all innovation indicators are essential for both countries, as graph shows (see figure13); although, the most significant indicator is cost-reduction due to innovations (products, processes, or services),(See Figure 4.13,and Table 4.8).

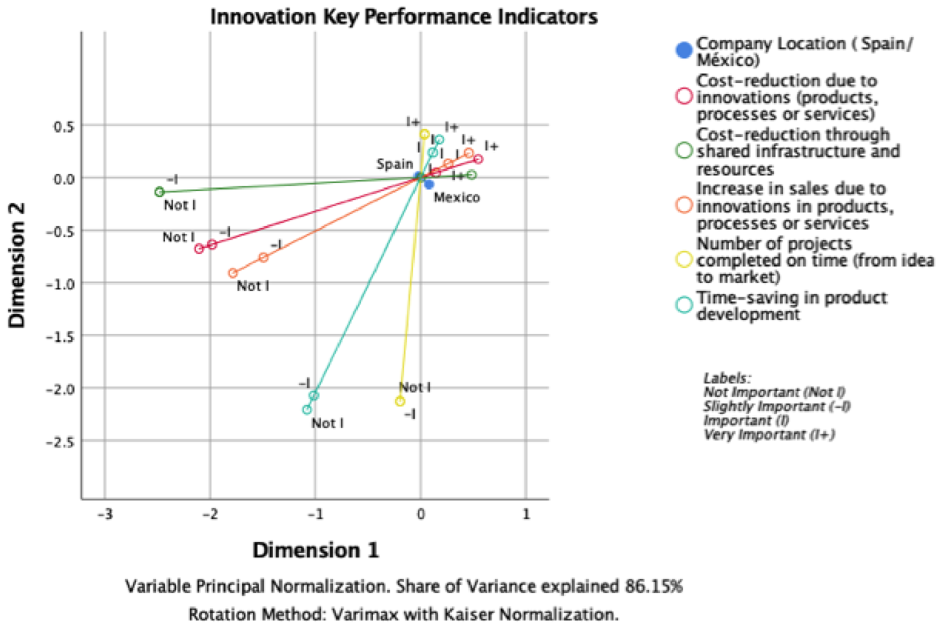


Figure 4.13: Innovation Key Performance Indicators

Table 4.8: Innovation Key Performance Indicators

Innovation Key Performance Indicators	**Rotated Component Loadings**		**Chi-Squared Test X2 0.05,3 =7.815 / U Mann-Whitney**		
(Cronbachs alpha 0.95)	1	2	Value	df	p <0.05
Cost-reduction through shared infrastructure and resources	0.93	0.05	3.74	3	0.29/0.28
Cost-reduction due to innovations (products, processes or services)	0.9	0.29	10.8	3	0.01/0.03
Increase in sales due to innovations in products, processes or services	0.82	0.42	0.36	3	0.95/0.48
Company Location (Spain/ Mxico)*	0.039	-0.03			
Number of projects completed on time (from idea to market)	0.09	0.94	11.22	3	0.01/0.15
Time-saving in product development	0.4	0.82	7.44	3	0.06/0.03

* Supplementary variable

4.4.7 University Support to Companies co-located at Science Parks

Finally, concerning University counselling, our findings, show as primordial needs technology assessment and funding. In the same line, Spanish companies are also asking for proper legal environment respect to IP as well as advice on business and marketing plans. Respecting these last-mentioned needs, Mexican companies showed that they frequently receive support in these issues,(See Figure 4.14,and Table 4.9).

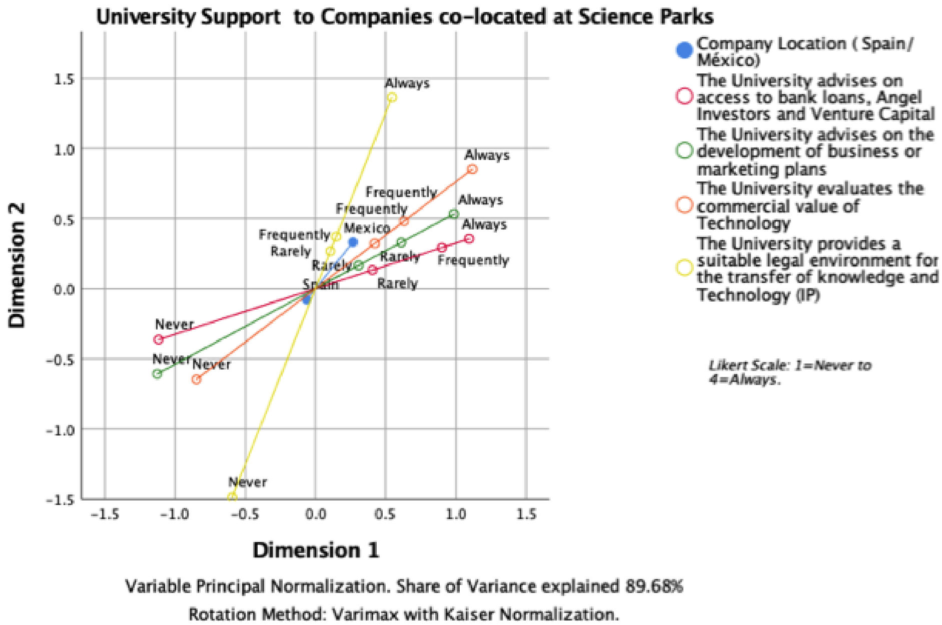


Figure 4.14: University Support to Companies co-located at University Science Parks

Table 4.9: University Support to Companies co-located at Science Parks

University Support to Companies co-located at Science Parks	**Rotated Component Loadings**		**Chi-Squared Test X2 0.05,3 =7.815 / U Mann-Whitney**		
(Cronbachs alpha 0.96)	1	2	Value	df	$p < 0.05$
The University advises on access to bank loans, Angel Investors and Venture Capital	0.91	0.29	38.73	3	0.00/0.05
The University advises on the development of business or marketing plans	0.83	0.45	38.19	3	0/0
The University evaluates the commercial value of Technology	0.72	0.55	24.37	3	0/0
The University provides a suitable legal environment for the transfer of knowledge and Technology (IP)	0.37	0.92	18.72	3	0/0
Company Location (Spain/ Mxico)*	0.13	0.16			
* Supplementary variable					

In general terms, the valuations of Mexican companies were slightly higher than those of Spanish companies in all categories analysed.

4.4.8 Comparative analysis of Semi-structured Interviews between Spain and Mexico

From the perspective of Science Parks, the qualitative study shows that the KPIs perceived by the interviewees from both countries focused on economic terms, sustainability and occupation of spaces.

Regarding KPIs in UBC from Spanish Science Parks stand out, the number of R&D contracts, the rotation of start-ups, the number of spin-off created, and networking activities between co-located companies and university. The other metrics, out of UBC, are focused mainly on visibility and monitoring the economic growth of co-located companies.

From the perspective Mexican Science Parks, the KPIs in UBC are focused on the students. The Science Parks keep follow up about students entrepreneur activities; in fact, some of Mexican SPs like Instituto Tecnológico y de Estudios Superiores de Monterrey, (ITESM), use an *entrepreneurship card* to monitoring UBC activities. In this line, Mexican SPs directors highlight the activities as the number of conferences, seminars, meetings, workshops, networking activities with students, academics and co-located companies, also mobility of students to companies, the number of start-ups and spin-off created and the number of collaborative projects with the university.

4.4.9 Science Parks Success Factors

Concerning SPs success factors, the Spanish Science Parks directors interviewed consider that innovation policies, the location, the innovation ecosystem and the great support of governmental entities and associations around Europe have been crucial factors to the development of SPs in Spain. On the other point of view, Mexican Science Park directors also consider location as an essential factor; however, they ex-pressed the need of governmental support in R&D and innovation policies (i.e. investment in R&D is less than 1% of GDP) as well as innovation culture, besides leadership with both perspectives academic and business, and a proper legal environment regarding IP. According the interviews findings, these factors were considered essential for the development of Mexican SPs. (Due the interviews were conducted in spanish language,the main notes are presented in Appendix Bin the original version) .

4.5 Conclusions

There is a diversity of indicators that measure the collaboration between university and company; however, the firms decision to do a partnership with the university will depend mainly on two of them (i) short and long-term business objectives and (ii) The industrial sector to which they belong. Therefore, without knowing the sector, it will be complicated to distinguish which indicators are more relevant. It is important to note that in this study the most representative industrial sectors were IT, scientific activities and other services. Therefore, it would be convenient to classify the above indicators presented, according to the governmental policies of each country and, the economic and social impact they present.

On the other hand, this study shows lack assistance in universities regarding business advice, technology assessment and funding. The results of this study fill an important gap in the literature because they take into account both the co-located companies at SPs and the Science Parks points of view, which are decisive, in order to know and aligned the objectives of the primary stakeholders in the process of knowledge and technology transfer.

The limitations from this study are found on the University side, since the data could only be taken into account partially; therefore, there is a need also to design a survey about university KPIs in UBC and compare the results with the analysis of the co-located companies KPIs in UBC showed in this study.

In summary, the findings showed similarities in the responses of co-located companies from both countries, by which, this study should be extended to larger samples in order to confirm the scalability of results. Therefore, in future research, it would be appropriate to integrate these factors.

Chapter 5

Conclusions

In this dissertation have been introduced a different perspective to measure the effectiveness of knowledge and technology transfer between Universities and Co-located companies at Science Parks, through University-Business Collaboration.

Firstly, it is widely known that universities were created to fulfil three primary missions: first: teach, second: research and the third, with active participation, to contribute to economic growth and social development through the transfer of this knowledge to society. This transfer of knowledge between universities and industry occurs through a variety of activities as: *The hiring of university graduates, joint research, research contracts, consulting, patents, publications and creation of start-ups and spin-off companies among others*. In this manner, companies can collaborate with universities in a wide range of possibilities. Therefore, the establishment of University-Business Collaboration (UBC) is central in the process of facilitating this knowledge flow from academia to industry.

Second, due to the importance of University-Business Collaboration (UBC), many universities have tried to narrow the gap between science and industry and have designed specific programs and structures to carry out this critical labour, an example of this type of support mechanism are the Science and Technology Parks (STPs), which, act as knowledge brokers, and bring together academics, businesses and venture capitalists. They seek to facilitate the transfer of knowledge from academia to the industry while infusing an entrepreneurial culture of innovation. Among the different types of Science and Technology Parks, this dissertation only took into account University Science Parks since they are closely linked to the university, and they are the bridge between a University and companies in the process of Knowledge and Technology Transfer (KTT).

Third, accelerate the technology transfer processes, is crucial to exploiting the most modern technologies and the latest discoveries made by research groups and then applying them in the production system to solve the real problems that companies face day after day. Knowing **who knows what**, who needs to know what, and how to transfer that knowledge is critical especially when so much of a companys worth consists of information. Investing in developing an effective way to transfer knowledge may, in the least, save you some headaches and, at the most, save your business.

Taking into account what was previously mentioned about the economic and social impact of University-Business Collaboration (UBC) and the critical role that play Science Parks in knowledge and technology transfer (KTT) process as well as their implications in the increase of global competition, employment and productivity

The present dissertation focused on companies co-located at Science Parks in Spain and Mexico to identify:

1. the criteria to select an SP,
2. the business objectives to select an SP and,
3. to identify the evaluation metrics, **Key Performance and Innovation Indicators** (KPIs), used by companies co-located at SPs to evaluate the company performance on campus.

For these last objectives, twenty-one KPIs in UBC were used, which are based on the principal UBC activities found in the literature. These activities of UBC used in this study are embedded within the three missions of the universities, and their importance is derived from this.

It is well-known that knowledge transfer between academia and industry is considered an essential driver of innovation and economic growth as it eases the commercialisation of new scientific knowledge within firms Bercovitz and Feldmann (2006). This is why the primary purpose of this research was to cover the main activities of knowledge and technology transfer between the university and industry with their respective KPIs.

Since performance metrics are used for firms to measure and monitor the achievement of objectives at different levels, a survey was designed with the objective to examine the level of importance of each KPI in UBC for companies co-located at SPs and, identify what matters to them, in terms of business objectives (*i.e.* long-term R&D, consulting, hire talent) and needs (*i.e.* human capital, technological, research, funding).

Moreover, this research took to account Science Parks, exploring their KPIs and critical success factors through semi-structured interviews with Science Parks directors. All this to identify those SPs indicators that measure UBC and in this manner, explore those that are aligned with co-located companies KPIs.

Finally, the main findings of this dissertation for both countries show that the firms decision to do a partnership with the university will depend mainly on two of them short and long-term business objectives and the industrial sector to which they belong. Therefore, without knowing the sector, it will be complicated to distinguish which indicators are more relevant. It is important to note that in this study, the most representative industrial sectors were IT, scientific activities and other services. Therefore, it would be convenient to classify the above indicators presented, according to the governmental policies of each country and, the economic and social impact they present. Moreover, the innovation ecosystem offered by the university is other essential criteria to co-located a company at Science Park as well as hire talent and corporate venturing.

On the other hand, the acquisition of university licenses and patents is the least relevant business objective for both Spanish and Mexican companies, being this indicator one of the most studied in the literature and the most valued by the universities and SP. Besides, this research also shows lack of assistance in universities regarding business advice, technology assessment and funding. Additionally, this research shows the willingness of co-located companies to develop courses with academia.

The results of this study fill an important gap in the literature because they take into account both the co-located companies at SPs and the Science Parks points of view, which are decisive, to know and align the objectives of the primary stakeholders in the process of knowledge and technology transfer.

The limitations from this study are found on the University side since the data could only be taken into account partially; therefore, there is a need also to design a survey about university KPIs in UBC and compare the results with the analysis of the co-located companies KPIs in UBC showed in this study. In summary, the findings showed similarities in the responses of co-located companies from both countries, by which this study should be extended to larger samples to confirm the scalability of results. Therefore, in future research, it would be appropriate to integrate these factors.

In summary, this research adds to the literature on UBC by utilizing KPIs in UBC, such it is a scalable and straightforward diagnostic tool and useful for universities and SPs. The findings from this thesis show evidence that firms bet for establish themselves in SP to accelerate their innovation processes and to quickly launch their products onto the market.

5.1 Future work

While this doctoral thesis has been influenced by the empirical phenomenon of technology transfer and open innovation and the role of Universities in this process, I believe that my findings, combined with current developments in the field, open up several exciting avenues for future research.

A line that, in my opinion, needs future work is that related with Institutional differences[1]. In our case Institutions may vary in very different ways. For example, we have pure Technical Universities as Universitat Politècnica de Catalunya to more comprehensive institutions. This can open a complete line of research.

Also cultural differences may be applied to knowledge transfer topics using the Hofstede model of six dimensions : (1) Power distance, (2) Uncertainty Avoidance, (3) Individualism/collectivism, (4) Masculinity/Femininity, (5) Long/Short Term Orientation, and (6) Indulgence/Restraint [2]. This model has been used in several marketing and organizational studies to understanding of other cultures, identifying each group's cultural patterns, and behavioral discrepancies. Therefore,it can be applied also to R&D multicultural collaborations between Latin American Countries.

Consequently, research exploring *how* the dynamics in the different actors changes and *how* innovation and the business models of these actors develop -depending on the cultural differences- offer very interesting directions for future research.

I am planning to address some of these issues as a continuation of my research when trying to compare innovation environments from various countries in Latin America.

[1] Differences in organisational goals and culture are a frequently mentioned, but not well defined barrier to academic engagement Bercovitz and Feldmann (2006).

[2] Dimensionalizing Cultures: The Hofstede Model in ContextHofstede (2011).

Appendix A

Categorical Principal Component Analysis

Table A.1: Criteria to select a Science Park

Model Summary Rotation			
Dimension (a)	Cronbach Alfa (b)	Total eigenvalue	Variance %
1	-0.662	2.646	44.105
2	-1.176	1.751	29.178
Total	.927b	4.397	73.284

a Rotation method: Varimax with Kaiser normalization
b The total of Cronbach's alpha is used in the total eigenvalue.

Table A.2: Business Objectives to select a Science Park

Model Summary Rotation (a)			
Dimension	Cronbach Alfa	Total eigenvalue (b)	Variance %
1	-0.044	2.375	33.93
2	-0.636	2.228	31.829
Total	.913b	4.603	65.758

a Rotation method: Varimax with Kaiser normalization
b The total of Cronbach's alpha is used in the total eigenvalue.

Table A.3: Education KPIs in UBC

Model Summary Rotation (a)

Dimension	Cronbach Alfa	Total eigenvalue (b)	Variance %
1	-0.32	2.605	43.419
2	-0.64	2.206	36.775
Total	.951b	4.812	80.194

a Rotation method: Varimax with Kaiser normalization
b The total of Cronbach's alpha is used in the total eigenvalue.

Table A.4: Research KPIs in UBC

Model Summary Rotation (a)

Dimension	Cronbach Alfa	Total eigenvalue (b)	Variance %
1	-0.126	2.876	47.931
2	-0.562	1.896	31.6
Total	.949b	4.772	79.532

a Rotation method: Varimax with Kaiser normalization
b The total of Cronbach's alpha is used in the total eigenvalue.

Table A.5: Valorization KPIs in UBC

Model Summary Rotation (a)

Dimension	Cronbach Alfa	Total eigenvalue (b)	Variance %
1	-1.606	2.027	50.669
2	-3.949	1.101	27.526
Total	.907b	3.128	78.195

a Rotation method: Varimax with Kaiser normalization
b The total of Cronbach's alpha is used in the total eigenvalue.

Table A.6: Innovation Key Performance Indicators

Model Summary Rotation (a)

Dimension	Cronbach Alfa	Total eigenvalue (b)	Variance %
1	-0.276	2.504	50.081
2	-0.382	1.804	36.071
Total	.960b	4.308	86.151

a Rotation method: Varimax with Kaiser normalization
b The total of Cronbach's alpha is used in the total eigenvalue.

Table A.7: University Support to Companies co-located at Science Parks

Model Summary Rotation (a)

Dimension	Cronbach Alfa	Total eigenvalue (b)	Variance %
1	0.918	3.209	80.235
2	-2.194	0.378	9.453
Total	.962a	3.587	89.687

a Rotation method: Varimax with Kaiser normalization
b The total of Cronbach's alpha is used in the total eigenvalue.

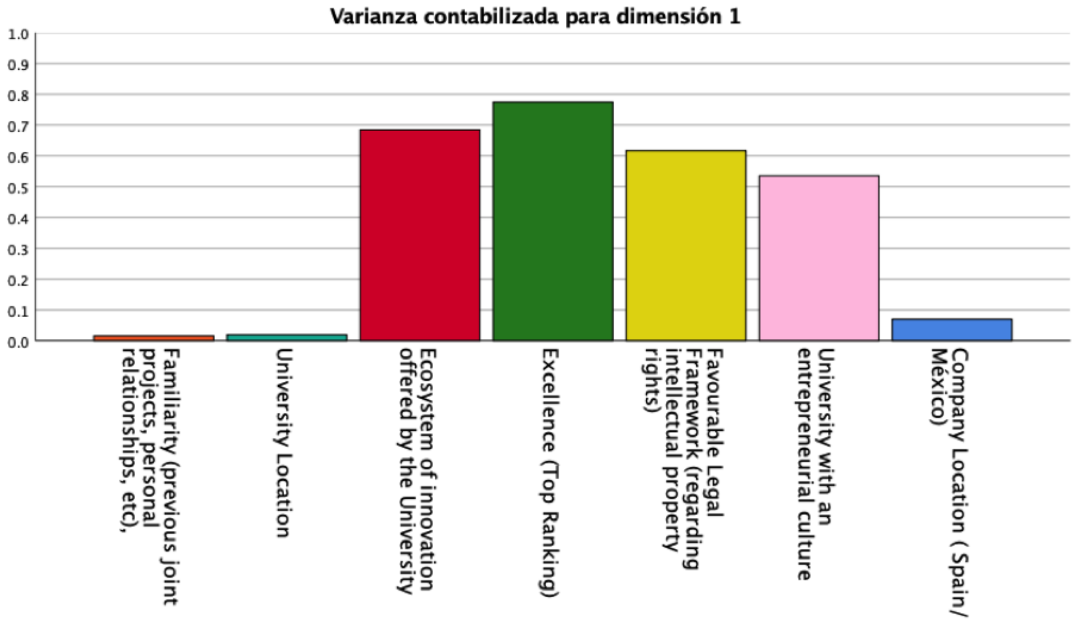


Figure A.1: Criteria to Select a Science Park

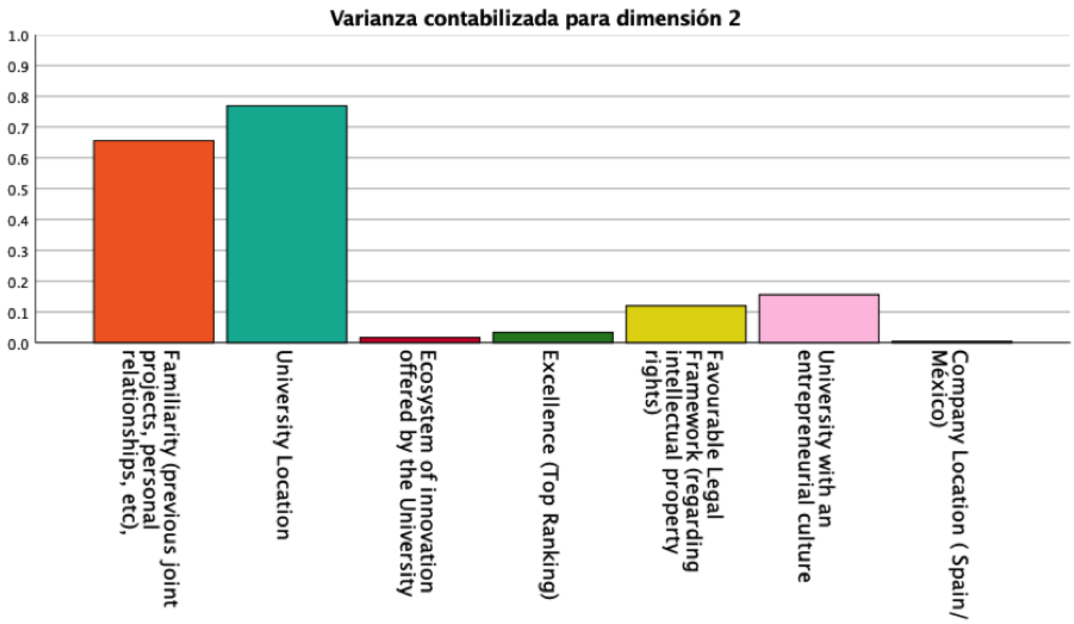


Figure A.2: Criteria to Select a Science Park

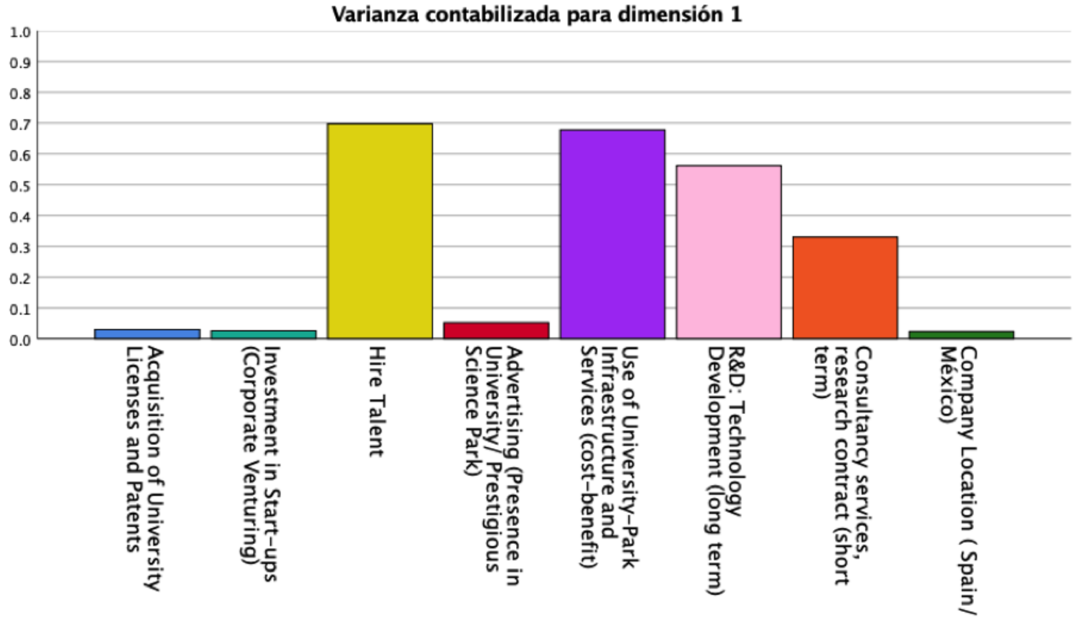


Figure A.3: Business Objectives to Select a Science Park

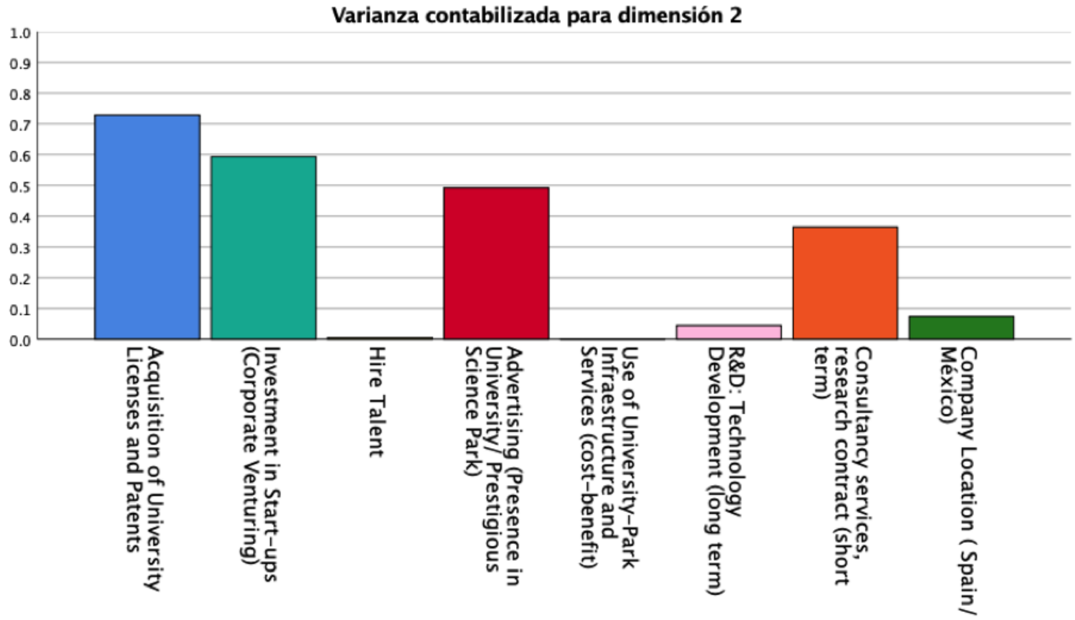


Figure A.4: Business Objectives to Select a Science Park

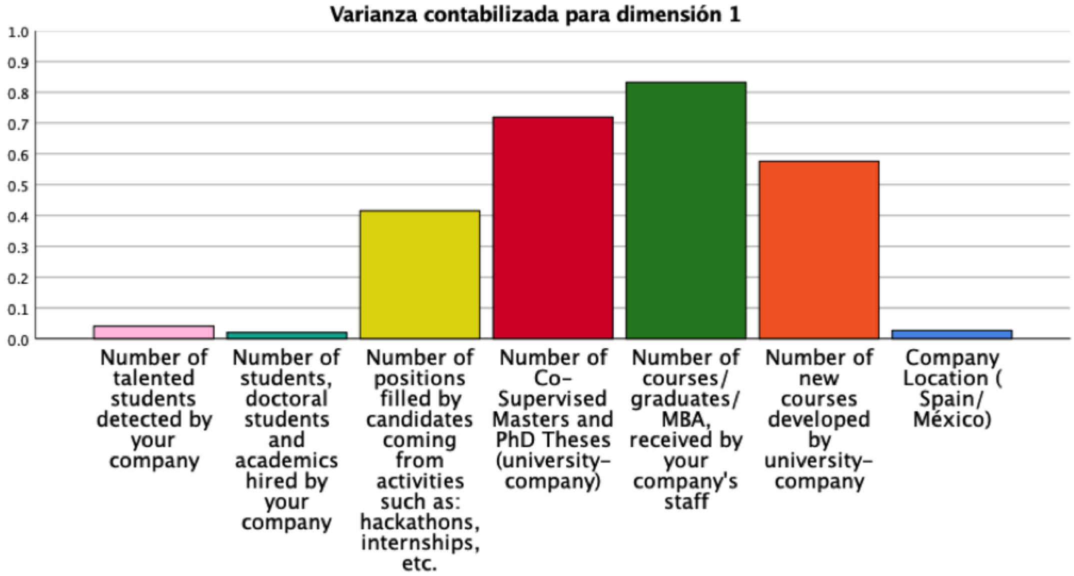


Figure A.5: Education KPIs in UBC

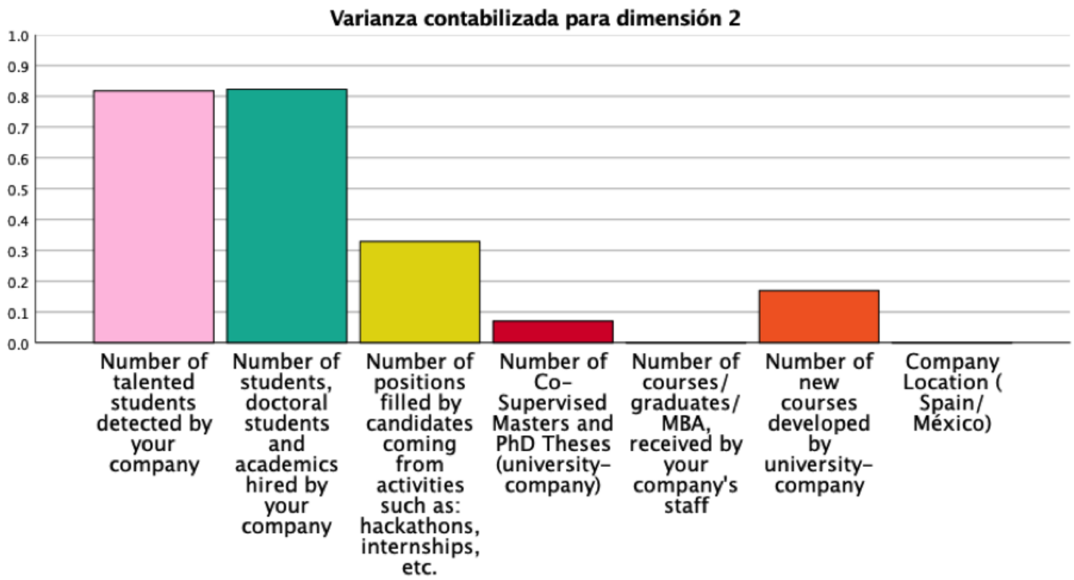


Figure A.6: Education KPIs in UBC

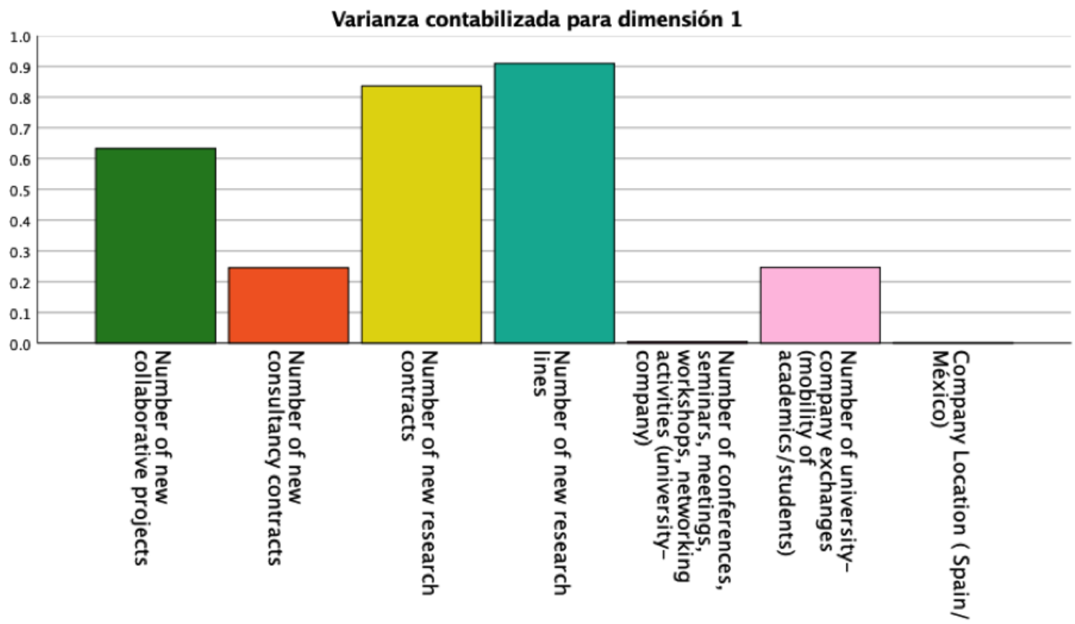


Figure A.7: Research KPIs in UBC

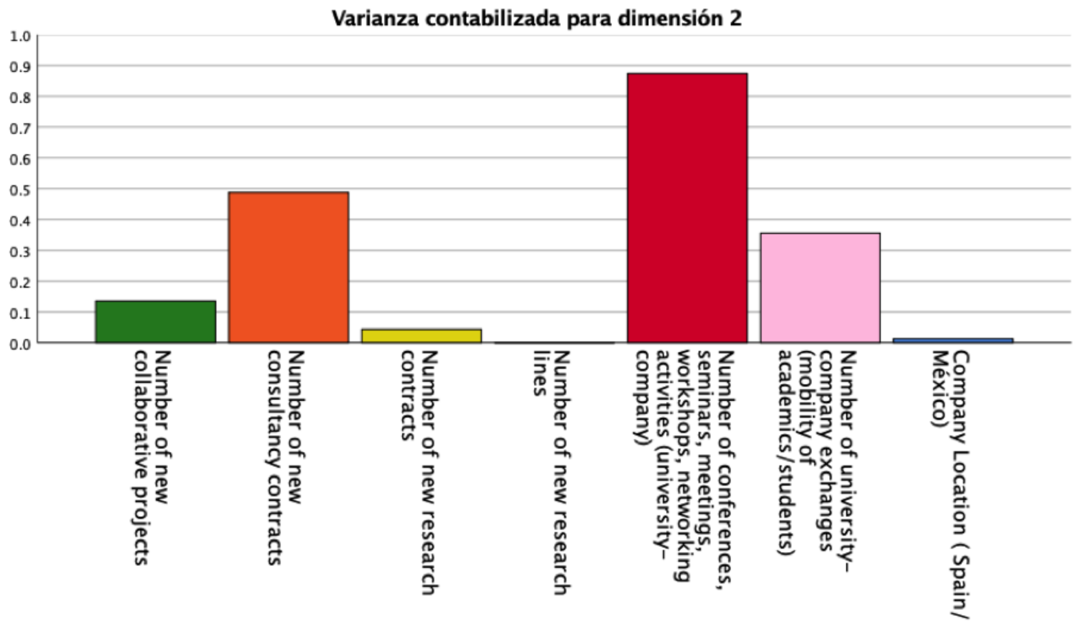


Figure A.8: Research KPIs in UBC

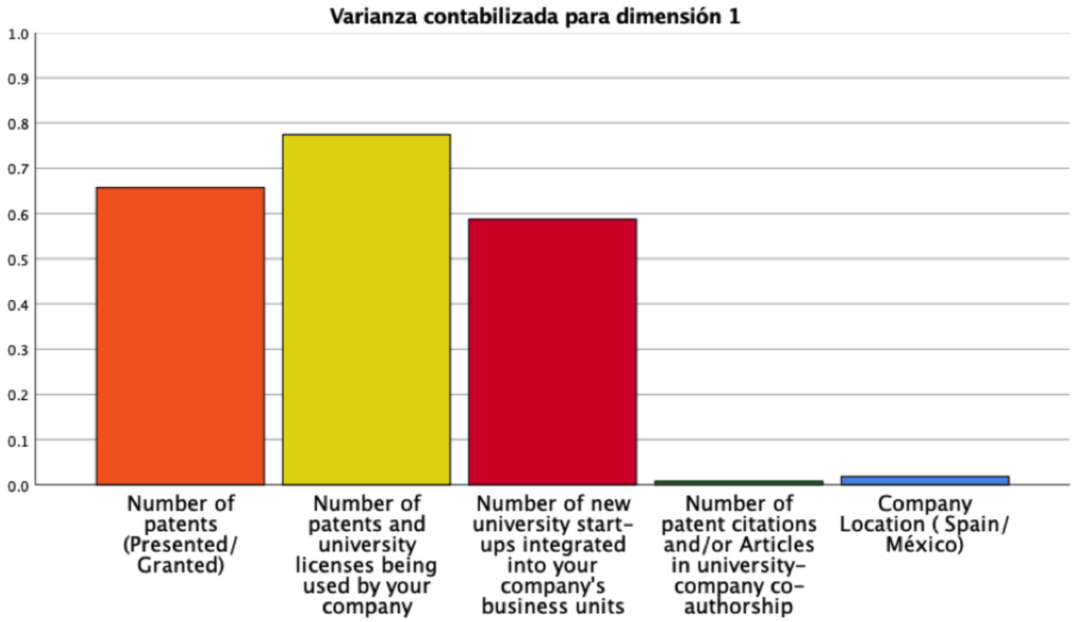


Figure A.9: Valorization KPIs in UBC

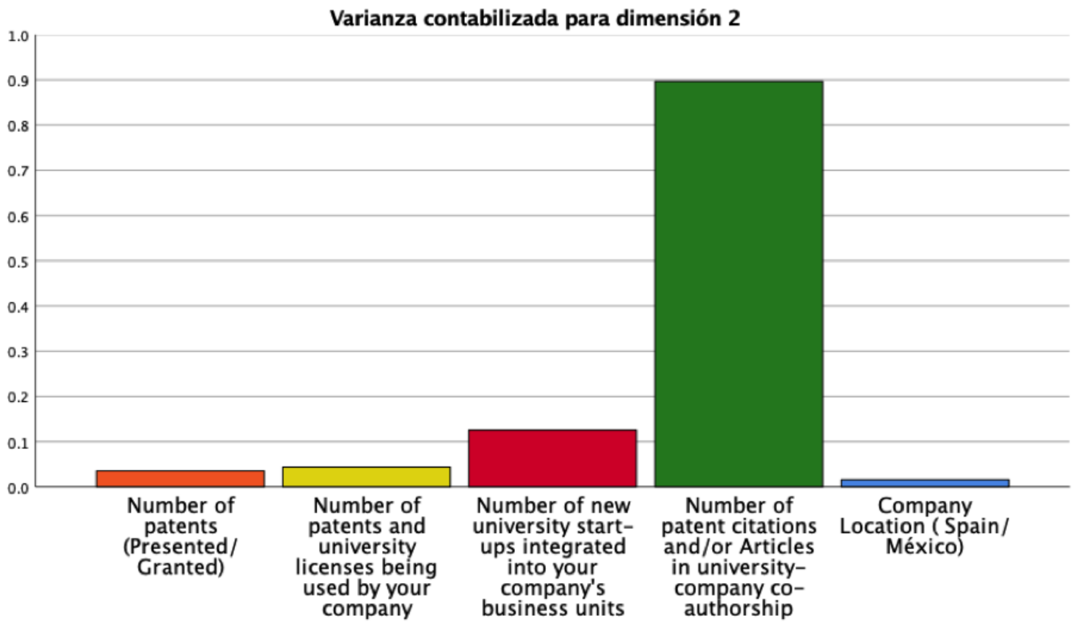


Figure A.10: Valorization KPIs in UBC

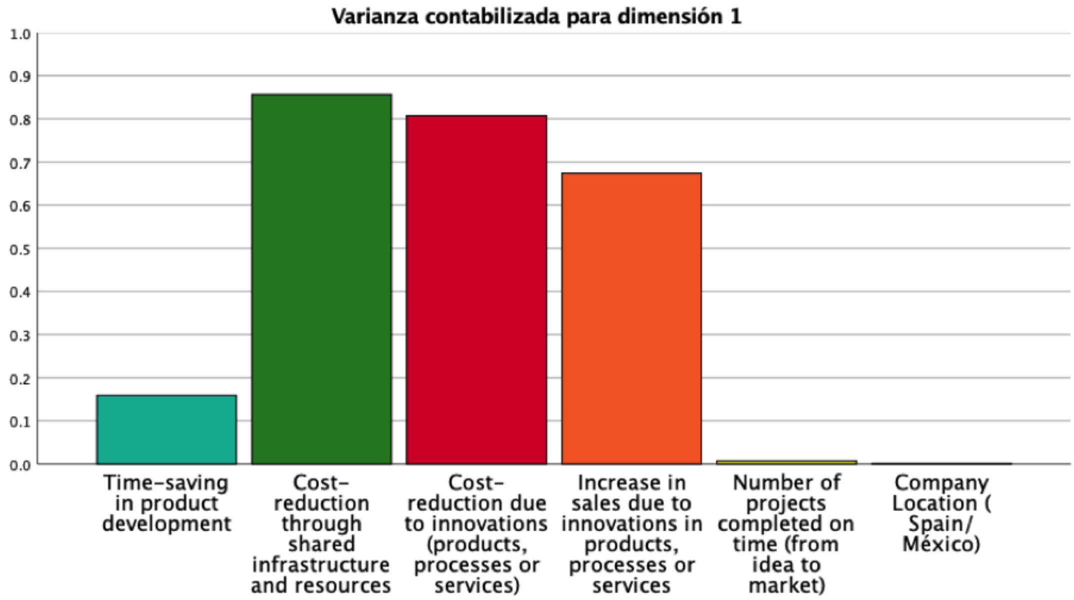


Figure A.11: Innovation Key Performance Indicators

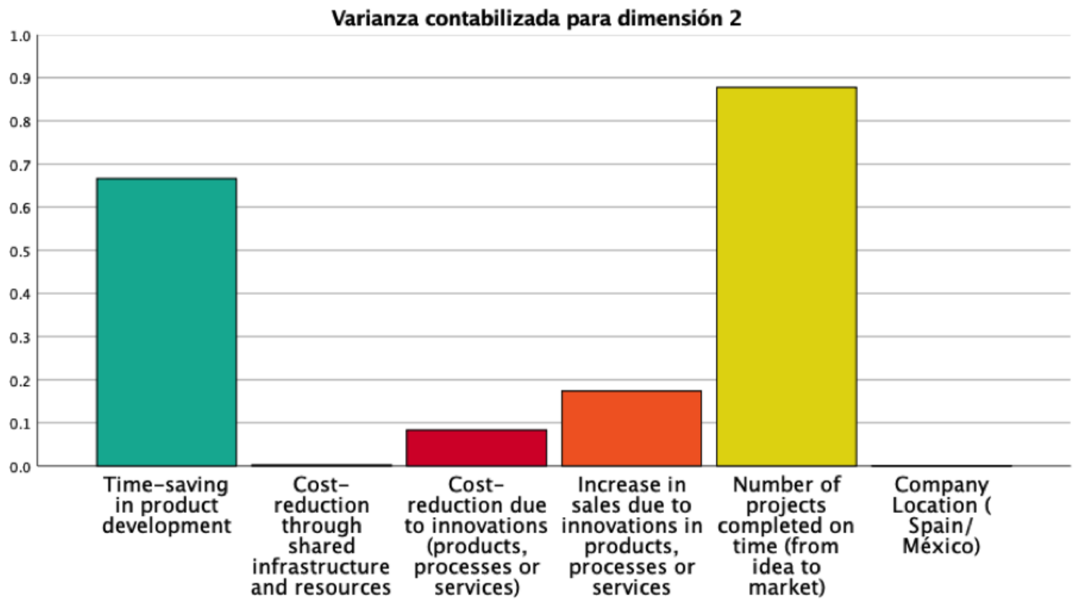


Figure A.12: Innovation Key Performance Indicators

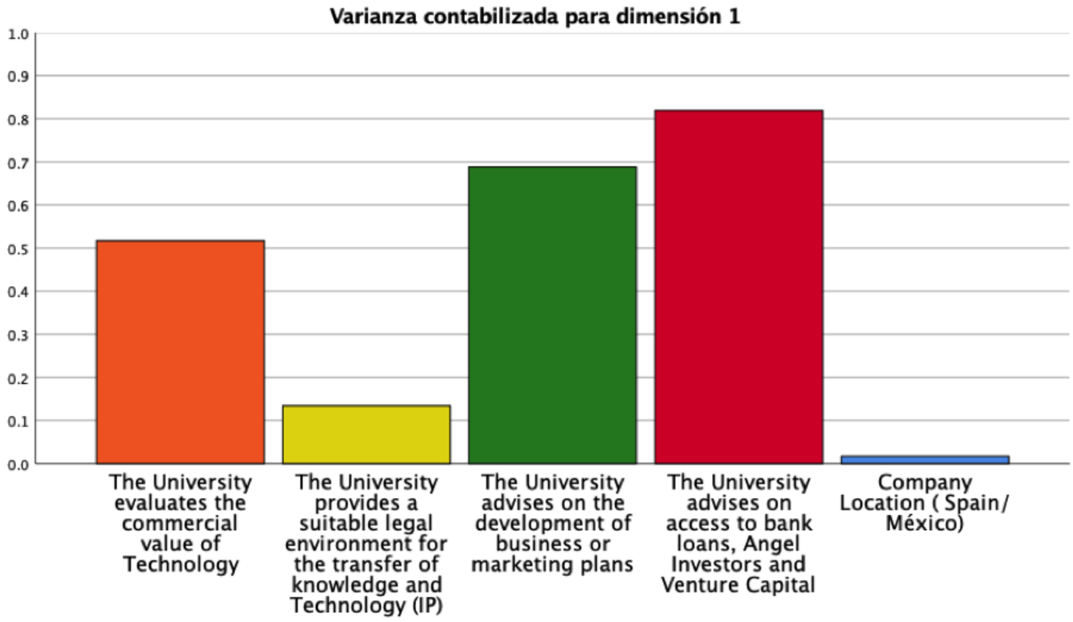


Figure A.13: University Support to Companies co-located at Science Parks

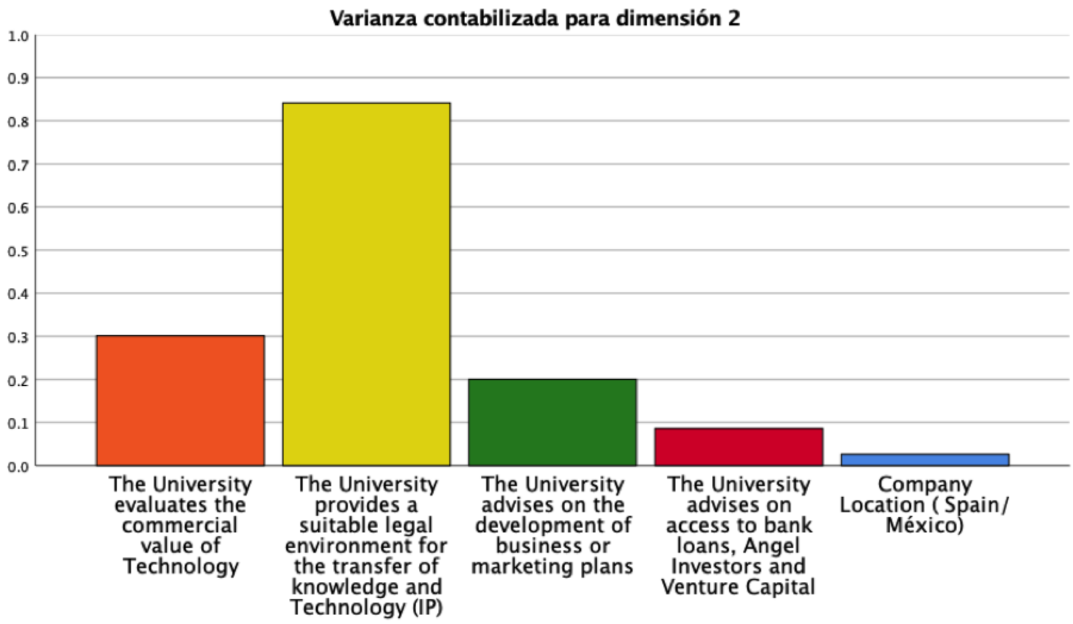


Figure A.14: University Support to Companies co-located at Science Parks

Appendix B

Semi-structured interviews

Interview Guide

General

1. -When did you start your activities as Director of the Science Park of the University of...?

2. -At the beginning of your duties as Director, at what stage of development did you find the Science Park of the University of...? (1)Planning and development (first generation) (2)Growth (second generation) (3)Maturation (third generation) The third stage is when the board and stakeholders recognise that the Science Park plays an important role in the economic development of the region.

Target Audience

1. -According to the current stage of development of the Science Park, what are the medium and long-term business objectives? (Expected outcomes).

2. -What is your target audience and why? (Start-ups, SMEs, large companies.)

3. -What are the criteria and/or processes of company selection?

Value Proposal

1. - What is the Science Parks value proposal?

2. -Regarding the co-located companies, what is the average life cycle of companies in the Science Park?

3. -How do you identify the needs of the companies?

University Collaboration

1. -What kind of activities does the Science Park carry out in order to create synergies between the co-located companies and the university?

2. -Could you mention any type of collaboration agreements with the University?

Key Performance Indicators

1. -What are the main Key performance indicators used by the Science Park to achieve its business objectives?

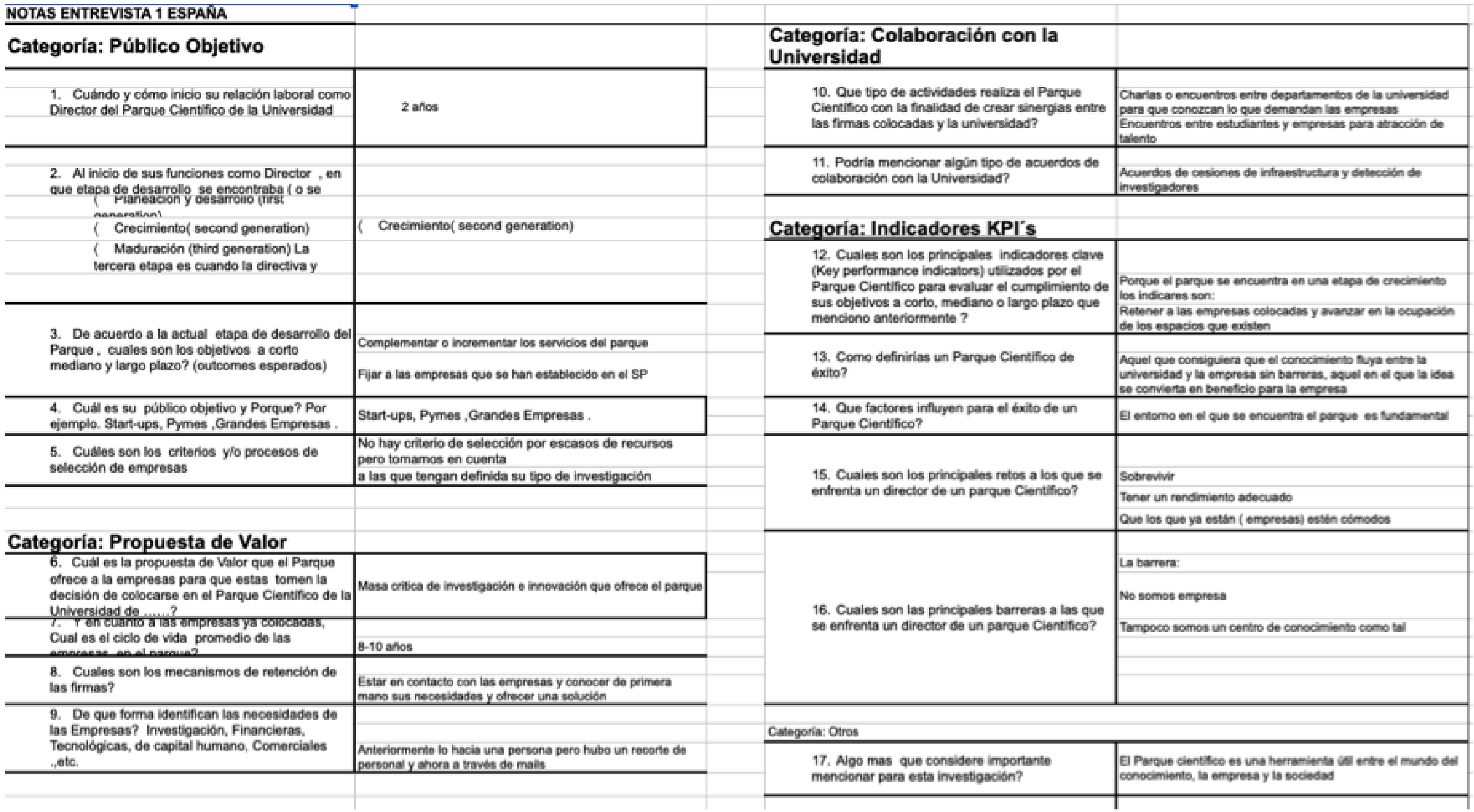
2. -How would you define a successful Science Park?

3. -What are the key factors of success for the Science Park?

4. -What are the main challenges facing the director of the Science Park?

5. -What are the main barriers for a director of a Science Park?

Other : We ask science parks directors for additional information and comments for this research.



NOTAS ENTREVISTA 1 ESPAÑA

Categoría: Público Objetivo	
1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad	2 años
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se (Planeación y desarrollo (first generation)	
(Crecimiento(second generation)	(Crecimiento(second generation)
(Maduración (third generation) La tercera etapa es cuando la directiva y	
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	Complementar o incrementar los servicios del parque Fijar a las empresas que se han establecido en el SP
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	Start-ups, Pymes ,Grandes Empresas .
5. Cuáles son los criterios y/o procesos de selección de empresas	No hay criterio de selección por escasos de recursos pero tomamos en cuenta a las que tengan definida su tipo de investigación
Categoría: Propuesta de Valor	
6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ......?	Masa critica de investigación e innovación que ofrece el parque
7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?	8-10 años
8. Cuales son los mecanismos de retención de las firmas?	Estar en contacto con las empresas y conocer de primera mano sus necesidades y ofrecer una solución
9. De que forma identifican las necesidades de las Empresas? Investigación, Financieras, Tecnológicas, de capital humano, Comerciales .,etc.	Anteriormente lo hacia una persona pero hubo un recorte de personal y ahora a través de mails

Categoría: Colaboración con la Universidad	
10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	Charlas o encuentros entre departamentos de la universidad para que conozcan lo que demandan las empresas Encuentros entre estudiantes y empresas para atracción de talento
11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?	Acuerdos de cesiones de infraestructura y detección de investigadores
Categoría: Indicadores KPI´s	
12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	Porque el parque se encuentra en una etapa de crecimiento los indicares son: Retener a las empresas colocadas y avanzar en la ocupación de los espacios que existen
13. Como definirías un Parque Científico de éxito?	Aquel que consiguiera que el conocimiento fluya entre la universidad y la empresa sin barreras, aquel en el que la idea se convierta en beneficio para la empresa
14. Que factores influyen para el éxito de un Parque Científico?	El entorno en el que se encuentra el parque es fundamental
15. Cuales son los principales retos a los que se enfrenta un director de un parque Científico?	Sobrevivir Tener un rendimiento adecuado Que los que ya están (empresas) estén cómodos
16. Cuales son las principales barreras a las que se enfrenta un director de un parque Científico?	La barrera: No somos empresa Tampoco somos un centro de conocimiento como tal
Categoría: Otros	
17. Algo mas que considere importante mencionar para esta investigación?	El Parque científico es una herramienta útil entre el mundo del conocimiento, la empresa y la sociedad

Figure B.1: Notas Entrevista 1 Espaa

Categoría: Público Objetivo	
	Desde 1992 trabaja en la Univ ….,
1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?	Monto la OTRI en la UNiv
	Primer director de la red de OTRIS de toda España
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de….. ?	Le tocaron todas las fases del Parques por el tiempo que estuvo como director, 16 años
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	En su mayoría Spin- offs
5. Cuáles son los criterios y/o procesos de selección de empresas	De acuerdo a las disciplinas de las universidad se forman spin-offs
Categoría: Propuesta de Valor	
6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ……?	
7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?	2 años
8. Cuales son los mecanismos de retención de las firmas?	
9. De que forma identifican las necesidades de las Empresas? Investigación, Financieras, Tecnológicas, de capital humano, Comerciales , etc	
	Hay un responsable , el contacto es permanente, con formación no solo técnica sino también administrativo. Se ha creado un comité de gestión para apoyar a las spin-offs en sus proyectos europeos

Categoría: Colaboración con la Universidad	
10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	
	Porque el parque es totalmente universitario y en su mayoría son empresas Spin-offs, la sinergia se logra asesorándolas sobre en todas las posibilidades de subvenciones
11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?	
	El parque es universitario 100%, no tiene entidad jurídica propia.
Categoría: Indicadores KPI´s	
12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	Best Practices: Hacen fichas para las empresas a través de web para que las empresas contraten los servicios del parque. Y los investigadores también llenan fichas sobre su expertise o proyectos en los que están trabajando y de esta manera se conectan e incluso podría contratar a un grupo de investigadores sin necesidad de pasar por el parque
13. Como definirías un Parque Científico de éxito?	Cuando el traspaso del conocimiento entre la universidad y las empresa sea un maridaje de conocimiento en cuanto mas avanzado mejor
	Movilidad entre investigadores hacia la empresa y viceversa
14. Que factores influyen para el éxito de un Parque Científico?	
15. Cuales son los principales retos a los que se enfrenta un director de un parque Científico?	
	Depende del modelo del parque, yo no me tuve que ocupar de alquileres… etc., solo de transferencia
16. Cuales son las principales barreras a las que se enfrenta un director de un parque Científico?	27:34:00
	Luchar contra la comunidad de Madrid, no son partidarios de la I+D
Categoría: Otros	
17. Algo mas que considere importante mencionar para esta investigación?	Comento lo mismo , Luchar contra la comunidad de Madrid

Figure B.2: Notas Entrevista 2 Espaa

Categoría: Público Objetivo

1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico	1 año
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se (Planeación y desarrollo (first generation) (Crecimiento(second generation) (Maduración (third generation) La tercera etapa es cuando la	(Crecimiento(second generation)
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	Crear un ecosistema de innovación
	Conseguir la sostenibilidad del parque
	Conseguir el mayor éxito científico de los centros de invest y empresas para
	conseguir la transferencia
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	Abarcamos todos y 50% centros de investigación y50% de todo tipo de empresas de base tecnológica y científica
5. Cuáles son los criterios y/o procesos de selección de empresas	Las empresas que tengan puramente un contenido científico

Categoría: Propuesta de Valor

6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ......?	Tres pilares del parque
	1.- infraestructura:espacios100000 mts cuadrados de lab y oficinas
	2.- servicios:equipamiento de uso compartido, self service, plataformas para personalizar
	3.- comunidad: networking entre la comunidad científica y emprendedores para formar un
7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?	El índice de permanencia es muy alto y es raro que se marche una , toda el parque esta completo.

Categoría: Colaboración con la Universidad

10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	La otri de la univ esta dentro del parque
11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?grupo de educadoras?	

Categoría: Indicadores KPI´s

12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	Ratios de ocupación de espacios
13. Como definirías un Parque Científico de éxito?	Lograr el ecosistema necesario para que el sector biomédico que consiga impulsar empresas de éxito y
14. Que factores influyen para el éxito de un Parque Científico?	Entorno en el que se encuentra el parque , las políticas del gobierno., etc
15. Cuales son los principales retos a los que se enfrenta un director de un parque Científico?	Retos a nivel financiación para logar tirar adelante proyectos
	Retos con clientes
16. Cuales son las principales barreras a las que se enfrenta un director de un parque Científico?	Si trabajas, no tiene que haber ninguna barrera

Categoría: Otros

17. Algo mas que considere importante mencionar para esta investigación?	
8. Cuales son los mecanismos de retención de las firmas?	-Traemos gente que dan información a las empresas sobre fondos de inversión, financiación
	-Jornadas de formación de temas que le puedan interesar a todo el mundo,
	-También llenan un cuestionario de calidad de los servicios
	-Programa de embajadores del parque, (CEOS de las

Figure B.3: Notas Entrevista 3 Espaa

Categoría: Público Objetivo

	Anteriormente mucha experiencia en Parques 15 años (UB, y asoc de parques de Cataluña)
1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?	1 año como directora de innovación la Salle
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de….. ?	17 años en funcionamiento
(Planeación y desarrollo (first generation), Crecimiento(second generation),Maduración (third generation) La tercera etapa es cuando la directiva y stakeholders reconocen que el Parque científico juega un papel importante en el desarrollo económico de la región.	(Maduración (third generation) La tercera etapa es cuando la directiva y stakeholders reconocen que el Parque científico juega un papel importante en el desarrollo económico de la región.
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	-fomentar la emprendeduría en los estudiantes de la Universidad
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	-Start-ups
5. Cuáles son los criterios y/o procesos de selección de empresas	- si son exalumnos es un criterio prioritario
	- analizamos proyectos que aporten valor a las empresas ya instaladas
	- empresas vinculadas a las áreas de ingeniería , TICs, o arquitectura
Categoría: Propuesta de Valor	
6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ……?	-desarrollo de la idea inicial hasta consolidación
	- validar su idea de negocio en el mercado
	-ayudar a conseguir financiación
7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?	Fase de incubación entre 3 -5 años
	Lo normal es un promedio de 3 años
8. Cuales son los mecanismos de retención de las firmas?	N/A

Categoría: Colaboración con la Universidad

10. Que tipo de actividades realiza el Parque Científico con	Estamos creando un nuevo espacio con financiación europea, le llamamos bit la Salle y lo que pretende precisamente es crear un espacio físico para fomentar estas sinergias entre las empresas y los grupos de investigación de la univ así como las empresas que están fuera del parque pero que pueda tener interés , salas de brainstorming, laboratorios.
11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?	
Categoría: Indicadores KPI´s	-no hacemos ningún tipo de evaluación anual
12. Cuales son los principales indicadores clave (Key perfo	-la rotación en el numero de star ups es el único indicador de éxito
	- indicadores de networking
	- las patentes no
13. Como definirías un Parque Científico de éxito?	Depende del modelo o tipología de cada Parque, pero hablando de solo parque científicos, es
	que todo el conocimiento que se genera en la univ llegue a la sociedad y a través de la creción de empresas star-ups
14. Que factores influyen para el éxito de un Parque Científi	-La transferencia de Tec es mucho mas que una Otri que ya existía desde los 80, el proceso se ha burocratizado yo creo que la solución radica más en poner en contacto con la gente que genera el conocimeinto y la gente que lo aplica. Lo que trabajamos mucho es open innovation. Problemas reales con soluciones.
15. Cuales son los principales retos a los que se enfrenta un	-El entorno fantástico de Barcelona , Barcelona supo crear su propia marca.
16. Cuales son las principales barreras a las que se enfrent	El dia a dia, ir viendo hacia donde va el mundo para ir cambiando, saber las tendencias y modelos de actuación.
	-La crisis económica
Categoría: Otros	-Los parques se creen con entidad jurídica propia para romper esta estructura mas lenta por el funcionamiento de la universidad, el echo de que fuesen entidades separadas permitia, facilitar la agilidad, como la transferencia y no seguir modelos burocráticos y estructurados de funcionamiento. En momentos de crisis eco. muchas univ quisieron revertir este modelo, ejem de la UPC , perdió la entidad jurídica el parque presisamente porque el anterior rector pensó que no era necesario.
17. Algo mas que considere importante mencionar para esta investigación?	

Figure B.4: Notas Entrevista 4 Espaa

Categoría: Público Objetivo		Categoría: Colaboración con la Universidad		Categoría: Otros
1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?		10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	Si a nivel de proyectos de colaboración muchas veces las empresas demandan un perfil de estudiante, en practicas, becarios, en fin muchos programas que las propias empresas no se enteran y nosotros les podemos informar, a las que consideramos que puede estar dentro del ámbito de su interés o de la actividad que desarrollan. No hay un procedimiento establecido pero si sabemos de las necesidades de las empresas porque estamos muy en contacto con ellas.	17. Algo mas que considere importante mencionar para esta investigación?
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de….. ?				Los parques científicos (de todos tipos) bien dependen de una univ o del sector publico , cumplen con una labor social que no s epuede ver, pero benefician en el corto o mediano plazo al tejido empresarial de una región en concreto y promueven el emprendimiento y la creación de empleo y el PIB de la región, esto había que medirlo, no en termino de los propio balances del parque científico, sino de todos sus colaboradores, es mucho tejido (clientes, los proveedores), que se mueve y que monta en torno a la actividad del Parque CT y esa labor social hay que poner en valor ante las administración publicas.
(Planeación y desarrollo (first generation)		11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?		8. Cuales son los mecanismos de retención de las firmas?
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)		Categoría: Indicadores KPI's		
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .		12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	Hemos instaurado una metodología recientemente que nos ayuda a seguir cuales son los números , las finanzas de las empresas que tenemos allí incubadas, lo que si nos interesa mucho es medir:	9. De que forma identifican las necesidades de las Empresas? Investigación, Financieras, Tecnológicas, de capital humano, Comerciales ,.etc.
5. Cuáles son los criterios y/o procesos de selección de empresas			medir su cifra de negocio-la creación de empleo y	
Categoría: Propuesta de Valor			- el nivel de facturación especialmente como empiezan y como están cuando abandonan las instalaciones del parque para comparar que ese paso por las instalaciones del PC les ha servido para crecer	15. Cuales son los principales retos a los que se enfrenta un director de un parque Científico?
6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ……?	Además de facilitar espacios ,	13. Como definirías un Parque Científico de éxito?		16. Cuales son las principales barreras a las que se enfrenta un director de un parque Científico?
	Relativo a suministros y mantenimiento de laboratorio		Cada caso es diferente, pero definitiva, esa longevidad que presentan las empresas en el parque es un buen indicativo que se encuentran a gusto con nosotros, mas allá de esto digamos que son medidores, no cuantitativos sino mas bien cualitativos	
	Asesoramiento en materia empresarial y mercantil así como proyectos europeos , que se les escapa	14. Que factores influyen para el éxito de un Parque Científico?	-la dotación de medios	
7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?	4- 5 años de media	- El etorno crea, sinergias que se crean con otros centros de investigación o acuerdo de colaboración, beneficiarse de ese entorno, científico y tecologico que esta al acance de la mano	-la inversión en infraestructuras que corre por cuenta del parque científico de Madrid	
			la proximidad al emprendedor y sus trabajadores para conocer sus inquietudes para identificar los nichos de interés de cada una de las empresas	

Figure B.5: Notas Entrevista 5 Espaa

Categoría: Público Objetivo		**Categoría: Colaboración con la Universidad**		
	- yo no tengo contrato laboral , es un cargo político,	10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	Programa continuo, dirigido a estudiantes de grado e investigadors, (generación de ideas), con retos donde intentamos buscar soluciones con equipos, el curso dura 3 meses y muchas veces acaban creando empresas o soluciones , (con varios temas, ejemplo: emfermedades neurológicas	11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?
1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de....?	- es parque no es idenpendiente de la univ , esta dentro de la estructura			
	- -hace 2 años			**Categoría: Otros**
			Conexión activa entre la sociedad y la univ	
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de..... ?	Es parque tiene 11 años de vida	**Categoría: Indicadores KPI´s**		17. Algo mas que considere importante mencionar para esta investigación?
	(Maduración (third generation) La tercera etapa es cuando la directiva y stakeholders reconocen que el Parque científico juega un papel importante en el desarrollo económico de la región.	12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	Los estamos cambiando pero lo que buscamos :	Checar el HUB de innovación B. 30
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)		-num de contratos de colaboración de los 3 socios con entidades o empresas externas	-num de conexiones que se establecen	-mas de 300 empresas
		cuantas ayudas consigo	-visibilidad	16. Cuales son las principales barreras a las que se enfrenta un director de un parque Científico?
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	El sistema pretende ayudar en la fases iniciales de la creación de spin off, pero no hay espacio suficiente para acoger a mas empresas de fuera.	-impacto social	- seguimiento de proyectos pluri institucionales se han generado	-desconocimiento de la PYME de que el sistema publico de investigación es bueno y que los retos que tengan se acerquen a la univ para buscar soluciones. Porque las grandes ya tienen su propio departamento de I+D.
		13. Como definirías un Parque Científico de éxito?	El punto básico el impacto que tenga sobre la sociedad, como consiguen conectar la innovación , conocimeinto con la industria local, conseguir que la pyme venga al parque	8. Cuales son los mecanismos de retención de las firmas?
5. Cuáles son los criterios y/o procesos de selección de empresas	Sistema mixto para desarrollar spin off , Solo tienes la opción de acceder si tienes alguna relación contractual con alguno de los 3 socios: la UAB o con, CSIC, agroalimentario de Cataluña	14. Que factores influyen para el éxito de un Parque Científico?	- tiene que haber instrumentos políticos que impulsen la innovación - que los inv piensen que los investiagadores piensen que es igual de importante un paper que un atransferencia	7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?
Categoría: Propuesta de Valor				
	-Intentamos hacer un sistema de innovación abierta	15. Cuales son los principales retos a los que se enfrenta un director de un parque Científico?		
6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ......?	-25 personas para dar apoyo al tejido empresarial	9. De que forma identifican las necesidades de las Empresas? Investigación, Financieras, Tecnológicas, de capital humano, Comerciales ..etc.	Convencer a los investigadores que lo que has hecho lo conozcan no solo tus colegas, sino también la sociedad y aumente la financiación	5 -6 años
	-empresas (de alguno de los 3 socios) tienen precio preferente	2 persona de cara afuera		no buscamos echarlos pero una vez graduados, se marchan, es lo que se busca.
			-	

Figure B.6: Notas Entrevista 6 Espaa

Categoria: Público Objetivo

1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?	- Actividad 2007
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de..... ?	Es parque tiene 11 años de vida,· Planeación y desarrollo (first generation)
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	3 lineas:
	1.- apoyo al emprendimiento universitario (estudiantes e investigadores) enfocado a soluciones a retos sociales
	2.-faciliatar los procesos de KTT con la universidad y las empresas del parque
	3.- aumentar la masa critica de empresas 20 dentro del parque y 22 fuera del parque pero conectados al parque.
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	Star ups
5. Cuáles son los criterios y/o procesos de selección de empresas	Se analiza el proyecto, entregan una memoria donde explican porque quieren vincularse con la Univ. es necesario que se quieran vincular con la Univ.
	No todas entran, deben tener un vinculo con la Univ.

Categoria: Propuesta de Valor

6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ……?	El activo principal del parque es la universidad debe haber un win win empresas y universidad.
	I+d +i competitividad tecnológica
	El parque no es barato , pero el entorno es favorable para desarrollar innovación y conocimiento
7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?	La idea es que se que no haya finalización que permanezcan en el parque siempre nos reunimos cada 3 meses para ver que necesitan , no es un real estate. No hay una incubadora como tal es un mix , queremos que vean que estamos ahí .
8. Cuales son los mecanismos de retención de	

Categoria: Colaboración con la Universidad

10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	Actividades de conexión, jornadas busines to science, empresas del sector y grupos de investigación , cada 3 o 4 meses una jornada de un tema especifico. Inobar una cervezada una vez al mes, sin speaker solo networking jueves por la tarde, equipos de futbol.
11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?	

Categoria: Indicadores KPI's

12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	- de las 3 lineas
	- # iniciativas de estudiantes
	- # de iniciativas de profesores
	- # de contratos de investigación (art 83, descuento en contratos de invest)
	- coste de capturar las empresas
13. Como definirías un Parque Científico de éxito?	Cuando llega a tener una visión clara en contribución (tangible, euros puestos de trabajo) a la tercera misión de la univ,
	Que se resuelvan problemas sociales
14. Que factores influyen para el éxito de un Parque Científico?	- De que exista una cal de comunicacion entre la i+d de la univ con el sector empresadal en la cudruple helix
15. Cuales son los principales retos a los que se enfrenta un director de un parque Científico?	Ser capaz de motivar a la comunid univ a sacar su talento, no loso para ser research, sino dar soluciones a problemas sociales.
	Generar una masa críticas de empresas donde se genere negocio entre ellas y entre las propia univ. Y que sean tecnológicas e innovadoras.

Categoria: Otros

17. Algo mas que considere importante mencionar para esta investigación?
Los SP no son espacios para empresas y sino que sean considerados como motor de innovación y no lo estamos consiguecindo , la mayoría se preocupan por los espacios.
Lo mas importante de un SP es la gente , el valor del parque es intangible es su gente, y lo que puedas aporatr a las empresas.
16. Cuales son las principales barreras a las que se enfrenta un director de un parque Científico?
1.- que la propia univ sea consiente del valor del SP y conseguir el apoyo 100 de Universitad
2.- rec humanos y económico para dinamizar el sistema
que la universidad tome el parque como algo suyo de otra manera es una barrera
3 barraeras
3.-es importante estar muy conectado a la universidad para que tenga sentido, no hacer 5 eventos malos sino 1 o 2 bueno
9. De que forma identifican las necesidades de las Empresas? Investigación, Financieras, Tecnológicas, de capital humano, Comerciales ..etc.
Reuniones cada 3 meses con el director del parque , cada una de las empresas, cuanto mas sepa de las empresas mas fácilmente identifico oportunidades

Figure B.7: Notas Entrevista 7 Espaa

Categoría: Público Objetivo

1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?	5 años
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de….. ?	〈 Planeación y desarrollo (first generation) 〈 Ahora esta en etapa de crecimiento 36 empresas
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	Proyectos de consultoria e investigación para micros y pequeñas
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	Micros yPymes en su mayoría porque no hay espacio para grandes
5. Cuáles son los criterios y/o procesos de selección de empresas	-Deben tener un proyecto de vinculación con la universidad para el proceso de selección -El espacio es limitado y por lo mismo no se puede instalar con maquinaria asi que en su mayoria son de servicios o electrónica (Tecnologías de información)

Categoría: Propuesta de Valor

6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ……?	-Ubicación -precio -instalación y servicios (parte física) - las empresas NO piensan en vincularse con la univ, , (piensan mas en los servicios)
7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?	4 – 5 años ciclo de vida
8. Cuales son los mecanismos de retención de las firmas?	No hacen algún mecanismo de retención de firmas Las empresas transfieren conocimeinto a la Universitad, algunas se acercan para organizar cursos de manera conjunta Actividades de networking, desayunos, conferencias,

Categoría: Colaboración con la Universidad

10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	Actividades de networking, desayunos, conferencias,
11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?grupo de educadoras?	En el contrato quue firman las empresas, tienen la obligación de tener colaboración con la univ

Categoría: Indicadores KPI´s

12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	Num de empleados (fuentes de emplo entre todas las empresas, se los pide el gobierno) Num de alumnos integrados a las empresas Num de intercambios de información (vinculación) con otros departamentos dentro dentro de la univ Num de servicios otorgados (info de cómo patentar., etc)
13. Como definirías un Parque Científico de éxito?	Investigación y consultoria Las empresas se sientan con la confianza de preguntar cosas y el constante flujo de información entre la univ y la empresa aun que no sea un proyecto de colaboración.
14. Que factores influyen para el éxito de un Parque Científico?	Factor de vinculación Cuanto se contribuye al desarrollo regional, no se tienen esos indicadores Indicadores de innovación de las empresas
15. Cuales son los principales retos a los que se enfrenta un director de un parque Científico?	Transformación , que no solo la bandera sea atracción de talento, sino vinculación con la universidad
16. Cuales son las principales barreras a las que se enfrenta un director de un parque Científico?	La cultura de las empresas (no encuentran el beneficio de vincularse con las empresas) El empresario en Jalisco no le apuesta a la innovación de verdad, no se arriesga.

Categoría: Otros

17. Algo mas que considere importante mencionar para esta investigación?	Vinculación con otros parques y entre empresas. El financiamiento es una falla en México, por eso no le apuestan a una vinculación con la universidad y el mismo ecosistema no propicia la innovación.

9. De que forma identifican las necesidades de las Empresas? Investigación, Financieras, Tecnológicas, de capital humano, Comerciales .,etc.	Persona esta en contacto directo con las empresas o las empresas se acercan a solicitar su necesidades.

Figure B.8: Notas Entrevista 1 Mexico

Categoría: Público Objetivo

1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?	2005 Director de Conacyt Miembro del consejo de la IASP Profesor Investigador univ Texas 2007 Inicia actividades el PIIT Monterrey Min. 14:41
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de….. ?	10- 11 años aprox.,Completamente desarrollado,Caso de éxio 70 hectareas desarroladas,35 lab públicos y privadosy 3050 empleos
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	(Se ampliara 40 hectareas más por, en NL existen más de 100 centros de investigación 600 millones de dólares en inversión en total
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	5. Todas: Start-ups, Pymes ,Grandes Empresas . **En el parque hay 3500 empresas, en su mayoría PYMES**
6. Cuáles son los criterios y/o procesos de selección de empresas	

Categoría: Propuesta de Valor

7. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ……?	Parque multitematico, diferentes diciplinas para trabajar en equipo y Tecnología 4.0 se invertirá 15 millones de dólares
8. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?	8:51
9. Cuales son los mecanismos de retención de las firmas?	
10. De que forma identifican las necesidades de las Empresas? Investigación, Financieras, Tecnológicas, de capital humano, Comerciales .,etc.	Veranos de ciencia y tecnología: estudiantes realizan estancias en las empresas , Programa para contrarar investigadores y les ayudan hasta 3 años Eventos de clusters para identificar necesidades y vincular univ-empresas

Categoría: Colaboración con la Universidad

11. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	Todos los proyectos de investigación están vinculados con la universidad (300 proyectos vinculados) Posgrados conjuntos entre empresas y universidades Visitas internacionales
12. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?	
16. Cuales son los principales retos a los que se enfrenta un director de un parque Científico?	En este parque es independiente de gobernanza, el parque es autónomo, se gestiona por un fideicomiso. Aunque lo dono el gob, el gob no lo maneja Es un reto porque se maneja diferente al modelo de los parques.
17. Cuales son las principales barreras a las que se enfrenta un director de un parque Científico?	Disponibilidad de talento humano(fortalecer las entidades educativas para contar on talento) Cultura de emprendimiento

Categoría: Indicadores KPI´s

13. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	Inversión acumulada en laboratorios Total científicos y tecnólogos del parque Calidad de empleos (salarios) Num de proyectos de vinculación univ-empresa Num de egresados de posgrados Num de start ups Num de acuerdos internacionales Num de estudiantes que se vinculan con la ciencia y tecnología Num de patentes y P.I en todas sus formas
14. Como definirías un Parque Científico de éxito?	Ecosistema de centros públicos y privados de diversas diciplinas tecnológicas basado en la ciencia tecnología e innovacion
15. Que factores influyen para el éxito de un Parque Científico?	Localización: ubicado en la zonas empresariales aspecto importante conectividad nacional e internacional Cercanía a las empresas: no a las universidades, lo s parques univ no funcionan Respaldo del gobierno: toda la inversión es del gobierno y la dono a los centros de investigación , no es un desarrollador inmobiliario. Centro que promueva la innovacion Por ley, el gob invierte el 1 % a innovación Apoyos del parque libre de costo para los emprendedores Un conjunto de políticas

Figure B.9: Notas Entrevista 2 Mexico

Categoría: Público Objetivo		Categoría: Propuesta de Valor		Categoría: Indicadores KPI´s	
		6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ……?	Tenemos un nucleo de invest muy consolidado 150 investigadores a un sector especializado , 100 laboratorios, prog de maestria y PHD.	12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono	
1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?	Empezó en 2008, la inauguarcion fue en 2013	7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?		13. Como definirías un Parque Científico de éxito?	La EN
	Gob del estado 5millones		Los estudiantes se van a trabajar a las empresas	El objeto del parqiue es ofrecer infraestructura, recursos , talento, para facilitar el proceso de transf para generr innovación.	
	Otros 25 millones (3 empresas fundadoras y centros de investigación		Cerca de la ciudad, servicios de transporte, salas de juntas, restaurantes, etc.	La innovación solo se da cuando tu incorporaste un nuevo proceso de transf a una empresa	1.-
	El centro se especializa en aquacultura		Servicio secretarial		2.-
		17. Algo mas que considere importante mencionar para esta investigación?	LOCALIZACION: el área esta posiionada COMO LA MEJOR en el mundo en aquacultura	Un SP exitoso, no es que renta mas espcios , no tiene ningún proceso de transf,	
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de….. ?	DESDE PLANEACIO y desarrollo estoy a cargo Y HASTA AHORA , QUE ESTA EN desarrollo y crecimeinto	Tratando de juntarte todo, si fuiste a la reunin de apte, te pudiste dar cuenta que no van en la cuarta transformación de la republica, vana más alla , todos los desaarroladores tech			No
		1.-En mexico seguimos haciendo plan de negocios y mandamos al emprendedor a buscar el dinero, eso hacemos en emxico y eso no sirve.	Depende para que estén a qui las empresas:	El éxito se da mejor caso, es cuando el trabajo de un investigador , mejora su viabilidad, economica respuesta a la sociedad , par mi es e es un parque exitoso.	
					Nu
	El objetivo principal CREAR UN PUENTE TECHNOLOGICO para la transferencia de conocimiento	2.- validar la tech; si llegan los venture cap y se quedan con tu negocio	Si fue para un desarrollo tech: 4 o 5 años	14. Que factores influyen para el éxito de un Parque Científico?	Nu
		2.- Yo pienso si tene,mos un plan de negocio , puede haber una combinación de riesgo temprano (gob, inadem, algún tomanode de riesgo, fondos de inv) para ser sustituidos por otro tomador de riesgo. Que ya tiene elementos de que esta idea funcione. Se debe determinar como van a ir entrando cada uno.		Me gusta potenciar la cultura dl éxito, el éxito no es malo. Queremos dar el ejemplo a los científicos de que se pude tener el éxito comercial	Nu
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	Corto plazo: tener todos los servicios, recursos y capacidades para alcanzar el desarrollo y consolidación de su negocio	Se necista una estragia para el funding, temprana, media tardia y redicir el riesgo y ser mas competitivo en el entorno global.	Si las empresas están aquí para escalar proyectos VALIDADCION TECH : 7 años	No hay una política de gob, que fomente la innovación , no llegamos al 1 % del bufged al Ciencia y tech, cuando menos y ningún gobierno lo ha hecho, no hemos comunicaos bien eso al gobierno. Y debería ser el 2% porque esta demostrado que eso se rrefleja en bienestar para la sociedad	Nu
	Mediano plazo (4 a 5 años): complementar la infraestructura para completar proyectos en el dessarrolo del parque que permita recibir nuevo proyectos desde faces tempranas hasta TRL 3 HASTA TRL9	Eel modelo de innovación debe incluir clatramente ese apoyofinanciero, para validar la tech y sino funciona la inv que hiciste es limitada y se	PRODUCCION COMERCIAL : 20 años, construir lab (son socios), las 3 empresas fundadoras firmaron para 20 años con prorroga para otros 20 años.		Nu
				Neceitamos certeza jurídica que me proteja eficientemente, de que me sirbve hablar patentes si me la van a poder robar	Nu
		8. Cuales son los mecanismos de retención de las firmas?			Nu
	Todas: Start-ups, Pymes ,Grandes Empresas .			Neceistamos certeza financiera, porque el dinero no es de mexico el dinero es mundial, certeza para repsetar mi inversión y tecnología	Nu
					Nu
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	PUBLICO OBJ. SECTOR AGROALIMENTARIO,		Entrevistas con ellos, un equipo evalua, el estado de arte de esa tech, y una evaluación en la industria , se discuten de las necesidades se reuqieren para llevarlos a	Necesitamos una cultura de innovación en el país, somo un país poco competitivo , generamos pocas patentes, aunque la patente no es lo importante, no protegemos la propiedad	Ind

Figure B.10: Notas Entrevista 3 Mexico

Categoría: Público Objetivo

1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?	
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de….. ?	
〈 Planeación y desarrollo (first generation)	
〈 Crecimiento(second generation)	Planeación y desarrollo (first generation
〈 Maduración (third generation) La tercera etapa es cuando la directiva y stakeholders reconocen que el Parque científico juega un papel importante en el desarrollo económico de la región.	
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	Corto plazo: rentablidad financiera del parque, que sea sustentable
	Mediano plazo : involucrar docentes con empresas y viceversa
	Lp: consolidad lineas d einvestigacion , especializarce
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	Pequeñas y medianas empresas, la vinculación con grandes no es tanto porque los proyectos no son grandes ellas ya tiene su propi i+d
	Hospedaje: strp ups para que estén corto plazo y después se gradúen

Categoría: Indicadores KPI´s

12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	Corto plazo :Nivel de ingresos por los proyectos, hospedaje e incubación de proyectos
	Todo esta en rentabilidad y sustentabilidad.
13. Como definirías un Parque Científico de éxito?	un SP de éxito tendria aque estar especializado
	Tendría que transferir conocimiento hacia la región , tech que ellos requieren y a la medida aunque no sea tehnologia de punta
	TRES FACTORES:ESPECIALIZADO, MUY VINVULADO Y SOSTENIBLE
14. Que factores influyen para el éxito de un Parque Científico?	LA REGION TIENE MUCHO QUE VER,
	La gobernanza y paoyo por parque del rector
	El equipo de trabajo de parque y el director, tienen que tener una capacidad emprendedora con cierto arrojo a los proyectos pero con cautela, los proyecto teh son de alto riesgo
15. Cuales son los principales retos a los que se enfrenta un director de un parque Científico?	Tener la sensibilidad de escuchar a la región en la que esta inmersa el parque, lod modelos a seguir ejem de silicon valeeyy , España o otra región , es un factor para que fracase, debe conocer la región y sus necesidades de la región y si la universidad tiene cacidad para cubir esas neceisdaes . es un reto entre desarrollar la technologia que requiere la región
	Disermir en si somos buenos y nuestras capacidades
16. Cuales son las principales barreras a las que se enfrenta un director de un parque Científico?	
	La cultura de la innovación de la región, los empresarios tienen la idea que la innovación sirve para bajar fondos pgar maquinas, pagar sueldos etc, entonces es errónea
	El tema DE FONDEO ES COMPLICADO EN MEXICO

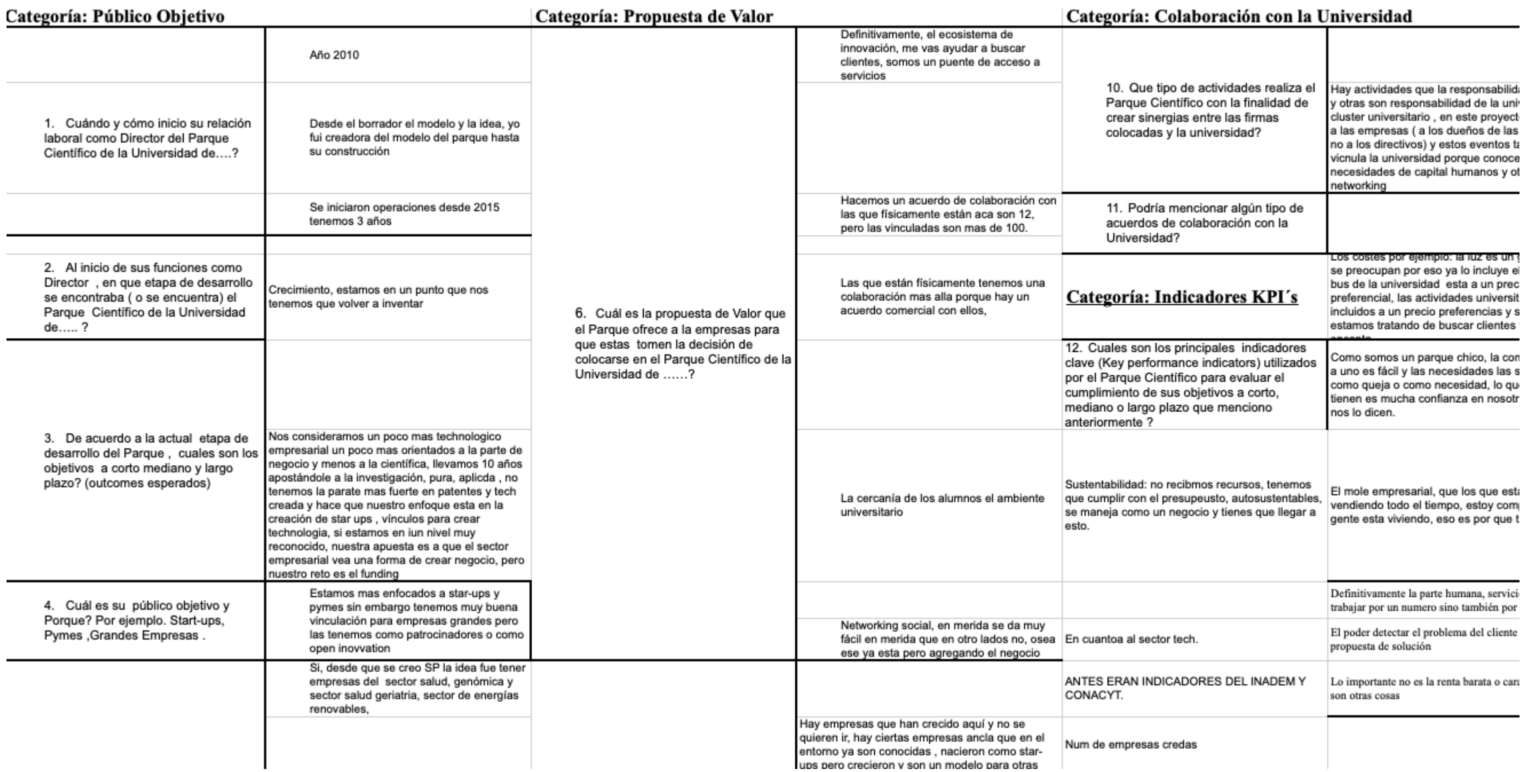
Categoría: Propuesta de Valor

6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ……?	Utilizaciór estaciona mayoría s valor que
7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?	Entre 12 y 15 mes
8. Cuales son los mecanismos de retención de las firmas?	No , han sido poc se gradúan aunqu ejem procesos de capacidad para al
9. De que forma identifican las necesidades de las Empresas? Investigación, Financieras, Tecnológicas, de capital humano, Comerciales .,etc.	Comúnmente pas es un menav¡misr

Categoría: Colaboración con la Universidad

10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	Ciclode conferenc cademicos , estud finalidad de hacer
11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?	No contamos con sumarse con las á

Figure B.11: Notas Entrevista 4 Mexico



Categoría: Público Objetivo		Categoría: Propuesta de Valor		Categoría: Colaboración con la Universidad	
	Año 2010		Definitivamente, el ecosistema de innovación, me vas ayudar a buscar clientes, somos un puente de acceso a servicios		
1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?	Desde el borrador el modelo y la idea, yo fui creadora del modelo del parque hasta su construcción			10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	Hay actividades que la responsabilid y otras son responsabilidad de la uni cluster universitario , en este proyect a las empresas (a los dueños de las no a los directivos) y estos eventos t vicnula la universidad porque conoce necesidades de capital humanos y o networking
	Se iniciaron operaciones desde 2015 tenemos 3 años		Hacemos un acuerdo de colaboración con las que físicamente están aca son 12, pero las vinculadas son mas de 100.	11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?	
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de….. ?	Crecimiento, estamos en un punto que nos tenemos que volver a inventar	6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ……?	Las que están físicamente tenemos una colaboración mas alla porque hay un acuerdo comercial con ellos,	**Categoría: Indicadores KPI´s**	Los costes por ejemplo: la luz es un se preocupan por eso ya lo incluye e bus de la universidad esta a un prec preferencial, las actividades universit incluidos a un precio preferencias y s estamos tratando de buscar clientes
				12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	Como somos un parque chico, la co a uno es fácil y las necesidades las s como queja o como necesidad, lo qu tienen es mucha confianza en nosotr nos lo dicen.
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	Nos consideramos un poco mas technologico empresarial un poco mas orientados a la parte de negocio y menos a la científica, llevamos 10 años apostándole a la investigación, pura, aplicda , no tenemos la parate mas fuerte en patentes y tech creada y hace que nuestro enfoque esta en la creación de star ups , vinculos para crear technologia, si estamos en iun nivel muy reconocido, nuestra apuesta es a que el sector empresarial vea una forma de crear negocio, pero nuestro reto es el funding		La cercanía de los alumnos el ambiente universitario	Sustentabilidad: no recibmos recursos, tenemos que cumplir con el presupeusto, autosustentables, se maneja como un negocio y tienes que llegar a esto.	El mole empresarial, que los que est vendiendo todo el tiempo, estoy com gente esta viviendo, eso es por que
					Definitivamente la parte humana, servic trabajar por un numero sino también por
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	Estamos mas enfocados a star-ups y pymes sin embargo tenemos muy buena vinculación para empresas grandes pero las tenemos como patrocinadores o como open inovvation		Networking social, en merida se da muy fácil en merida que en otro lados no, osea ese ya esta pero agregando el negocio	En cuantoa al sector tech.	El poder detectar el problema del cliente propuesta de solución
	Si, desde que se creo SP la idea fue tener empresas del sector salud, genómica y sector salud geriatria, sector de energías renovables,			ANTES ERAN INDICADORES DEL INADEM Y CONACYT.	Lo importante no es la renta barata o car son otras cosas
			Hay empresas que han crecido aquí y no se quieren ir, hay ciertas empresas ancla que en el entorno ya son conocidas , nacieron como star-ups pero crecieron y son un modelo para otras	Num de empresas credas	

Figure B.12: Notas Entrevista 5 Mexico

Categoría: Público Objetivo

1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?	oct-09 9 años
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de….. ?	〈 Planeación y desarrollo (first generation)
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)	Mayor numero de alumosnos vinculados con las mepresas, dentro del contrato las empresas deben cumplir con cierto numero de puntos , la empresa esta obligada por contrato a tener ese pack de actividades con alumnos y debe cumplir con la vinculación.
4. Cuál es su público objetivo y Porque? Por ejemplo. Start-ups, Pymes ,Grandes Empresas .	A los tres star up. Pymes y grandes Desde co-working incubación aceleración parque y deben participar en concunsos de emprendimiento
5. Cuáles son los criterios y/o procesos de selección de empresas	Landing, industrias creativas, Incubadora: empresas de alto impacto Mentores reconocidos para el programa de aceleración de empresas (el filtro es la facturación por ejemplo)

Categoría: Propuesta de Valor

6. Cuál es la propuesta de Valor que el Parque ofrece a la empresas para que estas tomen la decisión de colocarse en el Parque Científico de la Universidad de ……?	Ecosistema de innovacion que se genera en este edificio, se busca que el edificio sea mas empresarial y no universitario, y toda la transferencia de conocimiento que se genera de los dos lados univ-empresa-
7. Y en cuanto a las empresas ya colocadas, Cual es el ciclo de vida promedio de las empresas en el parque?	Cuando la empresa crece a veces por ciclo natural debe irse el ciclo es de 3 a 5 años
8. Cuales son los mecanismos de retención de las firmas?	Todos los convenios son anuales y se renueva dependiendo de la vinculación que se de con la universidad. Entre mas grande es la empresa, es mas complicada la vinculación porque ya tienen muy definidas sus necesidades y objetivos.
9. De que forma identifican las necesidades de las Empresas? Investigación, Financieras, Tecnológicas, de capital humano, Comerciales , etc	No hay un test para detectar necesidades, pero el área de proyectos detecta necesidades para iniciar proyects

Categoría: Colaboración con la Universidad

10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	Hackathon boot camps, master class, networking , cata de vino
11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?	

Categoría: Indicadores KPI´s

12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	Num de alumnos que participan en las actividades Cuantas actividades fueron organizadas por el parque Num de proyectos generados en el semestre Ingreso por las empresas de landing y el 20% se va a becas o inversiones , el edifico Num de ,aster class Num becarios Num de contratos de alumnos
13. Como definirías un Parque Científico de éxito?	Un parque que esta llneo de empresas y actividades de transferencia que se conocen es como un todo
14. Que factores influyen para el éxito de un Parque Científico?	Hay uno muy importante que es la parte de gob, invesion extranjera , cuando llega la delencion china el gob los trae al parque y gana los dos porque le da visiviliadad al tec y ala vez al gob por que hay inversion
15. Cuales son los principales retos a los que se enfrenta un director de un parque Científico?	Cada región tiene cambiso, entonces el poder visualizarte y ver hacia donde vamos y logar que el parque vaya evolucinando un paso mas
16. Cuales son las principales barreras a las que se enfrenta un director de un parque Científico?	el cambio de gobierno, afecta a que las empresas y ha habido una decremento de empresas extranjeras con el nuevo gobierno.

entrevistas | entrevista 2 | entrevista3 | entrevista4 | ent5 | ENT6 | ent7 | mexico1 | mexico2 | mexico3 | mexico4 | mexico5 | **mexico6** | mexico7 | +

Figure B.13: Notas Entrevista 6 Mexico

Categoría: Público Objetivo		Categoría: Indicadores KPI´s	
	Enero 2017., transisción. Y en agosto asumi el cargo (un año en el cargo)	12. Cuales son los principales indicadores clave (Key performance indicators) utilizados por el Parque Científico para evaluar el cumplimiento de sus objetivos a corto, mediano o largo plazo que menciono anteriormente ?	3 objetivos
1. Cuándo y cómo inicio su relación laboral como Director del Parque Científico de la Universidad de….?			
	Antes estaba a cargo de emprendimeinto de SP	**Categoría: Colaboración con la Universidad**	1posicionamiento.- net promure score, fuerza de la marca, interaccion con entidades globales, ranking globales
			2 nuevos alumos del tec, alumnos de otros campus, soporte a captación (num de actividades y alumnos i.
2. Al inicio de sus funciones como Director , en que etapa de desarrollo se encontraba (o se encuentra) el Parque Científico de la Universidad de….. ?	Tercera genración		3 tec 21.- la competencia espíritu emprendedeor, (mide competencias) del total cuantos alumons y en que programas están, graduados de la univ que son o han sido socios de un negios desde los 3 meses a 5 años.
3. De acuerdo a la actual etapa de desarrollo del Parque , cuales son los objetivos a corto mediano y largo plazo? (outcomes esperados)		10. Que tipo de actividades realiza el Parque Científico con la finalidad de crear sinergias entre las firmas colocadas y la universidad?	Casos de éxito, clientes , nuemro de empresas antendidas, funding , crecimiento de las mepresas, conversión entre un prog y el que sigue ejm de incubación a aceleración cuantos brincasn
	3 objectivos		
			Productos , % de empresas de technologias, patentes , TRL de las compañías para identificar las debibilades
	1.- ser una palanca de valor del ITESm y no separarse mucho de la vocación y los objetivos de la Universitat de Barcelona		Evangelización sobre desarrollo de tech-. Confencias , etc, cuantas personas tocamos en esas actividades
	1.-posicionamiento interno y externo		
	2.- captación de estudiantes porque tiene un parque tecnológico	11. Podría mencionar algún tipo de acuerdos de colaboración con la Universidad?	Emprendedores: resultados , carnet del emprendedor, gamificacion dan puntos por actividad que participe el estudiante
	3.- como el sp tiene influencia en la Universitad		
		Parque academica, empresarios están de invitados a dar una clase	Desarrollo de scositema: se mide el equipo, satidfaccion personal, key behaivor indocator, higj potenciasl y cuantos intership
	casos de éxito de empresas	El profesor visita la empresa	
	casos de éxitos de productos , patentes, invensiones., ect		Indicador de sempñeo del tec
	casos de éxito de capital humano: premios o logros a nivel indicifdual no por la tecnología sino por la persona	Prpyectos con investigadores	
	network dentro del parque es importante para	Start ups con empresas grandes, colaboración, es algo nuevo	Num de expertos, nacionales, globales
	indicadores macro., % del PIB aporta el parque		
	Transferencia de conocieminto		Proveedores
	Sotenibilidad, autosustentable, no le pide un solo peso a la univ. Es mas parte de ingresos se va a la univ aporta.		
4. Cuál es su público objetivo y Porque? Por ejemplo, Start-ups, Pymes, Grandes	El core es estudiantes y profesores	A veces se conocen por amistad alumnos y profes .y se vinculan para un proyecto	Acceso a capital, fondos públicos, grants,

Figure B.14: Notas Entrevista 7 Mexico

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