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Evaluating University-Business Collaboration at Science Parks: a Business Perspective

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Abstract

The evaluation of the companies' performance at University Science Parks (SPs) becomes essential in identifying the needs of the companies and the feasibility of the University-Business Collaboration (UBC). The companies' real needs are also of interest for universities and SPs, since they face the challenge of designing strategies that best help them to transfer knowledge more effectively. This research article focuses on Key Performance Indicators (KPIs) in UBC, needs and business objectives of companies co-located at SPs in Spain and Mexico. This article (i) aims to identify the KPIs in UBC used by co-located companies at SPs, and (ii) explore the KPIs in UBC and critical success factors of SPs. This article focuses on the perspective of companies, with a secondary focus on the perspectives of SPs and universities. For this study, data was collected through online company surveys in Spain and Mexico. Moreover, the

empirical analysis uses fourteen semi-structured interviews addressed to SPs directors to explore KPIs in UBC and success factors of SPs in both countries. In addition, two frameworks were developed with the main KPIs in UBC, taking into account university and company perspectives. They show the objectives, strategies and long-term KPIs as well as progress KPIs, and they are a useful guide to evaluate the accomplishments and the alignment of goals in UBC.

Keywords

Evaluation metrics – Key performance indicators – Open innovation – Science Parks – University business collaboration

Arabic

تقييم الشركات ذات الموقع المشترك في الحدائق العلمية الجامعية من خلال مؤشرات الأداء الرئيسية لتعاون بين الجامعة ومجال الأعمال

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الملخص

أصبح تقييم أداء الشركات في الحدائق العلمية الجامعية أمرا أساسيا في تحديد احتياجات الشركات وجدوى التعاون بين الجامعة ومجال الأعمال. كما أن الاحتياجات الحقيقية للشركات تهم الجامعات و الحدائق العلمية الجامعية لأن الجامعات تواجه تحدي وضع الاستراتيجيات التي تساعدها على نقل المعرفة بأكثر فعالية. تركز هذه الورقة البحثية على مؤشرات الأداء الرئيسية لتعاون بين الجامعة ومجال الأعمال ، والاحتياجات والأهداف التجارية لشركات ذات الموقع المشترك في الحدائق العلمية الجامعية بإسبانيا والمكسيك.تهدف هذه الورقة (1) إلى تحديد مؤشرات الأداء الرئيسية لتعاون بين الجامعة ومجال الأعمال التي تستخدمها الشركات ذات الموقع المشترك في الحدائق العلمية الجامعية، و(2) استكشاف مؤشرات الأداء الرئيسية لتعاون بين الجامعة ومجال الأعمال وعوامل النجاح المهمة للحدائق العلمية الجامعية. وتركز هذه الورقة بالأساس على رؤية الشركات، مع التركيز أيضا على وجهات نظر الحدائق العلمية الجامعية. تم جمع البيانات الخاصة بهذه الدراسة من خلال استبيانات وجهت إلى الشركات عبر الإنترنت في إسبانيا والمكسيك. بالإضافة إلى ذلك قمنا باستخدام التحليل التجريبي اعتمادا على مقابلات شبه منظمة.

الكلمات المفتاحية:التعاون بين الجامعة في مجال الأعمال؛ الابتكار المفتوح؛ مقاييس التقييم؛ مؤشرات الأداء الرئيسية؛ الحدائق العلمية الجامعية.

Chinese

通过在UBC中的KPI评估大学科技园中的并置公司

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摘要

对公司在大学科学园(SP)的绩效进行评估对于确定公司的需求和大学与企业合作(UBC)的可行性至关重要。公司的真正需求也是大学和科技园的利益所在，因为它们面临着设计最能帮助他们更有效传播知识的战略的挑战。本研究论文的重点是在UBC中的关键绩效指

(KPI)，同时地处西班牙和墨西哥的科技园的公司(并置公司[1])的需求和业务目

。本文旨在:(i)确定由并置公司使用的在UBC中的KPI；(ii)探索在UBC中的KPI和科技园的关键成功因素。本文首先侧重公司的观点，其次侧重于科技园和大学的观点。研究数据是西班牙和墨西哥通过对公司进行在线调查问卷收集的。此外，实证分析使用了半结构化的访谈。

关键词

大学-企业合作，开放式创新，评估指，关键绩效指，大学科学园

French

Évaluation d'entreprises co-implantées dans des parcs scientifiques universitaires par des indicateurs clés de performance dans la collaboration entre université et entreprise

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Résumé

L'évaluation de la performance des entreprises dans les parcs scientifiques universitaires devient essentielle pour identifier les besoins des entreprises et la faisabilité de la collaboration université-entreprise. Les besoins réels des entreprises présentent également un intérêt pour les universités et les parcs scientifiques, car ils doivent relever le défi de la mise en place de stratégies qui les aident à transférer plus efficacement le savoir. Cet article se concentre sur les indicateurs clés de performance de la collaboration entre université et entreprise, les besoins et les objectifs commerciaux des entreprises co-implantées dans des parcs scientifiques en Espagne et au Mexique. Il vise à (i) identifier les indicateurs clés de performance de la collaboration entre université et entreprise utilisés par les sociétés co-implantées dans les parcs scientifiques, et (ii) explorer les indicateurs clés de performance de la collaboration entre université et entreprise et les facteurs de succès critiques des parcs scientifiques. L'étude se concentre sur la perspective des entreprises, avec un accent secondaire sur les perspectives des parcs scientifiques et des universités. Pour cette étude, les données ont été collectées par le biais d'enquêtes en ligne auprès d'entreprises en Espagne et au Mexique. De plus, l'analyse empirique utilise des entretiens semi-structurés.

Mots-clés

collaboration entre université et entreprise – Innovation ouverte – Mesures d'évaluation – Indicateurs clés de performance – Parcs scientifiques universitaires

Portuguese

Avaliação de empresas localizadas em parques científicos da universidade por meio de KPIs na UBC

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Resumo

Avaliação do desempenho das empresas nos Parques Universitários de Ciências (SPs) torna-se essencial na identificação das necessidades das empresas e da viabilidade do Colaboração Universidade-Empresa (UBC). As reais necessidades das empresas também são de interesse para universidades e SPs, pois enfrentam o desafio de elaborar estratégias que melhor ajude-os a transferir conhecimento de forma mais eficaz. Este trabalho de pesquisa enfoca Key Indicadores de Desempenho (KPIs) na UBC, necessidades e objetivos de negócios de empresas colocadas em SPs na Espanha e no México. Este artigo (i) tem como objetivo identificar os KPIs na UBC utilizados por empresas localizadas em SPs, e (ii) explorar os KPIs na UBC e o sucesso crítico fatores dos SPs. Este artigo enfoca a perspectiva das empresas, com um secundário foco nas perspectivas de SPs e universidades. Para este estudo, foram coletados dados através de pesquisas on-line de empresas na Espanha e no México. Além disso, a análise empírica usa entrevistas semiestruturadas.

Palavras chave

colaboração empresarial empresarial – inovação aberta – Métricas de Avaliação – Indicadores Chave de Performance – Parques de ciências da universidade

Russian

Оценка совместно расположенных компаний в университетских научных парках через KPI в UBC

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Аннотация

Оценка деятельности компаний в университетских научных парках (СП) становится важным в определении потребностей компаний и осуществимости Университетско-деловое сотрудничество (UBC). Реальные потребности компаний также представляют интерес для университетов и СП, так как они сталкиваются с проблемой разработки стратегий, которые лучше всего помочь им более эффективно передавать знания. Эта исследовательская работа посвящена ключевым Показатели эффекти вности (KPI) в UBC, потребности и бизнес-цели компаний, расположенных вместе на ИП в Испании и Мексике. Этот документ (i) направлен на определение ключевых показателей эффективности в UBC, используемых совместно расположенными компаниями в SP, и (ii) исследовать KPI в UBC и критический успех факторы СП. Этот документ фокусируется на перспективах компаний, со вторичным сосредоточиться на перспективах СП и университетов. Для этого исследования были собраны данные через онлайн-опросы компаний в Испании и Мексике. Кроме того, эмпирический анализ использует полуструктурированные интервью.

Ключевые слова

университетское деловое сотрудничество – открытые инновации – Метрики оценки – Ключевые показатели эффективности – Университетские научные парки

Spanish

Evaluación de empresas de ubicación conjunta en parques científicos de la Universidad a través de KPI en UBC

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Resumen

La evaluación del desempeño de las empresas en University Science Parks (SP) se vuelve esencial para identificar las necesidades de las empresas y la viabilidad de Colaboración Universidad-Empresa (UBC). Las necesidades reales de las empresas también son de interés. para universidades y SP, ya que enfrentan el desafío de diseñar estrategias que mejor ayúdelos a transferir conocimiento de manera más efectiva. Este trabajo de investigación se centra en Key Indicadores de rendimiento (KPI) en UBC, necesidades y objetivos comerciales de empresas ubicadas en SP en España y México. Este documento (i) tiene como objetivo identificar los KPI en UBC utilizados por empresas ubicadas conjuntamente en SP y (ii) explorar los KPI en UBC y el éxito crítico factores de los SP. Este artículo se centra en la perspectiva de las empresas, con un enfoque secundario.centrarse en las perspectivas de los SP y las universidades. Para este estudio, se recopilaron datos a través de encuestas de empresas en línea en España y México. Por otra parte, el análisis empírico utiliza entrevistas semiestructuradas.

Palabras clave

Colaboración empresarial universitaria – innovación abierta – Métricas de evaluación – Indicadores clave de rendimiento – Parques Científicos Universitarios

1 Introduction

According to the theory of the knowledge-based economy, knowledge is one of the primary sources of the economic and social development of a country

(Harris 2001; Hitt et al. 2000). Universities and research centres, both public and private, are key actors in the generation and dissemination of knowledge (Etzkowitz et al. 2000; Porter and Van Opstal 2001). Additionally, as is widely known, universities were created to fulfil three primary missions: to teach; to do research and to contribute to the welfare and economic development of society. Through the research mission, universities generate cutting-edge discoveries, expanding the boundaries of the science; the third mission implies the dissemination and exploitation of this knowledge, contributing to social growth and economic development (Agrawal and Henderson 2002; D´Este and Patel 2007; Schartinger et al. 2002). Therefore, the establishment of University-Business Collaborations (UBC) is central in the process to facilitate this knowledge flow from academia to industry (Cohen and Levinthal ,1989).

Aiming at narrowing the gap between science and industry, many universities have designed specific programs and created supporting mechanism to assist in this endeavour. Technology Transfer Offices (TTOs) and University Science Parks (SPs) are two examples. They act as knowledge brokers and bring together academics, businesses and venture capitalists. They seek to facilitate the transfer of knowledge from academia to industry while fostering an entrepreneurial culture of innovation (Caldera and Debande 2010).

The Science and Technology Parks (STPs) play a key role in the knowledge and technology transfer process because they have the function of contributing to regional economic development, promoting a culture of innovation. To achieve this objective, The International Association of Science Parks and Areas of Innovation states that:

> Science and Technology Park stimulates the flow of knowledge and technology between universities, research institutions, companies and markets and facilitates the creation and growth of companies based on innovation through incubation and spin-off processes, and provides other value-added services together with high quality space and facilities. (IASP-Definitions, 2020)

The above definition not only emphasizes the importance of STPs as a key factor in the innovation system but also underlines their role as an intermediary in University-Industry-Government relations, Triple Helix Model (Etzkowitz and Leydesdorff 1998).

Among the diversity of STPs, it is possible to identify two types: (i) University Science Parks (SPs), which involve university shareholding and (ii) Technology Parks (TPs), which are not owned by universities (Albahari et al. 2017). Regarding the types of Science and Technology Parks, this study will take into account only University Science Parks due to their close relationship with

universities, and the fact that they are the bridge between the university and companies in the process of Knowledge and Technology Transfer (KTT). University Science Parks and related mechanisms have been created all over the world as a way to, among several objectives, facilitate and strengthen the interaction between universities and industries since SPs are the main agents of the scientific and technological development in their communities. This study focuses on the perspective of companies co-located at SPs, with a secondary focus on the perspectives of SPs and universities. The establishment of companies at SPs depends on several factors, i.e. needs, business objectives, university support among others which may influence their relationship. This article aims to identify these factors in terms of University-Business Collaboration indicators (KPIs in UBC) Olvera, (2019). Furthermore, both SPs and universities, as sources of innovation and creation of new companies, require a comprehensive set of University-Business Collaboration indicators that help them to understand the companies needs and evaluate their performance, in order to development strategies to foster the knowledge and technology transfer (Al-Ashaab et al. 2011; Albats et al. 2018).

Additionally, with a secondary focus this article aims to identify those University-Business Collaboration indicators (KPIs in UBC) that are more significant to SPs. This analysis with both perspectives is useful for universities and the SPs directors since the UBC indicators can be aligned with those of the co-located companies and thus to achieve common objectives.

It is important to note that to the extent that knowledge and technology are transferred to companies, they improve their production processes, services or business models and therefore increase their competitiveness. Companies with greater strengths in the field of innovation will be better prepared to extend their presence both regionally and in international markets. They will also be able to face and adapt to an environment of global competition.

The rest of the article is organized as follows. Section 2 is devoted to studying the theoretical background in this field. Section 3 provides a description of the methodology used in this work. Section 4 presents the KPIs in UBC and innovation indicators used by companies co-located at Science Parks according to the online survey results. Additionally, a qualitative analysis of semi-structured interviews is provided. The article ends with some concluding remarks alongside a discussion of future research.

2 Theoretical Background

Given the importance of Science and Technology Parks (STPs) in the innovation process, several authors have been interested in investigating these

organizations from different perspectives. The most representative studies are focused on companies' innovation performance on-Park and off- Park, and very little research has taken into account the Parks heterogeneity, which may affect the companies' performance, (Albahari et al. 2017). This study takes into account the heterogeneous nature of Science Parks as it is focused only on University Science Parks in Spain and Mexico.

The decision was made to focus this research on Spain and Mexico because the creation and development of STPs has been one of the most important innovation policies in Spain (Vásquez-Urriago et al. 2014) and, since the creation of the first University Science Park in 1997 established at the University of Barcelona, these types of parks have spread throughout Spain. Likewise, in Mexico STPs are experiencing rapid growth especially from private universities which are seeking to connect the business sector of the region with academia and to integrate innovation projects with co-located companies on campus.

Regarding studies in Spain about companies' innovation performance, (Vazquez-Urriago et al. 2014) prove the increase in the probability of being an innovator in companies co-located in Spanish STPs and show a positive effect on innovation outcomes, especially in small companies. Moreover (Díez-Vial and Montoro-Sánchez 2016) present a case study of Madrid Science Park which demonstrates that innovative capacity increases when the companies have a long-term relationship with the university. They go on to show that when companies focus on internal knowledge networks with other co-located companies, there is an increase in innovative outputs. Furthermore, (Albahari et al. 2018) find that companies co-located at new and consolidated STPs have a positive impact on innovation outcomes, and that the size and management of STPs are positively related to 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, most of them funded by The National Council of Science and Technology of México, (CONACyT).[1] These centres carry out the knowledge and technology transfer process with universities and companies; however, there are only around twenty-four STPs in Mexico, of which we can mention the most prominent such as Parque de Investigación e Innovación Tecnológica de Monterrey (PIIT), Parque de Innovación Tecnológica BioHelis and Centro del Software in the state of Jalisco (Rodriguez and Guevara 2014; Villegas et al. 2010). These Mexican STPs are significant because they are the largest ones in México and they were created by University-Industry-Government support, the Triple Helix Model (Etzkowitz and Leydesdorff 1998).

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

Concerning similar studies in other countries, Table 1 shows the performance effects of co-located companies at STPs, versus outside of STPs.

It is important to note that this study differs from the previous ones due to its focus on the Key Performance Indicators in University-Business Collaboration (KPIs in UBC) and the needs and business objectives of co-located companies at University Science Parks. All of this is considered from the CEOs perspective of the co-located companies. Additionally, to complement to this research, semi-structure interviews have been conducted to explore the point of view of University Science Parks directors regarding KPIs in UBC and SPs Success Factors. Furthermore, to the best of our knowledge, this is the first study on University Science Parks in Spain and Mexico that uses UBC indicators.

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

> Co-location allows for the efficient use of industry and university personnel and resources in a shared space where collaborative research is carried out based on an agreed long-term strategic vision (Science2Society project 2020).

Co-locating a company at a University Science Park brings benefits to the company since it 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

There is an extensive literature about the critical role that SPs play in the knowledge and technology transfer process between universities and companies; however, several empirical studies have found limited interaction

TABLE 1 The most representative studies on STPs focus on companies' innovation performance in on-Park and off-Park locations

Authors	Country	On Park	Off Park	Results: Companies on Park*
Squicciarini (2009)	Finland	252	–	The more companies on park, + patent activity for tenants and +"knowledge spillover"
Vazquez-Urriago et al. (2014)	Spain	653	–	+ Impact on innovation outputs, especially small companies
Díez-Vial and Montoro-Sánchez (2016)	Spain	76	–	+ Innovative capacity when the companies have a long-term relationship with university
Albahari et al. (2018)	Spain	849	–	+ Impact on new and consolidated STPs, and size of STP and +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.

**companies on Park= co-located companies at SPs and/or TPs*

between co-located companies of SPs and universities, and weak interaction also suggests weak spillover effects and there-fore low R&D agglomeration (Fukuwaga 2006; Colombo and Delmastro 2002); therefore, it is essential that SPs and universities know about the needs and objectives of co-located companies

in SPs in order to develop new strategies, tools and communication channels to strengthen UBC and, in this manner to contribute to economic growth and social welfare through the transfer of knowledge to society.

The knowledge and technology transfer between the university and industry occurs through a variety of UBC activities (D´Este and Patel 2007). The following are among the most representative UBC activities: the hiring of university graduates, mobility of academics/students, university–company joint research, consulting, research contracts, patents and publications, licenses, spin-off companies, and laboratories and other physical facilities financed by industry. It also includes informal contacts such as meetings and conferences. Through the activities above, companies can collaborate with universities on a wide range of possibilities.

It is important to highlight that the 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 (Conti and Gaule 2011). Science and industry operate differently. Their daily activities are closely tied to a specific organisational culture, mission and corporate practices (Siegel et al. 2003b). Accordingly, goals might reflect three opposite directions. First, companies cannot evaluate the quality of the invention *a priori*, and researchers may have difficulty assessing the commercial profitability of their inventions (Macho et al. 2007). Second, poor communication channels and limited interest from 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 and their products more attractive, and this consequently enables them to become more profitable (Iqbal et al., 2011; Rohrbeck and Arnold 2006). Third, timespan 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 et al. 2008; Bruneel et al. 2010; Dunowski et al. 2010).

Because of the importance of the economic and social impact that University–Business Collaboration (UBC) has in the development of a country, and the key role that University Science Parks play in the knowledge and technology transfer (KTT) process and their implications in the increase of

global competition, employment and productivity, the present study aims to investigate companies co-located at University Science Parks, (SPs) and to identify:

1) The companies' criteria to select a SP,
2) The companies' business objectives to select 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.

The evaluation metrics, KPIs in UBC, used by companies co-located at SPs to evaluate the company performance on campus were classified within the three primary missions of the universities: Education, Research and Valorisation.

Also, from the Directors of University Science Parks (SPs) perspective, the study aims to explore:

1) The KPIs in UBC of University Science Parks and
2) Critical success factors of University Science Parks.

For these objectives, the design of KPIs in UBC used in this study are based on the principal UBC activities found in the literature (Barnes et al. 2002; Davey et al., 2018; Iqbal et al. 2011; Langford et al. 2006; Perkmann et al. 2011; Seppo and Lilles 2012; Tijssen et al. 2009).

The KPIs in UBC used in this article are embedded within the three missions of the universities, and their importance is derived from this. Moreover, 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 companies (Bercovitz and Feldmann 2006). Therefore, 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 companies 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 to identify what matters to them, in terms of university-business collaborations: business objectives (i.e. hiring talent, technology development (R&D long-term), consulting, research contracts (R&D short-term), acquisition of university licenses and patents, and investment in start-ups (corporate venturing) and needs (i.e. advice on the development of business or marketing plans, a suitable legal environment for the transfer of knowledge and technology, use of University-Park infrastructure and services, technology assessment, venture capital).

Moreover, to complement, this research will take into account the University Science Parks' perspective, exploring their KPIs in UBC and critical success factors through semi-structured interviews with science parks directors. This analysis with both perspectives is valuable for universities and the SPs directors since the UBC indicators can be aligned with those of the co-located companies and thus to achieve common objectives.

This analysis is a diagnostic tool, and it is designed to be useful for both science parks and universities in the process of developing new strategies, tools and activities that help to transfer knowledge and technology more effectively.

Finally, the findings are shown at country level, taking into account both the main characteristics and the significant differences between co-located companies.

3 Research Methodology

This study uses both a qualitative and a quantitative research approach.

3.1 *Qualitative Analysis*

With respect to qualitative research, it has been conducted through fourteen semi-structured interviews with the directors of University Science Parks in Spain and in Mexico; seven directors from each country were interviewed. The interviews in Spain were conducted during The APTE General Assembly held by June 13–14, 2018, while in Mexico they took place between October 2018 and January 2019. The interview questionnaire was designed to cover two main categories: (1) the main KPIs in UBC of the SPs and (2) critical success factors of SPs. The information was coded into these two groups using *Atlas.ti* software tool, see Appendix B. 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 2007). The study used content analysis to study the data (Bardin 1991), The qualitative research analysis was used to interpret the data (Walsham 2006). The interviews were designed based on the International Association of Science Parks (IASP) Strategigram Questionnaire (Sanz 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.

In addition to designing and validating the interview questionnaire, literature review of the most representative studies on UBC was carried out and, two

university-company frameworks were developed with the main KPIs in UBC, taking into account university and company perspectives.

The first step in developing the framework of Company Key Performance Indicators was to identify three general objectives that are common for co-located companies at SP: (i) Enterprise Growth, (ii) Innovation and (iii) External Branding. The strategies as well as long-term and progress KPIs in UBC were based on these objectives. The same process was used to develop The Framework of University Key Performance Indicators, and in this case the objectives used were in accordance with the three core missions of the university: to teach; to do research and to contribute to economic growth and social development through the transfer of this knowledge to society. These primary missions were embodied as follows: (i) Talent Development (ii) Applicability of Research Results in the Market and (iii) Contribution to Ecosystem Innovation through Open Innovation and the Triple Helix Model.

These university-company frameworks show the objectives, strategies and long-term KPIs as well as progress KPIs, and they are a useful guide to evaluate the accomplishments and alignment of goals in UBC, the examples are highlighting in both frameworks. (see Figure 1 and Figure 2).

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 Politècnica de Catalunya, Spain, for eight years. This collaborative work is a result of the Science2Society project,[2] which has received funding from the European Union's Horizon 2020 research and innovation program under the grant agreement N° 693651.

3.2 *Quantitative Analysis*

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 UBC 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; Galán-Muros and Plewa 2016). The online SurveyMonkey platform was used to send the survey to CEOs of co-located companies and collect data. A total of nine SPs took part in this research, five from Spain and four from Mexico, (see Table 2).

According to The Association of Science and Technology Parks of Spain (APTE) there are 64 STPs throughout Spain, and 23 of these Parks are University Science Parks. On the other hand, in México STPs are in stage of development

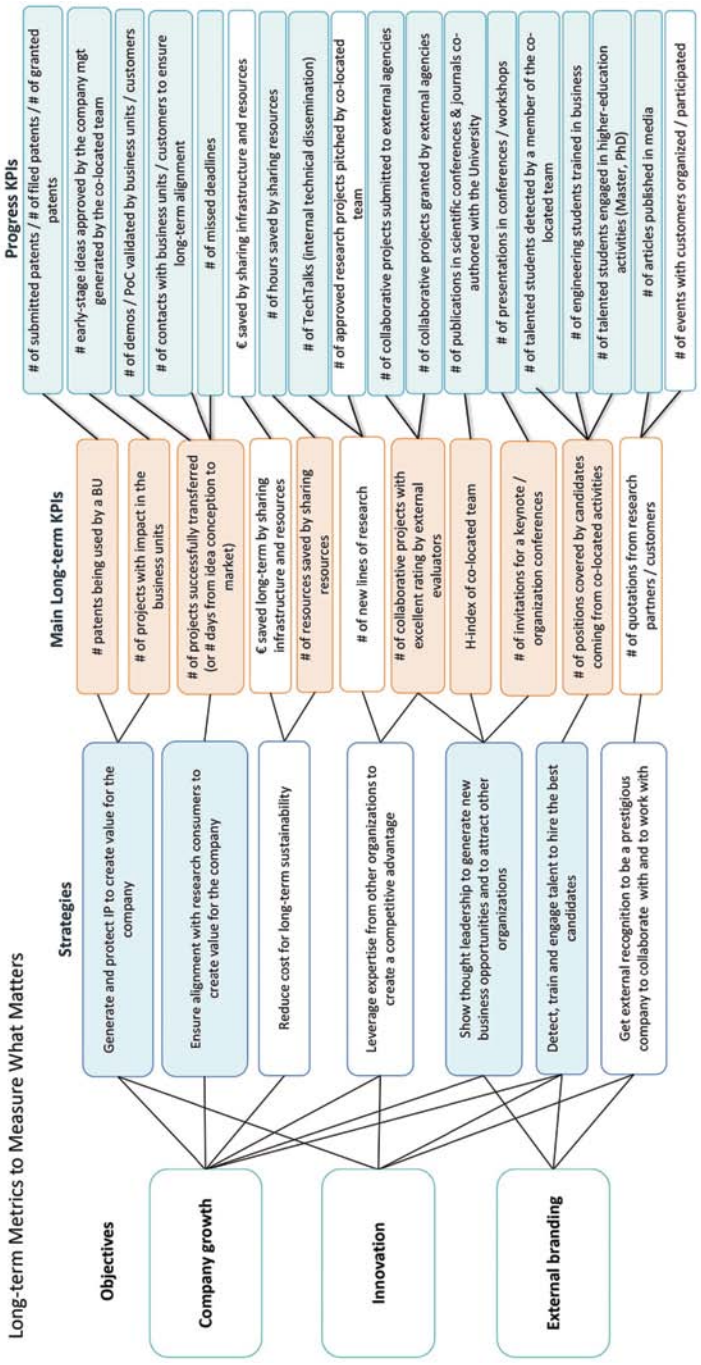

FIGURE 1 Framework of company key performance indicators in university–business collaboration
SOURCE: ELABORATED BY THE AUTHORS AND CA TECHNOLOGIES STAFF

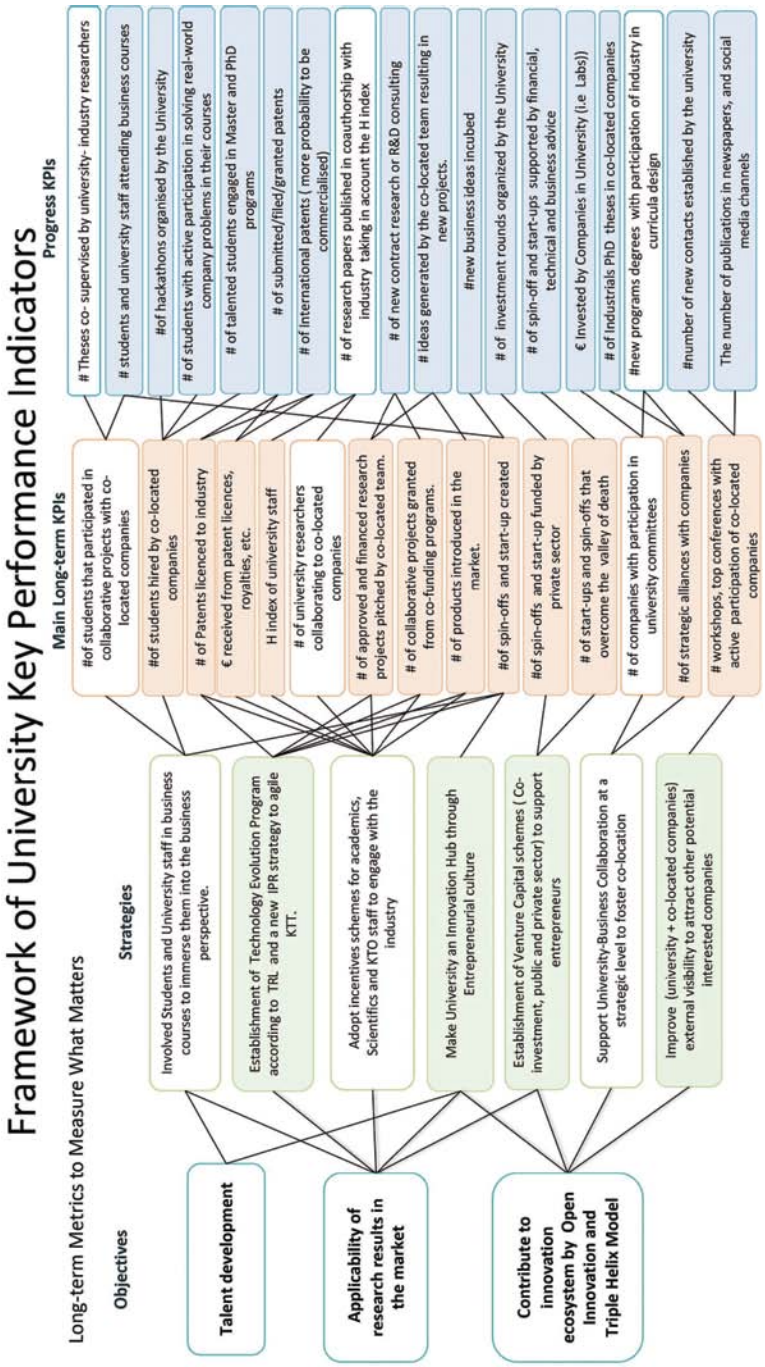

FIGURE 2 Framework of university key performance indicators in university–business collaboration

SOURCE: ELABORATED BY THE AUTHORS AND CA TECHNOLOGIES STAFF

TABLE 2 University Science Parks included in the study

University Science Park	Country	Shareholder´s Type*	Num. of Tenants	Num. of companies in the study
Parque Científico de la Universidad Miguel Hernández de Elche	Spain	U	70	12
Parque Científico y Tecnológico de la Universidad de Girona	Spain	U,G,F,P	150	8
Parque Científico Universidad Carlos III de Madrid	Spain	U,G,F,P	91	10
La Salle Technova Barcelona	Spain	U	15	9
Parc UPC-Universitat Politècnica de Catalunya-campus Nord – campus Terrasa	Spain	U	22	19
Parque Tecnológico ITESO	Mexico	U	34	10
Parque Científico y Tecnológico Iberoinnovación-Universidad Iberoamericana León	Mexico	U	8	8
Parque Tecnológico del Tecnológico de Monterrey-campus Querétaro	Mexico	U	26	15
tecniA Parque Tecnológico y de Innovación, Universidad Anáhuac Mayab	Mexico	U	14	9

**U: university; G: governmental entities F: private financial sector; P: private non-financial sector*

and still there is not information available about the number of University Science Parks in Mexico; therefore, the two-stage cluster sampling method was applied for both countries. From an original dataset of 430 companies, we obtained 138 responses. The response rate is thus 32.09%; from this sample, 38 questionnaires with incomplete responses were removed and we obtained

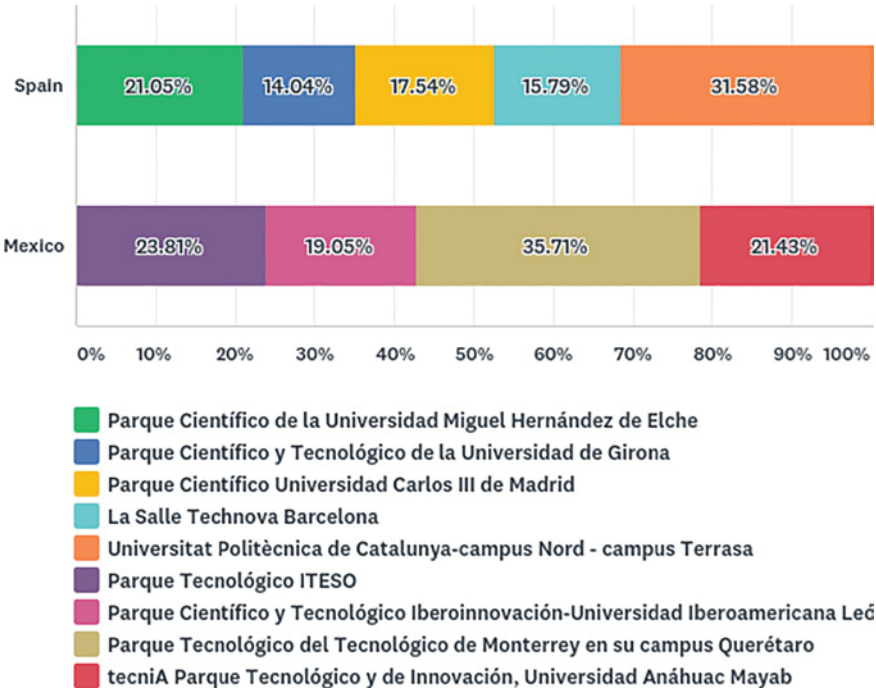

FIGURE 3 Data collected at university science parks

100 valid responses. In addition, the data were weighted to the full sample of 430 companies, 80.1% of the total sample from Spain and 19.1% from Mexico. Figure 3, shows the data collected at University Science Parks.

A comparative approach was used between Spain and Mexico. The dataset was taken from fifty-eight online surveys in Spain and forty-two online surveys in Mexico. First of all, the companies were asked about their criteria for choosing the university science park (i.e. a university with an entrepreneurial culture, location, previous joint projects.) (Frølund et al. 2018). Secondly, they were questioned about their business objectives related to co-locating the company at SP (i.e. short and long-term R&D, research contracts, hiring talent) (Frølund et al. 2018). Thirdly, they were asked about the KPIs in UBC and the innovation indicators that they used to evaluate the company's performance on campus. To measure the level of importance of KPIs, companies 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 forms part of EU science and technology statistics and is undertaken every two years by EU member states. Finally, the

companies were asked about the support received by the university in terms of funding, business, legal and technological issues.

Concerning the Statistical Method, the Categorical Principal Components Analysis (CATPCA) technique was applied for data analysis, using *IBM's SPSS* statistical software. The CATPCA technique serves for data reduction by finding homogeneous groups of categorical variables and highlighting their correlation (Abdi and Williams 2010; Greenacre 2008). The article 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 analyses 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 using Cronbach´s alpha, with all results showing an internal consistency threshold above .80. Moreover, to evaluate the statistical significance differences between Spain and Mexico, we performed two tests: the Chi-squared test, since all variables are categorical, and the Mann-Whitney U test, because we used an ordinal scale. The results are described in Appendix A.

According to the statistical data analysis and evaluation, the characteristics of companies in both countries showed significant similarities in relation to industrial sectors, the type of company, size and market. As mentioned previously, 100 companies have participated in our survey study and the data were weighted to the full sample of 430 companies. 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%. With respect to the type of company, 50% are start-ups, 43.62% consolidated companies and 6.38% spin-offs. The distribution by size of company 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, the two samples are comparable (See Figures 4 to 7).

4 Discussion of the Results

The data were weighted to the full sample of 430 companies, and the application of the Categorical Principal Components Analysis (CATPCA) was carried

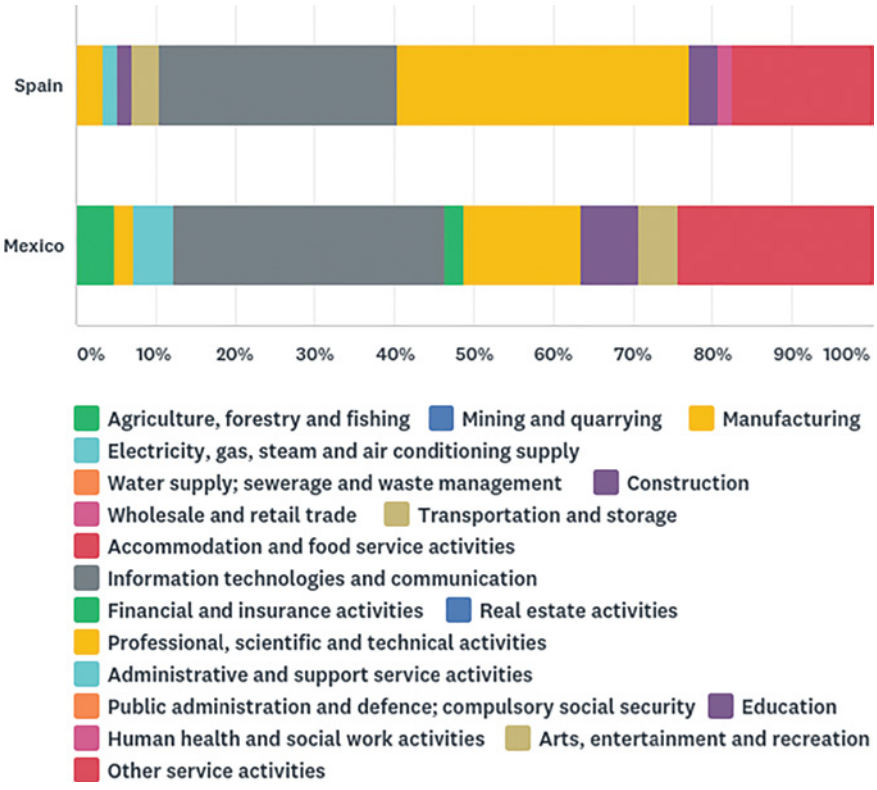

FIGURE 4 The most representative industrial sectors by country

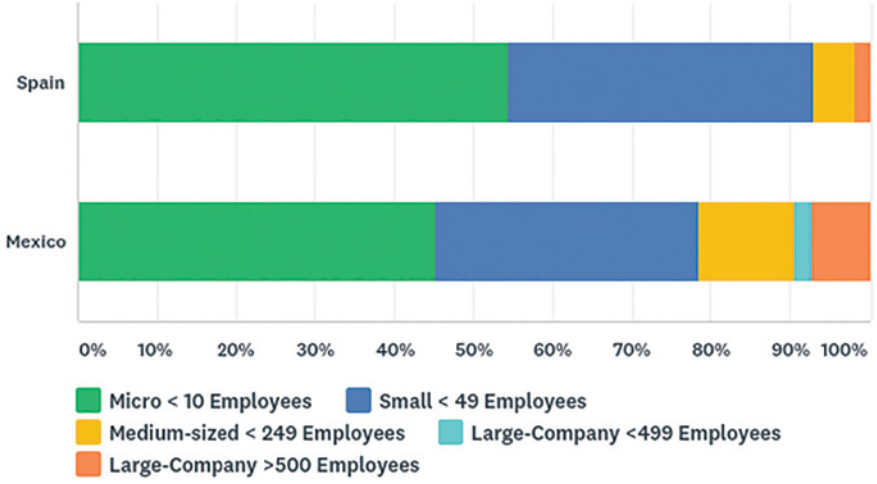

FIGURE 5 Companies' size by country

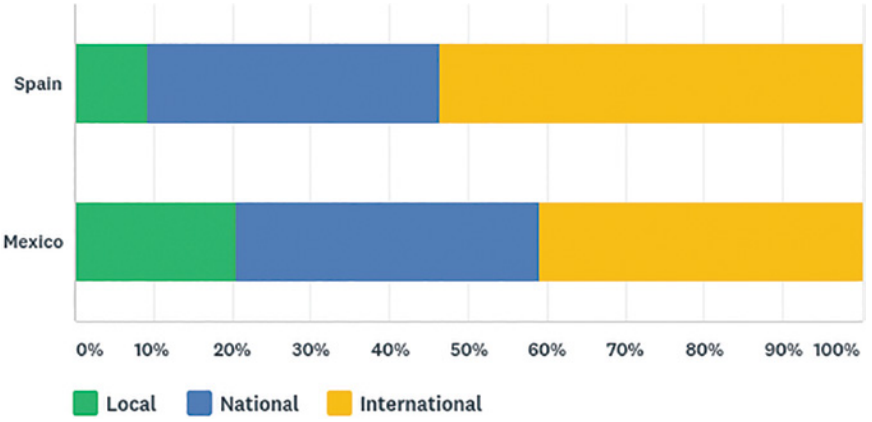

FIGURE 6 Companies' market by country

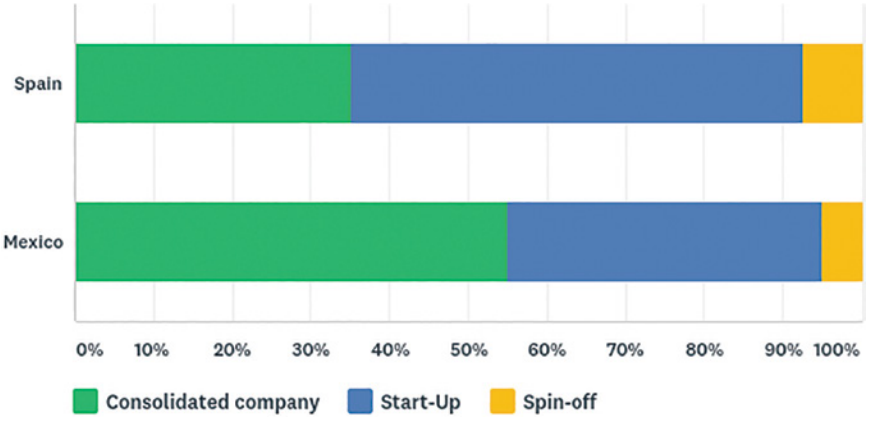

FIGURE 7 Type of company by country

out following this survey structure: (1) Company's criteria for choosing a SP, (2) Company's 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, a total of 38 variables were analysed and presented graphically in two dimensions. Due to the similarities in the responses of the two samples, the decision was made to highlight in graphs only the supplementary variable (Spain and Mexico) and analyse those variables with more weight for both countries (see Appendix A).

Regarding the criteria used by companies to select a University Science Park (SP), our results indicate that for both countries, the innovation ecosystem

offered by the university is the most important criterion; however, in this category, there is a significant difference in the importance that Mexican companies give to university excellence (top ranked). This could be due to the fact that the Mexican universities included in this study are private universities and are among the best in the country. Spanish companies held the opposite view since university excellence was the least important criterion.

In relation to the companies' business objectives when selecting an SP, as expected, the main objectives for both countries is hiring talent, as well as collaborating with the university in the short (i.e. consultancy services, research contracts) and long-term (R&D: technology development) (Al-Ashaab et al. 2011; Díez-Vial and Montoro-Sánchez 2016). 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, although this indicator is one of the most studied in the literature and the most valued by the universities and SP. (Albahari et al. 2018; Colombo and Delmastro 2002; Siegel et al. 2003a; Squicciarini 2008).

Regarding Education KPIs in UBC, besides hiring talent, two activities stand out for both countries: First, the number of new courses developed by the university-company. This indicator shows the educated workforce of co-located companies at SP (Colombo and Delmastro, 2002); and, Second, this category shows the number of positions filled by candidates coming from activities such as *hackathons* and internships. These findings reflect the willingness of companies to collaborate with universities, which could be used to reinforce these types of activities.

In terms of Research KPIs in UBC, we found agreement in the companies' responses about their business objectives, since the companies in both countries are interested in collaborating with the universities in the short and long term, (Albats et al. (2018).

Concerning Valorisation KPIs in UBC, our analysis again reflects the slight importance that Mexican and Spanish companies give to indicators such as patents (presented/granted), university patents and licenses as well as to articles published in co-authorship with the academy. Furthermore, this category reveals the interest of Mexican companies in integrating start-ups into their business units (Molina et al. 2011).

Regarding Innovation Indicators, the results indicate that all innovation indicators are considered essential in both countries, as the graph shows (see Figure 13) although the most significant indicator is cost-reduction due to innovations (products, processes, or services).

Finally, concerning university counselling, our findings show that technology assessment and funding are basic needs. At the same line, Spanish

companies are also asking for a proper legal environment with respect to IP as well as advice on business and marketing plans. Respecting the latter needs, Mexican companies showed that they often receive support in these areas.

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

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 the occupation of spaces. Regarding KPIs in UBC from Spanish Science Parks, 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 the university stand out. The other metrics, outside of UBC, are focused mainly on visibility and monitoring the economic growth of co-located companies.

From the perspective of Mexican Science Parks, the KPIs in UBC are focused on the students. The Science Parks keep track of students' entrepreneur activities; in fact, some Mexican SPs like Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM) use an *entrepreneurship card* to monitor UBC activities. Along these lines, Mexican Science Park directors highlight activities such as the number of conferences, seminars, meetings, workshops, and networking activities with students, academics and co-located companies. They also track the number of students who are hired by companies, the number of start-ups and spin-offs created and the number of collaborative projects with the university.

Concerning SPs' success factors, the Spanish Science Parks' directors interviewed consider that innovation policies, the location, the innovation ecosystem and the strong support of governmental entities and associations around Europe have been crucial factors in the development of SPs in Spain. Mexican Science Park directors also consider location to be an essential factor; however, they expressed the need for more governmental support of R&D and innovation policies (i.e. investment in R&D is less than 1% of GDP)[3] as well as innovation culture, leadership with perspectives from both the academic world and business, and a proper legal environment regarding IP. According to the findings of the interviews, these factors were considered essential for the development of Mexican SPs.

5 Conclusions

There is a diversity of indicators that measure the collaboration between university and company; however, the firm's decision to establish a partnership with the university will depend mainly on two of them; short or 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 most relevant. Moreover, universities, science parks, and companies differ by their missions, goals, research areas, industry etc. and for this reason to count with a very broad set of UBC indicators facilitate to choose which metrics fit best with their common goals (Rossi and Rosli, 2015). It is important to note that in this study, the most representative industrial sectors were IT, scientific activities and other services.

Likewise, the innovation ecosystem offered by the university is another essential criterion that is considered before co-locating a company at Science Park, along with hiring talent and corporate venturing.

Alternatively, the acquisition of university licenses and patents is the least relevant business objective for both Spanish and Mexican companies, although this indicator is one of the most studied in the literature and the most valued by the universities and SPs. Our findings also show a lack of assistance provided by universities regarding business advice, technology assessment and funding.

Finally, this study shows the willingness of co-located companies to develop courses with academia.

The findings of this research fill an important gap in the literature because they take into account the points of view of both the co-located companies at university science parks and the university science parks themselves. This is essential in order to know and align the objectives of the primary stakeholders in the process of knowledge and technology transfer. Along with, this study helps to understand how companies measure their collaboration with the university and the science park and what is really important for them.

In summary, the findings showed similarities in the responses of co-located companies from both countries. This study should be expanded to include larger samples to confirm the scalability of results.

These findings, combined with current developments in the field, open up several exciting avenues for future research. A line that, needs future work is related to institutional differences. For example, pure technical universities. Also, cultural differences (Hofstede, 2011) 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. This model has been used in several organisational and marketing studies to the understanding of other cultures, identifying each group's cultural patterns, and behavioural discrepancies. Therefore, it can be applied also to R&D multicultural collaborations between European and Latin American Countries. Moreover, another complete line of research could be how the KPIs in UBC

relate to management literature e.g. to transaction cost theory, resource-based theory, management control theory, governance theory, etc. Therefore, in future research, it would be appropriate to integrate these factors.

The limitations of this study are found on the university side since it was only taken into account partially; therefore, there is a need to design a second survey aimed at universities, using the KPIs in UBC designed in this study and apply it to university committees or at strategic levels of universities and compare the results with the analysis of the co-located companies KPIs in UBC presented in this study.

In summary, this research adds to the literature on UBC by utilizing KPIs in UBC; therefore, it is a scalable and straightforward diagnostic tool and useful for universities and university science parks.

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End notes

1. http://www.promexico.gob.mx.
2. http://science2society.eu.
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A Appendix A

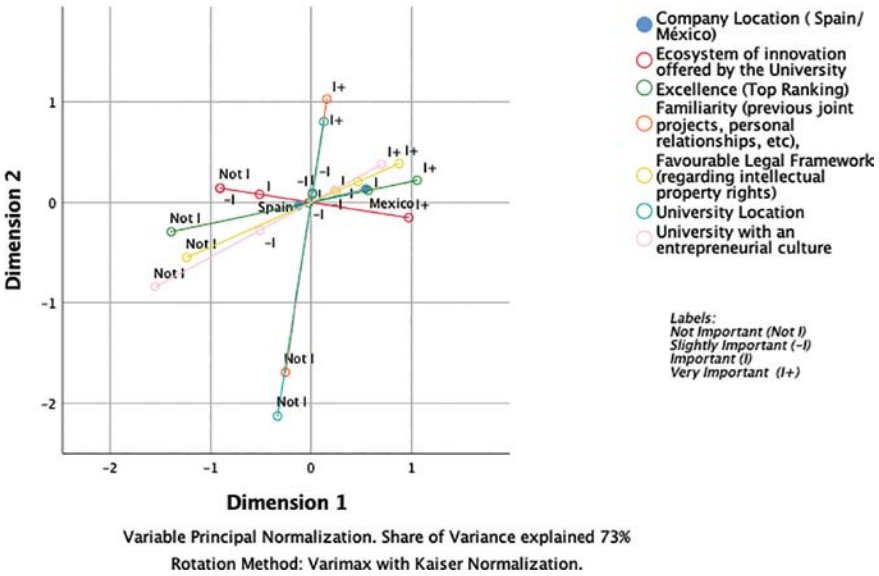


FIGURE 8 Companies' criteria for selecting a university science park

TABLE 3 Companies' criteria for selecting a university science park

Companies' criteria for selecting a university science park (Cronbach´s alpha 0.92)	Rotated Component Loadings 1	2	Chi-Squared Test X^2 0.05,3 = 7.815 / U Mann-Whitney Value	df	p < 0.05
Excellence (Top Ranking)	0.88	0.18	61.30	3.00	0.00
Ecosystem of innovation offered by the University	0.828	–0.13	21.48	3.00	0.00
Favourable Legal Framework (regarding intellectual property rights)	0.79	0.35	50.48	3.00	0.00
University with an entrepreneurial culture	0.73	0.40	10.02	3.00	0.02
Company Location (Spain/ México)*	0.26	0.07			
University Location	0.14	0.88	3.46	3.00	0.33/0.35
Familiarity (previous joint projects, personal relationships, etc.),	0.13	0.81	36.95	3.00	0.00

* Supplementary variable

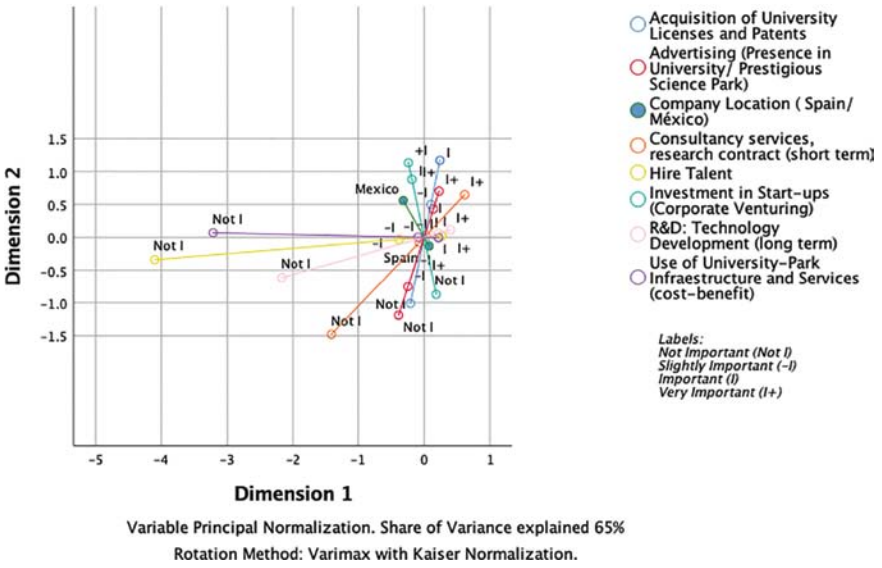


FIGURE 9 Companies' business objectives for selecting a university science park

TABLE 4 Companies' business objectives for selecting a university science park

Companies' business objectives for selecting a university science park (Cronbach´s alpha 0.90)	Rotated Component Loadings 1	2	Chi-Squared Test X^2 0.05,3 = 7.815 / U Mann-Whitney Value	df	p < 0.05
Hire Talent	0.84	0.07	18.69	3	0.00
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	0.00
Investment in Start-ups (Corporate Venturing)	–0.16	0.77	55.76	3	0.00
Advertising (Presence in University/ Prestigious Science Park)	0.228	0.70	10.03	3	0.02/0.29
Consultancy services, research contract (short term)	0.57	0.60	10.36	3	0.02
Company Location (Spain/ México)*	–0.15	0.27			

* Supplementary variable

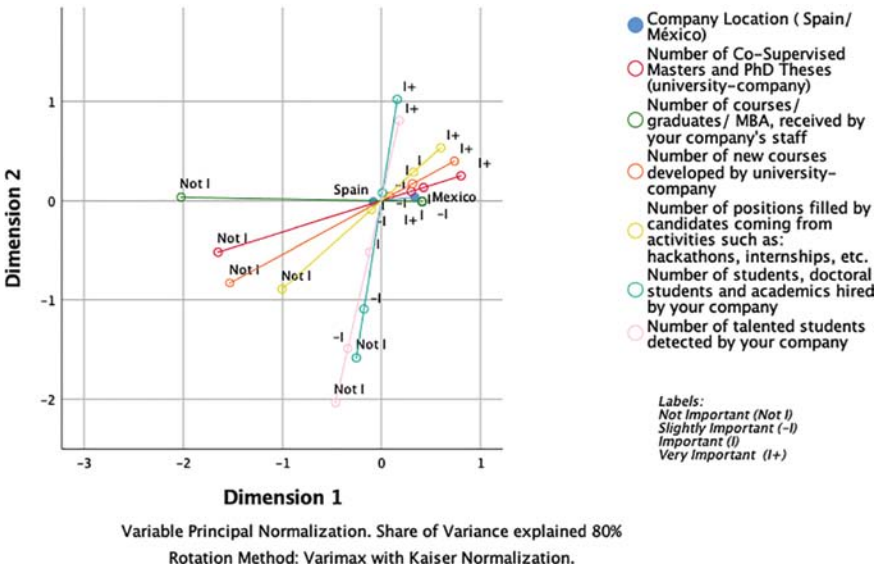


FIGURE 10 Education KPIs in university-business collaboration

TABLE 5 Education KPIs in university-business collaboration

Education KPIs in university-business collaboration (Cronbach's alpha 0.93)	**Rotated Component Loadings** 1	2	**Chi-Squared Test X^2 0.05,3 =7.815 / U Mann-Whitney** 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
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	0.00
Number of positions filled by candidates coming from activities such as: *hackathon*, internships, etc.	0.65	0.57	19.06	3	0.00
Company Location (Spain/ México)*	0.17	0.02			
Number of students, PhD students and academics hired by your company	0.14	0.91	42.27	3	0.0/0.17
Number of talented students detected by your company	0.20	0.90	3.85	3	0.28/0.08

* Supplementary variable

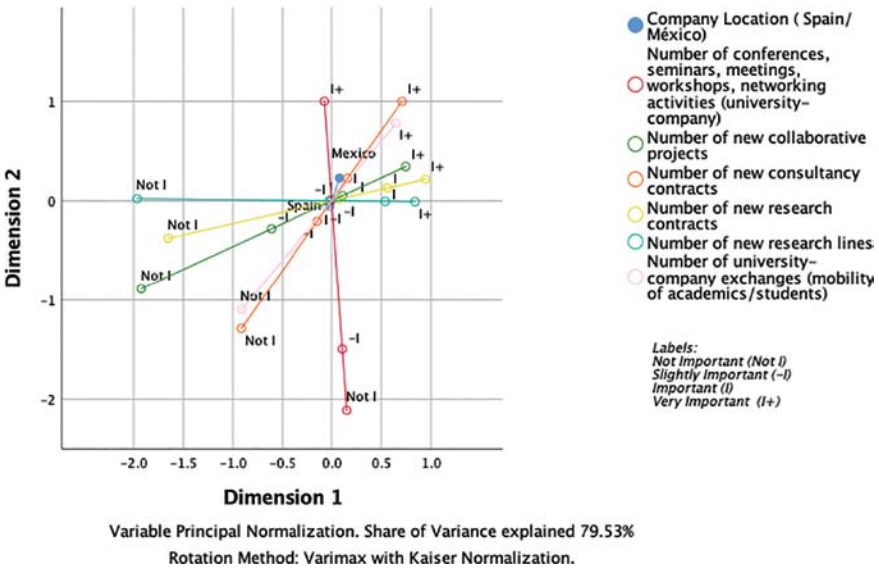
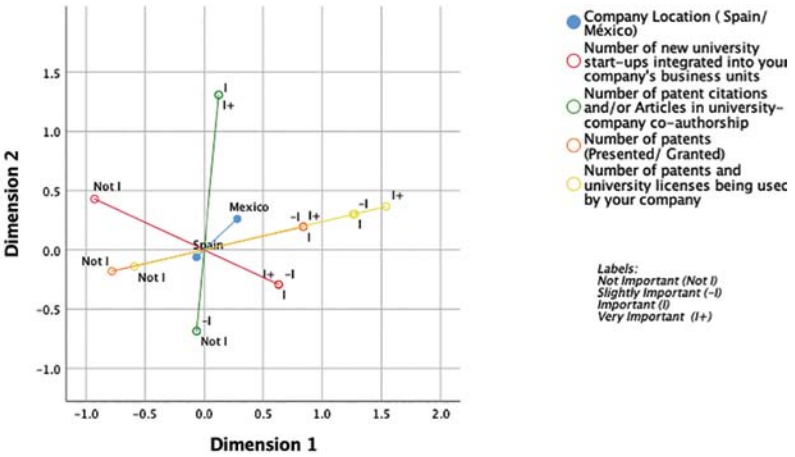


FIGURE 11 Research KPIs in university-business collaboration

TABLE 6 Research KPIs in university-business collaboration

Research KPIs in university-business collaboration (Cronbach´s alpha 0.94)	Rotated Component Loadings 1	2	Chi-Squared Test X^2 0.05,3 =7.815 / U Mann-Whitney 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	6.00	3	0.11/0.36
Number of new collaborative projects	0.80	0.37	16.96	3	0.00
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	0.50	0.70	23.43	3	0.00
Number of university-company exchanges (mobility of academics/students)	0.50	0.60	4.23	3	0.24/0.33
Company Location (Spain/ México)*	0.04	0.11			

* Supplementary variable



Variable Principal Normalization. Share of Variance explained 78.19%. Rotation Method: Varimax with Kaiser Normalization.

FIGURE 12 Valorisation KPIs in university-business collaboration

TABLE 7 Valorisation KPIs in university-business collaboration

Valorisation KPIs in university-business collaboration	**Rotated Component Loadings**		**Chi-Squared Test X^2 0.05,3 =7.815 / U Mann-Whitney**		
(Cronbach´s 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	0.00
Number of patents (Presented/ Granted)	0.81	0.19	85.19	3	0.00
Number of new university start-ups integrated into your company's business units	0.77	−0.35	18.90	3	0.00
Company Location (Spain/ México)*	0.14	0.13			
Number of patent citations and/or Articles in university-company co-authorship	0.09	0.95	15.57	3	0.00

* Supplementary variable

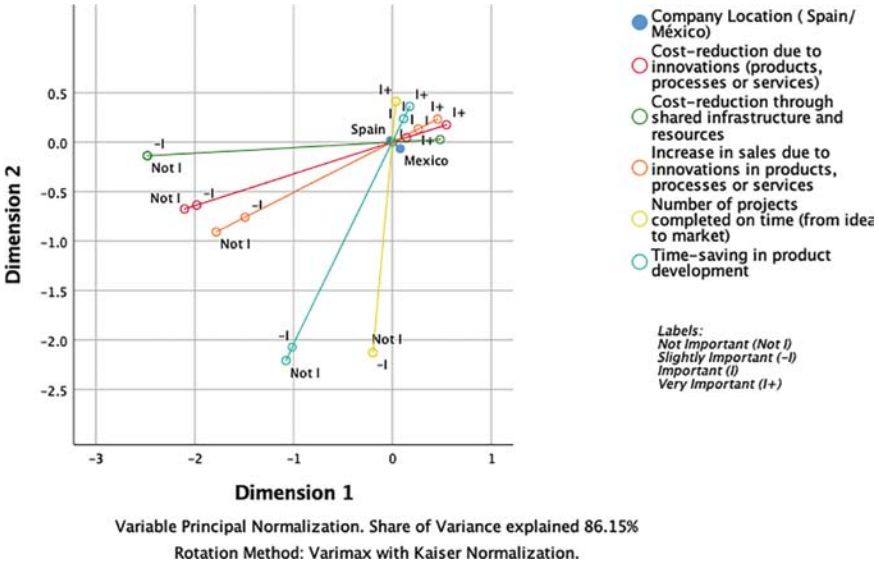


FIGURE 13 Innovation Key Performance Indicators

TABLE 8 Innovation Key Performance Indicators

Innovation Key Performance Indicators	**Rotated Component Loadings**		**Chi-Squared Test X^2 0.05,3 =7.815 / U Mann-Whitney**		
(Cronbach´s 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)	0.90	0.29	10.80	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/ México)*	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	0.40	0.82	7.44	3	0.06/0.03

* Supplementary variable

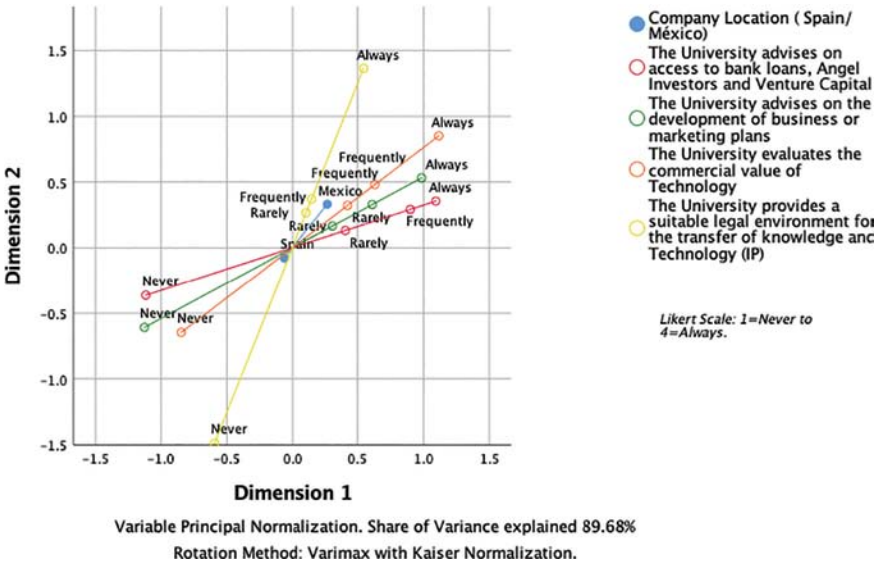


FIGURE 14 University support to companies co-located at university science parks

TABLE 9 University support to companies co-located at university science parks

University support to companies co-located at university science parks (Cronbach´s alpha 0.96)	Rotated Component Loadings 1	2	Chi-Squared Test X^2 0.05,3 =7.815 / U Mann-Whitney 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	0.00
The University evaluates the commercial value of Technology	0.72	0.55	24.37	3	0.00
The University provides a suitable legal environment for the transfer of knowledge and Technology (IP)	0.37	0.92	18.72	3	0.00
Company Location (Spain/ México)*	0.13	0.16			

* Supplementary variable

TABLE 10 The survey structure of university-business collaboration indicators

	University-Business Collaboration Indicators (Please mark the importance of each indicator on a 4-point Likert scale, 1=Not important to 4=Very important).
	Companies' criteria for selecting a university science park
1	Excellence (Top Ranking)
2	Ecosystem of innovation offered by the University
3	Favourable Legal Framework (regarding intellectual property rights)
4	University with an entrepreneurial culture
5	University Location
6	Familiarity (previous joint projects, personal relationships, etc.)
	Companies' business objectives for selecting a university science park
7	Hire Talent
8	Use of University-Park Infrastructure and Services (cost-benefit)
9	R&D: Technology Development (long term)
10	Acquisition of University Licenses and Patents
11	Investment in Start-ups (Corporate Venturing)
12	Advertising (Presence in University/ Prestigious Science Park)
13	Consultancy services, research contract (short term)
	Education KPIs in university-business collaboration
14	Number of courses/ graduates/ MBA, received by your company's staff
15	Number of Co-Supervised Masters and PhD Theses (university-company)
16	Number of new courses developed by university-company
17	Number of positions filled by candidates coming from activities such as: hackathon, internships, etc.
18	Number of students, PhD students and academics hired by your company
19	Number of talented students detected by your company
	Research KPIs in university-business collaboration
20	Number of new research lines
21	Number of new research contracts
22	Number of new collaborative projects
23	Number of conferences, seminars, meetings, workshops, networking activities (university-company)
24	Number of new consultancy contracts
25	Number of university-company exchanges (mobility of academics/students)
	Valorisation KPIs in university-business collaboration
26	Number of patents and university licenses being used by your company
27	Number of patents (Presented/ Granted)

TABLE 10 The survey structure of university-business collaboration indicators (*cont.*)

	University-Business Collaboration Indicators (Please mark the importance of each indicator on a 4-point Likert scale, 1=Not important to 4=Very important).
28	Number of new university start-ups integrated into your company's business units
29	Number of patent citations and/or Articles in university-company co-authorship
	Innovation Key Performance Indicators
30	Cost-reduction through shared infrastructure and resources
31	Cost-reduction due to innovations (products, processes or services)
32	Increase in sales due to innovations in products, processes or services
33	Number of projects completed on time (from idea to market)
34	Time-saving in product development
	University support to companies co-located at university science parks (Please mark each indicator on a 4-point Likert scale (1=Never to 4=Always).
35	The University advises on access to Bank loans, angel investors and venture capital
36	The University advises on the development of business or marketing plans
37	The University evaluates the commercial value of technology
38	The University provides a suitable legal environment for the transfer of knowledge and technology (IP)

B Appendix B Interview Guide

B.1 *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…?

– Planning and development (first generation)
– Growth (second generation)
– Maturation (third generation) The third stage is when the board and stakeholders recognize that the Science Park plays an important role in the economic development of the region.

B.2 *Target Audience*

1. According to the current stage of development of the University 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?

B.3 *Value Proposal*

1. What is the University Science Park´s value proposal?
2. Regarding the co-located companies, what is the average life cycle of companies in the University Science Park?
3. How do you identify the needs of the companies?

B.4 *University Collaboration*

1. What kind of activities does the University 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?

B.5 *Key Performance Indicators*

1. What are the main Key performance indicators used by the University 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?

B.6 *Other*

We ask science parks director's for additional information and comments for this research.