

The university-business collaboration and its impact on research, technological development and innovation

Rafael Núñez, Universidad UNAPEC, Dominican Republic, rnunez@unapec.edu.do

Abstract

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This study evaluates the impact of collaboration between universities and companies in the generation of research, technological development and innovation. The method to be used is a mixed approach. Surveys will be applied to researchers and R&D&I managers from Dominican universities. Also, experts on the subject, both researchers and businessmen, will be interviewed to collect their experiences in research projects. The time limit will be the research projects initiated and completed during the period 2019 to 2021. The main expected results of the study are to provide information on effective strategies and best practices to foster positive relationships between academia and the company; in ways that significantly drive innovation within companies, leading to the development of new products, services, or processes.

Keywords: University-business collaborations, research, technological development, innovation, university- industry collaborations

Introduction

The University-Business collaboration holds significance for various stakeholders, from policymakers and businesses to educational institutions, aiming to understand and harness the potential benefits of such collaborations in different areas, such as innovation, where academia and business interact, fostering a climate of creativity and technological progress. Furthermore, understanding the impact of this relationship could be fundamental for regions or nations seeking to stimulate economic development and entrepreneurship. Also, policymakers will be able to use the findings to shape policies that encourage and support these collaborations, potentially leading to a knowledge-based economy. For companies, the study could provide guidance on how to leverage university partnerships for R&D plus Innovation, which could lead to competitive advantage.

In recent years, the scientific community has focused its interest on the University-Business Collaboration, given its relevance and validity for the development of business sciences (Bruneel et al., 2010; Chang, 2010; García, 2013). However, the literature shows a gap on whether university-company cooperation improves innovative performance and effectively induces companies to develop innovation activities. Zelaya (2010) states that today's university is obliged to become an active pillar of the new innovation projects that occur in the business environment to seek solutions, design models and strategies applicable to reality.

Objectives

The main objective of this research project is "Evaluate the impact of collaboration between universities and companies in the generation of research, technological development and innovation", and the specific objectives are: 1) Examine the different channels of university- business linkage, in which university researchers interact with the company, 2)

Analyze the factors that influence the participation of university researchers in R&D&I business processes; and 3) Analyze the factors that influence the company to link with university researchers in its R&D&I processes. These specific objectives will measure the productivity and efficiency of companies as a result of collaboration with universities.

Justification

The importance of university knowledge for the business innovation process has been widely studied. There seems to be a certain consensus on the positive impact of academic research on the development of industrial innovation (Salter and Martin, 2001). Several researchers have worked on the issue, highlighting its relevance. The collaborative research for the transfer of knowledge between the university and the business sector is increasingly perceived as a means to improve innovation through this exchange of knowledge (Ankrah & Omar, 2015; Perkmann et al. 2013). University-business cooperation improves innovative performance because the knowledge generated at the university contributes to the innovation process of companies (Álvarez, 2013; Arias, et al., 2012), cooperation that, in developed countries (Aristei et al. 2016; Brunela et al., 2010; Chang et al., 2010) demonstrates that the university, as a source of information, has a positive effect on innovative performance, increasing business figures (Molina, et al, 2011). In addition to the above, García (2013) found that companies that use the University as a source of information obtain high innovative performance.

Literature Review

State of the Art

Bekkers and Freitas (2008), state that there is a wide variety of channels through which knowledge and technology are transferred between universities and industry. In their study they explain the relative importance of these different channels in different contexts. To this end, the responses to two questionnaires addressed to Dutch industrial and university researchers, respectively, were analyzed. Their results suggest that the perceived importance of the 23 different transfer channels they chose hardly differs between industry and university. Instead, this variety of channels could be better explained by the disciplinary origin, the characteristics of the underlying knowledge, the characteristics of the researchers involved in the production and use of this cutting-edge knowledge (individual characteristics) and the environment in which it occurs. produces and uses knowledge (institutional characteristics).

D'Este and Patel (2007), examined the different channels through which academic researchers interact with industry and the factors that influence researchers' participation in a variety of interactions. The study was based on a large-scale survey of academic researchers in the United Kingdom. The results show that university researchers interact and participate more frequently in channels such as consulting and contract research, joint research or training, compared to patent or spin-out activities. Explaining the variety and frequency of interactions, they found that the individual characteristics of researchers have a stronger impact than the characteristics of their departments or universities. They argue that by paying greater attention to the wide range of knowledge transfer mechanisms (in addition to patents and spin-outs), initiatives could help develop the necessary skills of researchers to integrate the worlds of research and application. scientific.

Ankrah and Omar (2015), ensure that collaboration between universities and industry

is increasingly perceived as a means to improve innovation through knowledge exchange. To address this gap, they employed a systematic procedure to review the literature from universities and industry collaboration (UIC). The review resulted in the identification of five key aspects, which underpin the UIC theory.

Perkmann et al. (2021), provide a systematic review of the literature on academic engagement from 2011 onwards. Academic engagement refers to the knowledge-related interactions of academic scientists with external organizations. It includes activities such as collaborative research with industry, contract research, consulting and informal links. The results suggest that individual characteristics associated with academic engagement include being scientifically productive, locally trained, and commercially experienced. Academic engagement is also socially conditioned by peer effects and disciplinary characteristics. In terms of consequences, academic engagement is positively associated with academics' subsequent scientific productivity. New areas of research are proposed where the evidence remains inconclusive, including individual life cycle effects, the role of organizational contexts and incentives, cross-country comparisons, and the impact of academic engagement on the quality of subsequent research. as well as in education, commercial and social impact.

Bruneel et al. (2010), point out that the literature on university-industry links has begun to uncover the reasons and types of collaboration between universities and companies. They claim that relatively little explanation is offered of ways to reduce barriers in these collaborations. Drawing on a large-scale survey and public records, this paper explores the effects of collaboration experience, breadth of interaction, and trust between organizations on reducing different types of barriers. The analysis shows that previous collaborative research experience reduces the barriers related to orientation and that higher levels of trust reduce both types of barriers studied. It also indicates that the breadth of interaction decreases orientation-related barriers but increases transaction-related ones.

D'este and Perkmann (2011), The debate over the entrepreneurial university has raised questions about what motivates academic scientists to engage with industry. This study provides evidence based on survey data for a large sample of UK researchers in the physical and engineering sciences. The results suggest that most academics interact with industry to promote their research rather than commercialize their knowledge. However, there are differences in terms of participation channels. Spin-off and patent creation are motivated exclusively by commercialization, while joint research, contract research, and consulting are strongly influenced by research-related motives. We conclude that policy should refrain from focusing too much on monetary incentives for industry participation and consider a broader range of incentives to promote interaction between academia and industry.

Perkmann and Walsh (2007), studied the diffusion and characteristics of collaborative relationships between universities and industry, and develops a research agenda informed by an "open innovation" perspective. A framework is proposed that distinguishes university-industry relations from other mechanisms such as technology transfer or human mobility. Building on the existing body of research, the role of practices such as collaborative research, university-industry research centres, contract research and academic consulting is analysed. The evidence suggests that such university-industry relationships are widely practiced, so differences exist between industries and scientific disciplines. While most existing research focuses on the effects of university-industry linkages on specific innovation variables, such as patents or firms' innovative capacity, the organizational dynamics of these relationships remain poorly understood. investigated. A detailed research agenda addresses research needs in two main areas: search and matching processes between universities and companies, and the organization and management of

collaborative relationships.

Perkmann et al. (2011), indicate that companies are increasingly involved in formal alliances with universities but there is a lack of tools to evaluate the results of such collaborations. We propose a performance measurement system for university-industry alliances. We derive a success map from existing research on university-industry relationships, indicating the causal relationships that underpin successful alliances. The success map distinguishes between different stages of the process, including inputs, in-process activities, products and impacts. We discuss specific measures for each of these stages and how they should be implemented. The resulting framework includes both prospective and retrospective measures and subjective and objective measures. It provides research and development managers with a tool for evaluating university-industry partnerships that is prospective, reliable and multidimensional.

Perkmann and Walsh (2009), analyzed the impact of university-industry relations on public research. The study used the inductive method of university-industry collaboration. In engineering it is suggested that basic projects are more likely to produce valuable academic knowledge than applied projects. However, applied projects show greater degrees of partner interdependence and therefore allow for exploratory learning by academics, leading to new ideas and projects. This result holds especially for research-oriented academics who work.

Maietta (2015), examined the drivers of R&D collaboration between university and business while evaluating the determinants of innovation in a low-tech industry. This includes analyzing the company's R&D collaborations with partners other than universities. They analyzed a unique data set in which company data was obtained from the Capitalia survey, covering the years 1995-2006, and university data was collected from various sources. The results reiterate that R&D collaboration between the university and the company affects process innovation. Evidence of a more novel kind suggests that product innovation is positively affected by geographic proximity to a university but is negatively affected by the amount of its codified knowledge production. Degree programs in fields useful to local companies encourage R&D collaborations. Academic policies that aim to commercialize research results have a negative impact on both product and process innovations of local companies.

Rybníček and Königsgruber (2019), state that industry-university collaborations have received increased attention in management and research practice. The need for innovation in today's business environment and the ambition of politicians to commercialize academic knowledge intensify this trend. However, although research has devoted considerable effort to finding the determinants of success for interfirm collaboration, much less is known about IUCs. They carried out an extensive analysis of published research on collaboration projects between industry and university with the objective of identifying the factors that influence the success of this type of collaborations, to propose a novel conceptual model that synthesizes our empirical results, and to use to organize and categorize the influential factors and their interrelation within the collaboration process.

Bozeman et al. (2013), developed a framework for their study. They analyzed the attributes of the collaborators, the collaborative process, and the characteristics of the organization, how they affect the collaboration options and the results. They concluded with some suggestions for possible improvements in research on collaboration including: (1) more attention to multiple levels of analysis and the interactions between them; (2) more careful measurement of impacts compared to outputs; (3) more studies on 'bad practice' in collaboration, including exploitation; (4) greater attention to the motives of collaborators and the social psychology of collaborative teams.

Bellucci and Pennacchio (2016), state that companies have intensified the exploration of external sources of knowledge to enhance their innovation capabilities. An empirical analysis of the factors affecting the importance of academic knowledge for the innovative activities of companies was carried out. An integrated approach is adopted that simultaneously considers country- and company-level factors. Regarding the first factors, the analysis shows that the entrepreneurial orientation of the university and the quality of academic research increase the importance of knowledge transfers from universities to companies. This suggests that the environmental and institutional context contributes to explaining transnational disparities in university-industry interactions and in the effectiveness of knowledge transfer. Regarding these last factors, the results indicate that companies oriented towards open search strategies and radical innovations are more likely to extract knowledge from universities. Furthermore, companies belonging to high-tech sectors and companies with high absorptive capacity value more the various links with universities. Regarding the size of the company, the estimates show an inverted U-shaped relationship with the importance of universities as a source of knowledge. However, the greatest benefits from interaction with universities are obtained by small and young companies active in research.

Anatan (2015), analyzed conceptual issues in knowledge transfer from university to industry within the university-industry alliance. The literature shows three main theories to analyze the transfer of knowledge from university to industry, which include cost economic theory. Etzkowitz and Leydesdorff (2000), contributes to the understanding of how collaboration between universities, industry and government can drive innovation and economic development, and how this collaboration has become essential in an increasingly complex and market-oriented innovation environment. The concept of the "Triple Helix" has influenced the way in which the relationship between these actors is approached in the field of research and innovation.

Perkmann et al. (2013), contributed with a taxonomy of collaborative activities, classified into categories such as joint research, technology transfer, personnel training and consulting. Also, it refers to "Academic Engagement", which is the active participation of academics in knowledge transfer activities and collaboration with companies and to the facilitating and hindering factors, which can facilitate or hinder effective collaboration between universities and companies, such as organizational culture, incentives, intellectual property and government policies.

Theoretical Framework

The research questions have a common variable and that is "Technological Innovation". To measure this variable, the theory of absorption capacity will be used, as an aspect that implies the interaction between internal and external elements of companies, because the organization does not have sufficient internal knowledge to improve or develop all its innovation processes. It is then that absorptive capacity contributes to the company's integration, construction and reconfiguration of resources and capabilities to provide quick responses to environments (Teece & Leih, 2016). It can be defined that absorptive capacity refers to the internal and external interactions that allow knowledge to be captured, integrated, assimilated, and exploited as a dynamic part of innovation (Cohen & Levinthal, 1990).

Absorption capacity evaluation models are different contributions from authors who, as a result of their research, make proposals that explain the development of the absorption capacity, which allow identifying the coincidence in the integration of potential absorption capacities (acquisition and assimilation), as well as real ones (transformation and

exploitation). It is established that the absorption capacity is classified into two: potential and real, the first is defined as an instrument to acquire and assimilate knowledge, which is relatively dormant, until an argument for its use is identified, thereby becomes real absorption capacity, an aspect on which most authors agree regarding the phases (Cassol, Reis, Santos, & Lima, 2016).

Cohen and Levinthal (1990) define the Potential-Acquisition criterion as: “The ability of a company to recognize, among sources of external information, the most relevant knowledge for its operations; and Potential-Assimilation, are routines and processes that allow the company to analyze, process, interpret and understand the information obtained from external sources. The Real-Transformation classification is the ability of a company to develop and perfect productive routines that allow combining existing knowledge with newly acquired and assimilated knowledge; Finally, the Real-Exploitation condition is the practical application of the acquired and transformed knowledge, manifested in a new product or process” (pp.4).

To measure the variable “Technological Innovation” they will be classified into the following nominations: a) Potential-Acquisition, b) Potential-Assimilation, c) Real-Transformation, and d) Real-Exploitation.

Hypothesis and Methods

Hypothesis

The Hypothesis of this study is to demonstrate that “Active and continuous collaboration between universities and businesses has a significantly positive impact on the number of joint research projects and the generation of technological innovation in companies. This hypothesis that suggests that active and continuous collaboration between universities and companies has a positive impact on the number of joint research projects and the generation of technological innovation in companies has been investigated in the academic literature.

Methods

This study will have a mixed approach. This will allow to combine quantitative data collection and analysis (such as collaboration statistics and financial data) with qualitative research (through interviews, focus groups, or content analysis) to gain a complete understanding.

Surveys will be applied to researchers and R&D&I managers from Dominican universities. The time limit will be the research projects initiated and completed during the period 2019 to 2021. Also, experts on the subject, both researchers and businessmen, will be consulted to collect their experiences in research projects. The techniques to use are interviews and focus groups.

The expected results of the study entitled "The university-business linkage and its impact on research, development and business innovation" could be the following: 1) Provide information on effective strategies and best practices to foster positive relationships between academia and the company; in ways that significantly drive innovation within companies, leading to the development of new products, services or processes; 2) Reveal an increase in the quantity and quality of research output, such as publications, patents or prototypes, as a result of these linkages;

3) Indicate that regions or countries with strong links between universities and businesses

experience higher levels of economic growth, driven by greater investments in R&D and business expansion; 4) Show that university-business collaborations facilitate the development of a highly qualified workforce with knowledge and experience relevant to business needs; 5) Indicate that university-business collaborations lead to the creation of new ventures and startups, contributing to job creation and economic dynamism; 6) Highlight successful cases of technology transfer from universities to companies, showing specific technologies or innovations that have had a significant impact; 7) Point out various collaboration models, from joint research projects to internship programs, demonstrating the diversity of approaches that produce positive results for innovation; and 8) Identify challenges and barriers to effective collaborations between universities and businesses, helping stakeholders address these issues in the future.

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