



## Knowledge transfer and university-business relations: Current trends in research

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### **Abstract**

**Purpose:** To identify the current research trends regarding knowledge transfer and the university-business relationships during the period 2013-2016 in the journals indexed in ISI Web of Knowledge.

**Design/methodology:** In order to fulfill the research objective, a bibliographic search was conducted using the Pro-KnowC (Knowledge Development Process-Constructivist) tool, developed by LabMCDA (Laboratory of Multicriteria Methodologies to Support Constructivist Decision-Making).

**Findings:** As a result, a total of 122 articles were identified, classified into 4 separate lines of research, in which the most discussed topic was the economic impact of university-business relations, appearing in a total of 35% of the publications.

**Originality/value:** This article provides the basis for future lines of research, focusing it on areas of greater importance within the topic.

**Keywords:** University-business relations, Knowledge transfer

**Jel Codes:** I23, O3, O32

## 1. Introduction

Social integration, in an effort to find profitable solutions to real problems faced by humanity, is a cornerstone of economic development. Every society seeks an effective way to create mechanisms of development, which range from the creation of new businesses to the alliance of key actors in its environment.

University-business relations (UBR) are playing an increasingly more important role in technology transfer, the marketing of knowledge, and consequently, regional economic growth. Some universities have even installed research centers within companies (primarily focused on information technologies) to execute joint research projects (Guerrero, Urbano & Fayole, 2016), a topic that in the current world economic scenario has evolved and is an object of discussion. In some cases, an analysis is being carried out on how the UBR should be formalized through collaboration agreements and, in successful cases, how to replicate these relationships to other universities or companies in the research community (Ramos, Sánchez & Woolley, 2016).

The globalization process places companies in a competitive position that obligates them to carry out research and development (R&D) projects in coordination with universities, the mission of which has evolved in line with the demands of the commercial and production sector (Hayter & Rooksby, 2016). Today's universities have great potential in knowledge generation and transfer (KT), which may be effectively exploited to generate local economic growth, which is commonly recognized as their third mission (Fromhold-Eisebith & Werker, 2013; Goldstein, Bergman & Maier, 2013; Obeso, Sarabria & Sarabia, 2013; Burgos, Ribeiro & Martínez, 2016; Bellucci & Pennacchio, 2016; Steinmo & Rasmussen, 2016).

This work sheds light on the considerable upsurge experienced by this topic throughout the research community. Based on a bibliographic search in scientific journals of recognized prestige, trends were identified in a growing number of publications for the year 2016 on topics related to UBR and KT.

## 2. Methodology

The purpose of the present work is to identify research trends related to the KT between universities and the business sector. This research topic has been identified by Ripoll and Díaz (2014) within the research trends in the area of control and management, in which a total of 15 scientific articles had been identified for 2014 in the ISI Web of Knowledge, in high-impact scientific journals in the Web of Science. In this sense, Benson, Clarkson, Smith and Tutticci (2015), based on a review of academic accounting research journals in the Asia Pacific region, declare that said journals make a very significant contribution to research and its relationship to practice in the region and on an international level. In this same journal in 2014, the authors Olaya, Berbegal-Mirabent and Duarte conducted a bibliographic search up to 2010 on the main lines of research and future projection with regard to Technology Transfer Offices (TTOs), in which the authors acknowledge the need for UBRs and KT, focused on the work done by the TTOs, and anticipate future research related to the identification and quality of the services provided by the TTOs. This research stands out in that it uses university-business relations and the transfer of the knowledge they generate as a starting point, predicting future topics related to KT and the economic impact of the UBRs.

To give the research continuity, we propose analyzing the trends in the publication of articles related to UBRs and KT for the period between 2013 and 2016. As a basis for knowledge management, the tool Proknow-C (Knowledge Development Process-Constructivist) was used, developed by LabMCDA (Laboratory of Multicriteria Methodologies to Support Constructivist Decision-Making). This instrument has been disseminated through several scientific publications in journals, most notably, by Tasca, Ensslin, Ensslin and Alves (2010), Ensslin, Ensslin and Pacheco (2012), Rosa, Ensslin, Ensslin and Lunkes (2012), Lacerda, Ensslin and Ensslin (2012, 2014), Azevedo, Lacerda, Ensslin, Jungles and Ensslin (2013), Sartori, Ensslin, Campos and Ensslin (2014), Ensslin, Ripoll, Ensslin and Dutra (2014) and Dutra, Ripoll, Fillol, Ensslin and Ensslin (2014). The main objective of ProKnow-C is to construct the knowledge of a certain researcher in terms of his or her interests, options and delimitations, in accordance with a constructivist view.

The tool being used is based on 4 fundamental stages: the selection of a bibliographic portfolio (BP) of articles on the research topic, a bibliometric analysis of the BP, the systematic analysis of the BP and the identification of the research questions and goals for future research.

For its application, the research topic is defined as “University-Business Relations and Knowledge Transfer,” using the key words “university-business relations” and “knowledge transfer” to search the ISI Web of Knowledge database in the Web of Science.

850 articles containing the key words were considered for the selection process. Of these, once duplicates were excluded, a total of 122 had a direct relationship to the proposed topic. These articles are found in 53 journals, of which 46 have a JCR with a relevant impact factor. The articles identified make up the bibliographic portfolio (BP) used for this analysis.

### 3. Analysis of the results

For the analysis of the results, the articles obtained were classified according to the year of publication, journal and research topic addressed by the authors.

For the selection of topics, the time frame considered was between 2013 and 2016. The results are shown in Figure 1.

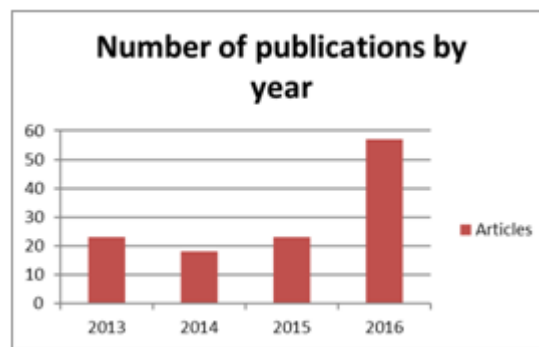


Figure 1. Number of publications by year

We believe that the importance researchers have given to the current topic is increasing considerably, judging by the increase in publications over the last year.

The study reveals that there are journals which dedicate a large part of their publications solely to addressing topics related to knowledge transfer from universities to business, such as in the cases of the Dutch publication *Journal of Technology Transfer*, and the *Journal of Business Research and Research*

Policy, which publishes a considerable amount of articles on the topic. It should be pointed out that there are increasingly more high-impact journals in the Web of Science that dedicate a space in their publications to the contribution made by the university through knowledge and technology transfer to the world around them (companies, industry and society in general).

Based on the content of the articles, the lines of research followed by the authors were then identified; these are shown in Figure 2.

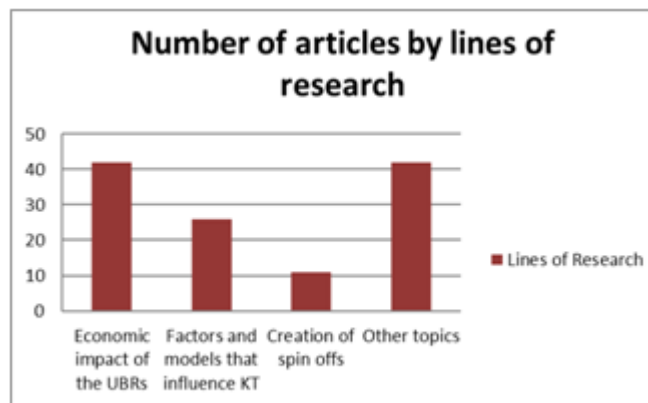


Figure 2. Identified lines of research

Next, we will proceed to analyze the 4 lines of research, although we will focus particularly on the “economic impact of university-business relations and knowledge transfer,” as it is the most significant topic.

### 3.1. Creation of spin off

The term spin off refers to research-based companies. They are business initiatives generated in a university environment that are focused on exploiting new processes, goods or services based on acquired knowledge and the results obtained from the university itself. The creation of companies often occurs as a way of marketing the results of the research conducted, primarily, at the universities.

On this topic, the authors analyzed refer to the importance of creating spin offs for KT development, indicating that the knowledge generated in the spin offs adds significant value to R&D (Karnani, 2013; Beraza & Rodríguez, 2014; Czarnitzki, Rammer & Toole, 2014; Ortín-Ángel & Vendrell-Herrero, 2014;

Ramaciotti & Rizzo, 2014; Beraza & Rodríguez, 2015; Hayter, 2015; Hayter & Link, 2015; Hayter, 2016; Muscio, Quaglione & Ramaciotti, 2016; Walter, Schmidt & Walter, 2016).

### **3.2. Factors and models that contribute to knowledge transfer**

Authors such as Cowan and Zinovyeva (2013), Heinzl, Kor Orange and Kaufmann (2013), Malik (2013), Muscio (2013), Muscio and Pozzali (2013), Plewa, Korff, Baaken and Macpherson (2013), Plewa, Korff, Johnson, Macpherson, Bakeen and Rampersad (2013), Szulanski, Ringov and Jensen (2013), Wan-Hsin (2013), Khorsheed and Al-Fawzan (2014), DinhTho & Thi Mai Trang (2015), Franco and Haase (2015), Hsu, Shen, Yuan & Chou (2015), Cabeza, Gutiérrez and Llorens (2016), Calcagnini and Favaretto (2016), Calcagnini, Favaretto, Giombini, Perugini and Rombaldoni (2016), De Fuentes and Dutrenit (2016), Galán-Muros and Plewa (2016), Lupton and Beamish, 2016, Machikita, Tsuji and Ueki (2016), Moutinho, Au-Yong, Coelho and Pires (2016), Ranga, Temel, Ar, Yesilay and Sukan (2016), Reus, Lamont and Ellis (2016), Sánchez and Ruediger (2016), Subramonian and Rasiah (2016) and Xie, Fang, Zeng and Huo (2016) concentrate their publications on the elements or factors that can influence knowledge transfer, making reference to the dimensions of the university system, critical factors in the performance of the transfers and the existence of barriers and conducive factors within it.

### **3.3. Other related topics**

A smaller number of articles were found that are related to topics within the theoretical framework of UBRs and KT, such as the role of government, patent development, technology transfer offices (TTOs) and sources of financing for the KT, which have been analyzed by authors such as: Calderón and García (2013), D'Este, Rentocchini, Grimaldi and Manjarrés-Henríquez (2013), Martín and Montoro (2013), Morandi (2013), Azagra-Caro (2014), Bektaş and Tayauova (2014), Cassia, De Massis, Meoli and Minola (2014), Miller, McAdam and McAdam (2014), Miller, McAdam, Moffett, Alexander and Puthusserry (2016), Muscio, Quaglione and Vallanti (2014), Schoen, Van Pottelsberghe and Henkel (2014), Berbegal, Sánchez and Ribeiro (2015), Fisch, Hassel, Sandner and Block (2015), Helmers and Rogers (2015), O'Kane, Mangematin, Geoghegan and Fitzgerald (2015), Parra, Gómez and Pastor (2015), Siegel and Wright (2015), Srividya and Anupama (2015), Weckowska (2015), Wu, Welch and Huang (2015), Al-Tabbaa and Ankrah (2016), Apostolov (2016), Berbegal-Mirabent and Llopis-Albert (2016), Brescia, Colombo and Landoni (2016), Burgos et al. (2016), Cesaroni and Piccaluga (2016),

Czarnitzki, Doherr, Hussinger, Schliessler and Toole (2016), Drivas, Economidou, Karamanis et al. (2016), Faisal, Yedidia, Lui and Glaister (2016), Fernández, Merchán and Valmaseda (2016), Fukugawa (2016), Hayter and Rooksby (2016), Ho, Liu and Kuan (2016), Hu et al. (2016), Jiang and Mei (2016), Kochenkova, Grimaldi and Munari (2016), Lee and Stuen, (2016), Missingham (2016), Olcay and Bulu (2016), Ramos et al. (2016), Steinmo and Rasmussen (2016) and Torugsa and O'Donohue (2016).

### **3.4. Economic impact of the university-business relations**

With a large concentration of articles, the topic of greatest importance is considered to be that referring to the economic impact generated by university-business relations. Empirical studies have clearly demonstrated the role of universities and the fulfillment of their third mission, as revealed by: Ankrah, Burgess, Grimshaw and Shaw (2013), Audretsch, Leyden and Link (2013), Bozeman, Fay and Slade (2013), Fromhold-Eisebith and Werker (2013), Fukugawa (2013), Goldstein et al. (2013), Salled and Omar (2013), Sendogdu and Diken (2013), Urbano and Guerrero (2013), Audretsch (2014), Boardman and Ponomariov (2014), Costantini and Liberati (2014), Guerrero, Urbano, Cunningham and Organ (2014), Morales, Sanabria and Pacheco (2014), Rolfo and Finardi (2014), Olmos, Castro and D'Este (2014), Thune and Gulbrandsen (2014), Bastieler, Hemmert and Barczak (2015), González-Pernia, Parrilli, and Peña-Legazkue (2015), Kalar and Antoncic (2015), Lee and Miozzo (2015), McKelvey, Zaring and Ljungberg, (2015), Corral, Jones and Lindsay (2015), Guerrero, Cunningham and Urbano (2015), Morales, Sanabria and Caballero (2015), Balduzzi and Rostan (2016), Bellucci and Pennacchio (2016), Bolling and Eriksson (2016), Casimiro and Macamo (2016), Chang, Chen and Fong (2016), Chantler (2016), Chen, Wu and Yang (2016), Dada and Fogg (2016), Fu and Li (2016), Ghauri and Rosendo-Rios (2016), Giunta, Pericoli and Pierucci (2016), Guerrero et al. (2016), Johnston and Huggins (2016), Markuerkiaga, Caiazza, Ignacio and Errasti (2016), McCabe, Parker and Cox (2016), Onate and Urdaneta (2016), Ratten (2016) and Zaharia and Kaburakis (2016).

Due to the number of publications, this topic is the one we consider to be the most relevant, as explained in the present work. It is addressed in greater detail in the following section.

#### **4. Discussion of the topic: The economic impact of the university-business relations**

Common elements considered by the authors are the actors who participate in the UBRs, with particular emphasis on the role of the government. The literature coincides in that each actor has different motivations related to need, efficiency, reciprocity and stability in the relations. On the same token, the expected result of KT also differs. For the government, the motivation is social benefit, while the universities expect an institutional benefit and businesses expect economic benefits (Ankrah et al., 2013).

The researchers unanimously recognize that knowledge is the key driving force behind growth and job creation, inherent to the process of economic development. The differences lie in the ways in which knowledge is generated, which range from social pressure on economic entities to the geographic proximity of the parties involved, public policies and the growing demand for knowledge. They also propose that the economy has gone from being driven by physical capital to being fueled by intellectual capital (Audretsch et al., 2013; Bozeman et al., 2013; Fromhold-Eisebith & Werker, 2013; Fukugawa, 2013; Bolling & Eriksson, 2016). Audretsch (2014), in turn, proposes that the role of universities in society (the emergence of business universities in response to demands by the forces that shape economic growth and performance), focuses its goals on providing solutions to the specific problems of society.

The comparative analysis between the contribution to the regional economic development made by universities in the United States and the European Union, based on empirical studies, is the subject of analysis by several authors, who have concluded that the common aspects that promote KT are: the proximity of the universities to businesses and the skills of the professors and within the academic discipline, in which the regional colleges have a significant influence, given their economic conditions, recognizing that regional economic development is perceived as a social responsibility of the educational institutions in the globalized knowledge economy (Goldstein et al., 2013; Urbano & Guerrero, 2013; Guerrero et al., 2014; Corral et al., 2015; Bellucci & Pennacchio, 2016; Guerrero et al., 2016).

Other authors present UBR models based on KT in different universities. As a common ground, the starting point is the research motivations at universities and the commitment to business needs. Then comes the identification and reinforcement of the strong and weak points of the universities, the role of government in management, the stabilization of relations and finally, the business results from an economic perspective and the contribution made to the university institution (Salled & Omar, 2013;



Kalar & Antoncic, 2015; Casimiro & Macamo, 2016; Chen et al., 2016; Fu & Li, 2016; Giunta et al. 2016).

Bastier et al. (2015) propose that transparency in the management of intellectual property analysis at universities ensures greater confidence in UBRs by their members.

However, Balduzzi and Rostan (2016) contradict this, reporting that the organizations which play a key role in the management of "knowledge transformation" cannot be either universities or businesses. They refer to the TTOs, spin offs and research centers, institutions that are capable of connecting structures that are not normally connected to one another. They represent an underestimated resource for the third mission of universities and the management of said mission.

Boardman and Ponomariov (2014), Rolfo and Finardi (2014), Chang et al. (2016) and Fu and Li (2016) attribute most of the knowledge generated to non-university organizations, including both research centers and those institutions previously mentioned by Balduzzi and Rostan (2016).

In this sense, the authors are not totally in agreement, since many universities have their own science parks set up as initiatives aimed at building closer ties between the scientific potential of the university and the production system, generating knowledge, supporting processes of innovation, promoting the founding of scientific/technically-based companies and contributing to the economic and social development of the surrounding area.

For Chantler (2016), the commitment of universities is an intrinsic value that forms part of the ideological conception of the same, but suggests that globalization, instrumentalism and democratization of higher education negatively affect academic freedom and the autonomy of universities, elements which he believes are the basis for knowledge management and transfer.

Most publications use interviews with university professors or business professionals to demonstrate their results, also relying on empirical evidence from the results of knowledge transfer for support.

Finally, we consider a weak point to be the absence of methods or tools to measure knowledge transfer and the economic quantification of what it generates.

Another weakness found in the publications is that the dissemination of the results of knowledge transfer is carried out to a greater extent by the university research community in scientific spaces, which limits their use in the activities of businesses, which are the main customers of KT.

In response to the weaknesses indicated, we believe that while it is true that, as technical offices, the transfer offices responsible for disseminating research results (TTOs) have the mission to promote and serve as a catalyst for relations resulting in the exchange of knowledge, thus facilitating its transfer through the provision of R&D services, the protection of knowledge through intellectual and industrial property rights and licenses, and the creation of technology-based businesses, it would be important for future research to analyze the behavior of these relations from the business towards the university (Olaya, Berbegal-Mirabent & Duarte, 2014). The perception of the results generated by KT on behalf of entrepreneurs should be examined in order to ensure greater dissemination. It would also be interesting to work on indicators that measure knowledge transfer and its economic results based on the identification of the variables involved.

We understand that one of the competences with which the TTOs are charged is the identification, cataloging and dissemination of the offer of scientific-technical capacities of university research groups, this being one of the few ways to establish contact between the immediate socioeconomic fabric and the university.

## 5. Conclusions

Based on the use of the Pro Know-C tool, a selection of articles was compiled on university-business relations and knowledge transfer. This was conducted for the period between 2013 and 2016, from journals indexed in the ISI Web of Knowledge.

Currently, topics related to knowledge transfer and university-business relations are taking on special importance, as judged by the total of 122 articles found in 53 scientific journals in the fields of social sciences, with considerable growth during the 2013-2016 period.

The research lines followed by the authors were identified and classified into 4 groups, the most representative being university-business relations and their economic impact, which consisted of 35% of the publications, with factors and models that contribute to knowledge transfer in second place, addressed by 22% of the articles.

Based on the analysis of the most relevant topic, strengths were observed to include the recognition of the role of government in the relations and the economic impact they generate. Weaknesses are

indicated to include the lack of any quantification of the economic results derived from these relations and the low level of dissemination of the results by the business sector.

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