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## **KIBS: Innovative Capacity in the Service Sector**

### **Abstract**

The objective of this paper is to explain how the elements based on KIBS (Knowledge Intensive Business Services) can be applied in an integrated way to assess the innovative capacity of firms in the service sector and create a strategic vision to innovation. The building of the propose is based on a bibliometric analysis in the databases Scopus and ISI (Web of Science). We propose a elements with four dimensions: KIBS, knowledge creation, knowledge transfer and innovation to innovative capacity. The research presents interesting features from the scientific papers analyzed, highlighting gaps that gave origin to the propose study analysed.

**Keywords:** KIBS; innovative capacity; knowledge creation; knowledge transfer; innovation.



## 1 Introduction

Since the initial study by Miles *et al.* (1995), an increasing number of contributions have questioned the traditional view of service companies as incapable of creating innovations. Researchers and practitioners recognize that far from being innovative latecomers or just intensive generators of technologies and novelties in manufacturing, services are becoming an important option for innovative companies (Howells, 2000; Tether & Metcalfe, 2004). Although having grown very fast since the 1970s, it is more and more acknowledged that KIBS (Knowledge Intensive Business Services) are essential constituents of service innovation systems (Cooke & Leydesdorff, 2006) and are responsible for knowledge transmission (Den Hertog, 2000; Muller & Zenker, 2001; Miles, 2008).

In this article we share the view of researchers who have, in recent years, investigated the subject KIBS, known in the international literature as Knowledge Intensive Business Services. In 17 years of publications, we have identified articles on this topic, based on a bibliometric analysis carried out in the databases Scopus and ISI Web of Knowledge (Web of Science), from the first publication in 2001 until 2017. In addition, we have explored the published papers in order to propose elements for evaluating KIBS' innovative capacity in the service sector. We noticed that, over time, the role of KIBS in the learning-based economy has received increasing attention, from empirical studies that were conducted and classified according to the region, topic and main conclusions (Doloreux & Laperrière, 2013), which allowed us to carry out this research. By assessing these articles on KIBS, we found a gap regarding the innovative capacity of service firms. Therefore, we sought to explain how the elements of a conceptual model - with the dimensions KIBS, knowledge creation, knowledge transfer and innovation - can be applied in an integrated way to evaluate the innovative capacity of firms in the service sector.

## 2 Method of Analysis

The choice of data was made according to the international relevance of the databases (Web of Science/ISI and Scopus), by comparing the amount and quality of the publications in order to conduct the bibliometric analysis. Thus, we have identified articles on the topic KIBS related to the innovative capacity in the service sector. Using the keywords (1) Knowledge Creation, (2) Knowledge Transfer, (3) Innovation, and (4) KIBS, and based on the Boolean method "AND" and "OR", we arrived at 366 articles in the databases, in the areas of management, economics and engineering. After the exclusion of repeated papers, we reached the number of 161 articles on KIBS, which were then examined. Figure 1 presents the number of articles identified in the two databases, for each year, since 2001.

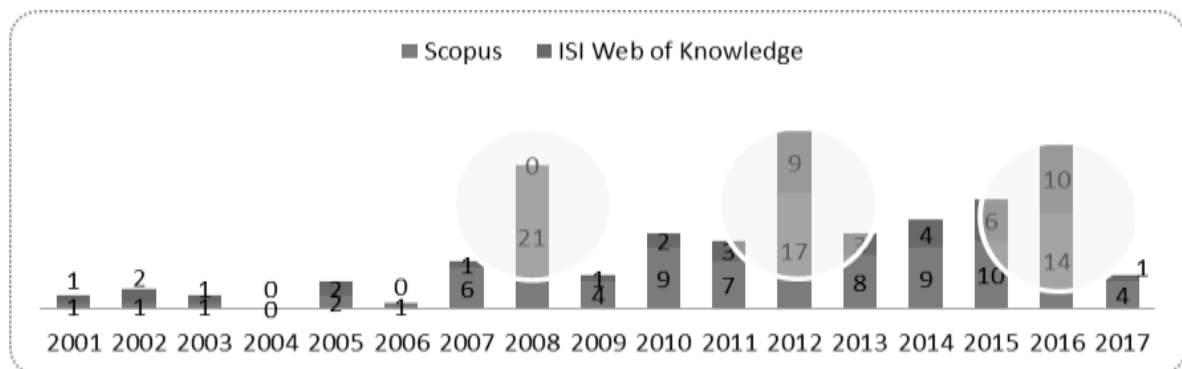


Figure 1. Evolution of papers on KIBS during the the chosen period of study



Figure 1 shows a significant evolution in the year 2007, as compared to the number of papers in 2001 (year of the first publication). These years represent peaks of publications, each corresponding, on average, to 23 articles, approximately 15% of the published papers. We have considered the periods 2001-2007 (12%), 2008-2012 (45%) and 2013-2017 (43%). By examining the publication years separately, the highest concentrations were in 2008 - 21 articles found in Scopus database -, 2012 - 26 articles published, from which 17 were in Scopus database and 9 in ISI -, and 2016, with 24 papers identified – 14 in Scopus and 10 in ISI. It should be noted that KIBS has only recently become a topic of interest and discussion, confirmed by the increasing number of articles in the last 10 years, which include 88% of the publications examined since 2001.

Regarding the most cited articles in the period of highest concentration on the KIBS theme, we used the h-b index and the m index, proposed by Banks (2006) as an extension of Hirsch's h-index (2005). To obtain the h-b index, we considered the number of citations of articles related to that topic in the 17-year period, listed in descending order of citations, totaling the first 10. For the analysis of the m index, we used Bank's (2006) definitions, dividing the h-b index by the period of years over which information was needed (n), being considered "hot topics" those with an index  $m > 2$ .

Bibliometric analysis showed the evolution of the theme and the authors of papers with the highest number of citations on the topic. We note that the articles do not have a direct relationship with the evaluation of innovative capacity. The greater concentration of the analyzed papers investigates the attributes and roles of KIBS for innovation. Among the papers identified with the h-b index, two "hot topics" stand out, measured by the m index, whose authors are Muller, E. and Zenker, A. (2001), and Den Hertog, P. (2000). Therefore, KIBS can be interpreted in several ways, but an issue is very clear, regardless of a single concept, that is, its purpose: to contribute to companies' innovation. There is an evolution of the topic in the literature and an opportunity to explain how the elements of a conceptual model based on KIBS can be applied in an integrated way to assess the innovative capacity of firms in the service sector and create a strategic vision to innovation, which are the objects of this study.

### 3 Literature Review

#### 3.1 Dimension KIBS

According to Den Hertog (2000), KIBS are defined as organizations or private companies that frequently use professional knowledge, whether related to a specific discipline (technique) or domain (technical), generating intermediary knowledge businesses (products or services). In the view of Miles *et al.* (1995), Boden and Miles (2000), Tomlinson (2002), Nahlinder (2002), CRIC (2004), and Miles (2005), KIBS are defined as a group of companies that find solutions for other companies, based on specific knowledge. Miles *et al.* (1995), Den Hertog and Bilderbeek (1998), Hipp (2000), André, Feio and Ferrão (2002), and Miles (2007) consider KIBS as agents of dissemination and transfer of knowledge and innovation to their customers, which cannot be dissociated from the national-regional economic and social environment (macro and micro).

Bettencourt *et al.* (2002, pp. 100-101) defined KIBS as "companies whose primary value-added activities consist in the accumulation, creation, or dissemination of knowledge with the goal of developing a customized service or product solution to meet customer's needs". Den Hertog and Bilderbeek (1998) highlight some important aspects of KIBS, such as: catalysts in the creation of processes of knowledge and innovation for their customers' companies; knowledge can be created by them or developed in cooperation with their clients;



they play a role that enables processes of knowledge conversion, helping their customers to become learning organizations; intervention is mainly an oriented process, non-contractual, and implies the use of tacit knowledge. KIBS possess qualities that are highlighted by Miles *et al.* (1995): i) they contribute to knowledge and innovation in the economy; ii) they serve as knowledge carriers; iii) they favor the development of new activities for clients; iv) they collaborate to build new knowledge in their products; and v) they facilitate flows of knowledge and expertise from one sector to another (Boden & Miles, 2000; Tomlinson, 2000; CRIC, 2004; Muller & Zenker, 2001). The proposed variables are shown in Table 1.

Table 1  
Variables and Definitions of KIBS

Variable	Definition
<b>Firm Size</b>	For firm's size we adopted IBGE's (Brazilian Institute of Geography and Statistics, 2010) criteria, which consider micro enterprise the one with an annual revenue below or equal to R\$ 2.4 million (approximately US\$ 730,000); small enterprise, with a revenue above R\$ 2.4 million and below R\$ 16 million (~ US\$ 4,850 million); medium enterprise, above R\$ 16 million and below or equal to R\$ 90 million (~ US\$ 27 million); medium-large, above R\$ 90 million and below or equal R\$ 300 million (~ US\$ 91 million); and large, with an annual revenue above R\$ 300 million.
<b>Number of Employees</b>	The number of employees in the firm considers the amount of people who have a work permit, according to the Brazilian law CLT, measured in five echelons: (1) up to 10 employees; (2) up to 30 employees; (3) up to 50 employees; (4) up to 100 employees; and (5) above 100 employees.
<b>Lifetime</b>	Firm's lifetime is measured from its foundation year, divided in five echelons: (1) up to 10 years; (2) from 11 to 30 years; (3) from 31 to 50 years; (4) from 51 to 100 years; and (5) above 100 years.
<b>Location</b>	Four capitals from Brazil southeast region made part of the sample, and received codes from 1 to 4, in ascending order: (1) São Paulo/SP; (2) Rio de Janeiro/RJ; (3) Belo Horizonte/MG; and (4) Vitória/ES.
<b>Number of ventures created</b>	The amount of ventures created in the last five years was measured according to five echelons: (1) up to 10 ventures; (2) up to 30 ventures; (3) up to 50 ventures; (4) up to 100 ventures; and (5) above 100 ventures.
<b>Type of service rendered</b>	We included in the sample firms that belong to 16 CNAE (National Classification of Economic Activities) and NACE ( <i>Nomenclature statistique des Activités économiques dans la Communauté Européenne</i> ), which are: (1) telecommunications; (2) computer systems consulting; (3) development of software programs; (4) data processing; (5) database activities; (6) technical services to firms; (7) legal activities; (8) maintenance and repair of office and informatics equipment; (9) accounting and auditing; (10) market research and opinion poll; (11) management of equity interest; (12) business management consulting; (13) architecture and engineering services and specialized technical assistance; (14) materials and products tests; (15) advertising; and (16) informatics activities.

### 3.2 Dimension Knowledge Creation

The role of knowledge has been widely discussed in the management literature, but when it comes to the "knowledge based economy" - at least to some extent - it holds a different logic from value creation in the industrial economy. The special attributes of knowledge, its dimensions and especially its feature as a "public good", together with the infinite possibilities of its replication, make it a key factor for innovation in the new economy, and is seen today as the main source of competitive advantage (Drucker, 1995; Marr, 2005). Knowledge is presented as a competitive differential and key element in the innovation process (Tidd, Bessant, & Pavitt, 2008; Yang, Yu, & Lee, 2002), which leads any product - goods or services - to be measured by the amount of knowledge embedded in it, and buyers'



perception of its value through technology support (Brown, 2000), besides sustaining the competitive advantage of an organization, an industry sector or a country (Wenhong & Min, 2010). "It is the basis of the ability to act and has four fundamental attributes: knowledge is tacit; knowledge is action oriented; knowledge is supported by rules - both conscious and unconscious - that act as filters of knowledge; and knowledge is permanently changing (Sveiby, 1997, pp. 29-35, 37).

Knowledge is not only restricted to documents, or guides of norms and management manuals, but is also found in the routines, processes and ways of conducting people's work (Davenport & Prusak, 2001; Santiago, 2004), causing organizations to assume an important role in the discussion on how it can be used to create innovative products, a key element for a firm to achieve competitive advantage (Tidd *et al.*, 2008; Wenhong & Min, 2010). The ability to manage knowledge can be a decisive factor for a company to remain competitive in the market (Grant, 1996; Nonaka & Toyama, 2002). Thus, Drucker (1999) defines knowledge management as "the coordination and exploitation of organizational knowledge resources, in order to create benefits and competitive advantage", being more limited in his definition, by considering only lessons learned and techniques used for managing what is already known (Wellman, 2009). In this sense and after reviewing the literature on knowledge creation, we consider in this study the following variables related to the innovative capacity of firms, as shown in Table 2.

Table 2  
**Variables and Definitions of Knowledge Creation**

Variable	Definition
<b>Knowledge creation</b>	Refers to the firm's involvement in knowledge creation in the last five years. This is a dichotomous variable, which assumes the simple binary value 0 for firms that did not create knowledge in the period, and 1 for firms that did.
<b>Interaction</b>	It considers the relationship between people through the use of dialogue, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Dialogue</b>	It considers dialogue as a continuous reflection on the business, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Justification</b>	Justification of the concepts created from the dialogue, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Systemic Approach</b>	The development of a model from the concepts created through dialogue, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Diffusion</b>	The diffusion of knowledge created to those interested in the business, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.

### 3.3 Dimension Knowledge Transfer

For some authors, knowledge sharing differs from knowledge transfer, being defined as a more useful concept, and seen as a double process of research and contribution to knowledge, through activities such as learning by observation, listening and asking, sharing ideas, giving advice, recognizing clues, and adopting patterns of behavior. Hendriks (1999, p.22) states that "it takes knowledge to get knowledge and thus, share knowledge". Knowledge sharing is an activity both individual and collective, involving explicit and tacit exchanges between people (Polanyi, 1966). For Geraghty and Desouza (2005), knowledge transfer is defined as the act of transmitting from one entity to another, in an optimal and



reliable way, a social process by which one member is affected by the experience of another through social learning (Hansen, 1999; Argote & Ingram 2000), and it may involve a wide diversity of technological knowledge, from the most basic to the most specific procedures and capacities (Amesse & Cohendet, 2001).

Nonaka and Takeuchi (1995), Damsgaard and Scheepers (2001) and Lakomski (2003) state that sharing knowledge involves the generation and exchange of new ideas and concepts, often with a significant action - for example, solutions for a problem. In this reciprocal process, receivers and creators exchange knowledge through conversations, online forums etc., making use and contributing to knowledge-based artifacts that are relevant to a specific context. Bartol and Srivastava (2002) define knowledge transfer as the sharing of information, ideas, suggestions and organizationally relevant experiences, from the individual to others. Szulanski (2000) approaches the transfer of knowledge by emphasizing that this transference should not be seen as an act in which one person passes something to another, but as a process, made of different stages, each with its own difficulties. In this sense, and after reviewing the literature on knowledge transfer, we consider in this study the following variables related to the innovative capacity of firms, as presented in Table 3.

Table 3  
**Variables and Definitions of Knowledge Transfer**

Variable	Definition
<b>Knowledge Transfer</b>	The involvement of the firm in knowledge transfer in the last five years. This is a dichotomous variable, which assumes the simple binary value 0 for firms that did not transfer knowledge in the period, and 1 for firms that did.
<b>Association</b>	It considers the free association of ideas, which generates others as a result, and is ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Improvement</b>	It is obtained by considering the test of collective ideas in a coherent form, and is ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Knowledge sending</b>	The remittance of knowledge by the firm without a formal request from the client, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Knowledge request</b>	The formal request of knowledge by the customer, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.

### 3.4 Dimension Innovation

Innovation can be defined as an idea, practice, or a material good that is perceived as new and of relevant application (Zaltman, Duncan & Holbek, 1973); or an object perceived as new by an individual or an organization (Rogers, 2003), and considered, from a business point of view, as the key to economic growth, competitive advantage, and even the survival of companies (Agarwal *et al.*, 2003; Merrilees, Rundle-Thiele, & Lye, 2011; Sheehan, 2006). In the process of implementing an innovation, the nature of information exchange in the relationships determines the conditions under which an employee receives knowledge or has an experience by using the new idea (Enz, 2012).

The term "innovation" has taken a broader meaning in recent years. More than the development of new products in companies, it is also the creation of new arrangements between the institutional spheres that provide the conditions for innovation "(Etzkowitz, 2003, p. 299). A process that combines problems and needs with solutions that are relevant and new for these problems (Wahren, 2004; Rickards, 1985; Paton & McLaughlin, 2008; Kerka, Kriegsmann, & Schwering, 2009). It can be understood, in a general way, as the apprehension and introduction of new practices, products, processes and designs by companies and



institutions, that is, the result of a process that can only be analyzed when considering its interactive character (Sbicca & Pelaez, 2006). A search, discovery, experimentation, development, imitation and adoption of new products, processes and new organizational techniques, that should be something absolutely new in the world, focused on the economic agent that is implementing it in the organization (Dosi, Freeman, Nelson, Silverberg, & Soete, 1988). In this sense, and after reviewing the literature on innovation in services, we consider in this study the following variables related to the innovative capacity of firms, as shown in Table 4.

Table 4

**Variables and Definitions of Innovation**

Variable	Definition
<b>Innovation</b>	Refers to the involvement of the firm in innovation in the last five years. This is a dichotomous variable, which assumes the simple binary value 0 for firms that did not innovate in the period, and 1 for firms that did.
<b>Achieved Differential</b>	The introduction of a new differentiated product in the business, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Competitive Differential</b>	The introduction of a new process in the business, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Form of production</b>	The introduction of a new form of production, product or process in the business, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Improvements</b>	The introduction of process, product or organizational improvements in the business, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Organizational Structure</b>	The implementation of a new structure in the organization, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.
<b>Technological</b>	The launching of a new technological production process of products and services, ranked in five echelons: (1) very low importance; (2) low importance; (3) medium importance; (4) high importance; and (5) very high importance.

**4 Conclusions**

At this point of the study, concerning the general conclusions of the research, we try to achieve the general objective initially proposed, by explaining how the elements based on KIBS (Knowledge Intensive Business Services) can be applied in an integrated way to evaluate the innovative capacity of firms in the service sector and create a strategic vision to innovation. We have presented the elements based on KIBS, created from bibliometric analysis, and exploring the views of researchers who have, in recent years, investigated this theme. The dimensions and variables show the elements to assess the innovative capacity of firms in the service sector and create a strategic vision to innovation.

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