

Universities as Knowledge Intensive Business Services – A Systematic Literature Review and a Case Study of a Research Group

Ademar Schmitz, Pierry Teza, Gertrudes Aparecida Dandolini, João Artur de Souza

Abstract – There has been a significant change in the university concept due to its third mission (added to teaching and research missions) for economic and social contribution, materialized through innovative and entrepreneurial activities. At the same time, knowledge intensive business services (KIBS) have started to produce and diffuse knowledge, which is crucial for innovation processes. This article intends to present an exploratory and descriptive study based on scientific literature on the relation between universities and KIBS and to present a case study of a research group at a university based on innovative and entrepreneurial activities and on knowledge intensive services provided to other firms. According to our findings, no attempts were made to study and categorize universities as KIBS providers, even though it is accepted that universities contain, create, disseminate and transfer much knowledge that is needed to the innovation of companies and society. On the other hand, the case study shows a synergy between the services provided by the studied research group and the concept of innovative and entrepreneurial university and the concept of KIBS providers. Further studies need to be conducted to map all knowledge intensive services provided by universities in the context of innovative and entrepreneurial universities and on the knowledge lifecycle when universities act like KIBS providers.

Index Terms–entrepreneurial University; innovative university; knowledge intensive business services.

I. INTRODUCTION

There has been a significant change in the concept of universities over time. Originally universities were created with the purpose of teaching, but two main revolutions happened, known as academic revolutions [1]. The first academic revolution, which took off in the late 19th century, made research universities function in addition to the traditional task of teaching. Then, a second academic revolution transformed the university into a teaching, research and economic development enterprise [1], known in the literature as entrepreneurial (or innovative, in some cases) university. The entrepreneurial university has the ability to generate a focused strategic direction [2] both in formulating academic goals and in translating knowledge produced within the university into economic and social utility [1]. At the same time that universities need to contribute for the economic and social development of their regions and nations, a significant reduction of public funding for universities occurred, forcing universities to strive for financial benefits. According to [3], there are many examples of universities that have undertaken activities that can be considered as contributing to

economic development and which have also brought financial benefit for the university. Another concept that has recently got some attention is Knowledge Intensive Business Services (KIBS). KIBS produce and diffuse knowledge, which is crucial for the innovation processes [4]. The increasing importance of knowledge intensive services constitutes one of the characteristics of the rise of the so-called “knowledge economy” [4]. In general terms, KIBS are mainly concerned with providing knowledge intensive inputs to the business processes of other organizations, including private and public sector clients [5]. In this sense, if universities really want to engage the social and economic development of their regions, they need to provide knowledge intensive inputs to companies, to the government and to society, acting in many cases as KIBS providers. The objective of this paper is to present an exploratory and descriptive study based on scientific literature on the relation between universities and KIBS, and to present a case study of a university research group based on its innovative/entrepreneurial activities and on knowledge intensive services provided to other firms. As will be argued later in this paper, research groups in entrepreneurial universities may act as “quasi-firms” [1]. Based on its objectives, this research is characterized as an exploratory and descriptive study, since it aims to provide greater familiarity with the topic, making knowledge more explicit on the subject [6] and describes the inferences obtained both by the literature review and by the case study. Based on its procedures, this research is characterized as a literature search, developed based on material already prepared, consisting mainly of articles [6], and a case study, based on a university research group analysis. This article is organized in such a way that this section introduces its subject, objectives and research design. Second section brings a brief literature review on innovative and entrepreneurial universities and on KIBS. Third section presents the methodology procedures by which the goals of this article were accomplished. Fourth section shows the main findings from the systematic literature review and from the case study. Main conclusions and future work are presented in the fifth section.

II. LITERATURE REVIEW

A. Innovative and Entrepreneurial Universities

According to the Oslo Manual, innovation is defined as the implementation or introduction of new products, production processes, and business practices (e.g., organizational or marketing methods) in the marketplace, and innovation

activities are defined as “the scientific, technological, organizational, financial, and commercial steps” leading to innovation [7]. That means that to implement innovations there some innovation activities that have to be executed. Innovations are to an increasing extent seen as the result of an interactive process of knowledge generation, diffusion and application [8]. The importance of knowledge interactions for innovation has been stressed by the literature on innovative milieu, knowledge spillovers, innovation networks, and innovation systems [8]. In particular, the innovation system approach emphasizes the importance of interactions among firms, public research institutions and technology policy for innovation success [9], being the importance of universities in the innovation system approach recognized in literature. Reference [9] suggests a reading of [10] to see that universities play three major roles within an innovation system:

- they undertake a general process of scientific research, affecting the technological frontier of industry over the long run;
- they partly produce knowledge which is directly applicable to industrial production;
- They provide major inputs for industrial innovation processes in terms of human capital, either through the education of graduates or through personnel mobility from universities to firms.

A university that embraces its role within the triple helix model (one of the ways to understand national innovation systems) and adopts the mission of contributing to regional and national development is revered to as an “entrepreneurial university” [3]. To do so, the internal organization of the research university consists of a series of research groups that have firm-like qualities, especially under conditions in which research funding is awarded on a competitive basis [1]. This same author argues that research groups operate as firm-like entities, lacking only a direct profit motive to make them a company and that universities in which research results are routinely scrutinized for commercial as well as scientific potential is becoming the modal academic institution. The main ways in which universities have attempted to engage in relations with industry while resolving or regulating conflicts of interest over the commercialization of research can be captured in two models. The first model is separating academic and business activities, and the second model is integrating research and business activities under the rubric of a broader institutional mission [1]. Independent of which model is adopted, to become an entrepreneurial university universities have to engage business activities to contribute to innovation and to economic and social development of their regions and nations. In [3] a spectrum of entrepreneurial activities of universities are defined, from “soft” activities (closer to the traditional paradigm) to “hard” activities (closer to the entrepreneurial paradigm), including: producing highly qualified graduates, publishing academic results, grantsmanship, consulting, industry training courses, contract research, patenting and licensing, spin-off firm formation and creation of technology parks.

B. Knowledge Intensive Business Services (KIBS)

Over the last years, there has been a significant increase in the attention paid to the activities of knowledge intensive business services (KIBS), which produce and diffuse knowledge that is crucial for the innovation processes. “In fact, the increasing importance of knowledge intensive services constitutes one of the characteristics of the raise of the so-called ‘knowledge economy’” [4]. KIBS may be defined as “consultancy” firms in a broad sense, but more generally “KIBS can be described as firms performing, mainly for other firms, services encompassing a high intellectual value-added” [4]. Also in general terms, KIBS are mainly concerned with providing knowledge intensive inputs to the business processes of other organizations, including private and public sector clients [5]. In [11] three principal characteristics of KIBS are identified:

- they rely heavily on professional knowledge;
- they either are themselves primary sources of information and knowledge or they use knowledge to produce intermediate services for their client’s production processes;
- They are of competitive importance and supplied primarily to business.

Reference [12] emphasizes the importance of network relations for KIBS providers. Her article has a key role in the quest to understand the interaction between KIBS suppliers (or providers) and KIBS customers. According to the author, the network structures within the corporate KIBS segment constitutes a form of organization to the individual demands of customers using the full potential and inter-organizational flexibility available via knowledge intensive services [12]. In terms of national innovation systems, according to [4], KIBS providers can assume two roles. The first refers to the diffusion of knowledge among firm’s customers, i.e., acting as an external source of knowledge and contributing to the innovation in the firm’s customers. The second role concerns to the innovation introduced within the KIBS provider firm itself.

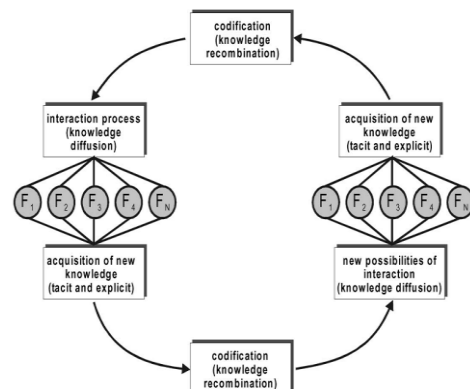


Fig. 1: Knowledge flow by KIBS [12]

These roles can be perceived by the representation proposed in [38] for production and dissemination of knowledge as a result of KIBS activities (see Fig. 1). From Fig. 1 we can see the important role of KIBS within the national innovation system. Companies providing KIBS acquire new knowledge in contact with customers. This new knowledge is then encoded and subsequently used in the

interaction with other client companies, where KIBS providers acquire more knowledge, forming a virtuous cycle. In this sense, KIBS are the main agents in disseminating knowledge [13].

The Statistical Classification of Economic Activities (NACE) in the European Community (EC) classifies KIBS in sectors and sub-sectors, as shown in Table 1.

Table 1: KIBS sectors and sub-sectors [5]

NACE	Description
72	Computer and related activities
721	Hardware consultancy
722	Software consultancy and supply
723	Data processing
724	Database activities
725	Maintenance and repair of office, accounting and computing machinery
726	Other computer-related activities
73	Research and development
7310	Research and experimental development in natural sciences and engineering
7320	Research and experimental development in social sciences and humanities
74	Other business activities
741	Legal, accounting, book-keeping and auditing activities; tax consultancy; market research and public opinion polling; business and management consultancy; holdings
7411	Legal activities
7412	Accounting, book-keeping and auditing activities; tax consultancy
7413	Market research and public opinion polling
7414	Business and management consultancy activities
742	Architectural and engineering activities and related technical consultancy
743	Technical testing and analysis
744	Advertising
7484	Other business activities n.e.c.

two parts: a) a literature study, and b) a case study. The literature study established the main proposition of this paper, which is the vision of universities as KIBS providers. The case study conducted in a research group at a university tried to illustrate the aforementioned proposition. This study is characterized as exploratory and descriptive. It is exploratory at the time that it aims to provide greater familiarity with the topic and the context studied: universities and other organizations with which they relate. It is descriptive when it seeks to describe the inferences obtained both by the literature review and by the case study. It is important to say that no studies correlating the role played by universities as KIBS providers were found, which is the central proposition of this work. In this sense, despite the exploratory nature of the study, we seek to make a theoretical and empirical contribution to the area. The theoretical contribution focuses on the systematic collection and analysis of the literature on the role of the university in its environment of operation as the central proposition of this work. The empirical contribution is made at the time that the theoretical findings are confronted with the reality of one research group at a university, which gives support and complements the analysis of the theory. For the literature study, a systematic search and analysis of the literature regarding the role of the university in its environment of operation was undertaken, specifically about its role as a source of knowledge and innovation agent. Additionally, we used the KIBS literature raised in a non-systematic way. The systematic search was conducted on Scopus and Web of Science databases, on November 2, 2013, based on the keywords and parameters shown in Table 2. It returned 79 records (59 from Scopus and 20 from Web of Science). The search was parameterized so that the search keywords could appear in the article title, abstract or keywords (Scopus) or on topic (Web of Science), which is equivalent to the first one. Further, where considered only documents in English, Spanish or Portuguese and of type article, proceeding paper (Web of Science) and conference paper (Scopus). All registries were imported to EndNote and organized. A first analysis identified that 8 records were duplicated, and therefore deleted, resulting in 71 records. These resulting records were further analyzed, initially based on title, abstract and keywords and the ones that potentially could be used to achieve the research goals were searched for the full text e read accordingly. The results of the readings are presented in section IV.A.

Table 2: Parameters used for the search

Item	Specification
Keywords	(university OR "higher education institution" OR HEI) AND ("knowledge-intensive service" OR KIS OR "knowledge-intensive business" OR KIBS OR "knowledge-intensive organization")
Language	English, Spanish and Portuguese
Fields	article title, abstract and keywords
Document Type	articles, proceeding papers (web of science) and conference papers (scopus)
Databases	Scopus (www.scopus.com), Web of Science (www.webofknowledge.com)

According to this classification, at a first look, the only sector that truly applies to universities is sector 73 (Research and Development), which includes research and experimental development in natural sciences and engineering (7310) and research and experimental development in social sciences and humanities (7320). Further analysis could try to identify with of these sectors and sub-sectors are related or not to those entrepreneurial activities of universities indicated by [3], as described in section II.A. In addition, if we assume that the activities of universities that make them engage in the social and economic development of their regions and nation are those of research groups that act like “quasi-firms”, then there are probably other KIBS activities being executed by universities. Analysis presented in section IV will discuss this issue further.

III. METHODOLOGY

To accomplish the purpose of analyzing the relationship between universities and KIBS, the study was divided into

For the case study, one research group at a university was chosen. The Research Group in Archaeology and Patrimonial Education – GRUPEP is a reference in the research of the archaeological heritage of the south of Santa Catarina and is a research group of the University of Southern Santa Catarina (UNISUL). This group was chosen because in addition to providing easy and unrestricted access to their internal processes and researchers, it has over the years entered into knowledge providing partnerships with public and private organizations, allowing empirically demonstrate the theory analyzed. From the literature review, a qualitative research approach was defined, understood by [14] as capable of analyzing the implicit aspects in the development of the practices of an organization and the interaction among its members. This approach was used because it allows to explore and to understand the meaning that individuals or groups assign to a social problem [15], the interaction between the research group and other organizations, in this case. For planning and subsequent execution of the research, the requirements proposed by [15] were used, which are: research strategy, the procedures for data collection, and analysis and interpretation of data. Regarding the research strategy, a case study was utilized. For [16], the case study is an empirical research that studies a contemporary phenomenon in depth and in its real life context, especially when the boundaries between phenomenon and context are not clearly evident. In this sense, the phenomenon (interaction between the research group and other organizations) is studied in its real life context (the research group, its processes, technologies and people) seeking to draw inferences from fuzzy boundaries between phenomenon and its context. Regarding the procedures of data collection, an unstructured interview was used. Given the exploratory character of the research, this type of interview allowed to collect better empirical evidence. Additionally, we used documents (catalogs and information available on the web) and observation (non-participant form). Analysis and interpretation of the data was performed primarily on data collected in the interviews. The written reports of the participants were transcribed and subsequently analyzed together with the documents and observation reports. During data analysis we tried to infer empirical evidence that could support the propositions extracted from the literature review. The results of the case study are presented in section IV.B.

IV. MAIN FINDINGS

A. From the Systematic Literature Review

From the overall 71 registries, only in 21 of them some evidence was found relating universities (or Higher Education Institutions – HEI) and KIBS. These 21 registries were categorized in 5 groups: those that considered universities as knowledge intensive organizations, those in which the importance of relations of universities with KIBS were stressed, those that considered R&D as a knowledge intensive business service, those that considered Technology Transfer (TT) as a knowledge intensive business service and those that simply considered universities (or higher education

institutions) as knowledge intensive business services itself. A total of eight articles were classified in the first group, which are shown in Table 3. All these articles argued or characterized universities as Knowledge Intensive Organizations (KIO). It should be clear that KIBS are a subset of KIO.

Table 3: Universities as knowledge intensive organizations

Author	Concept Indication
Liu, Lin, & Shi (2003) [17]	As a special knowledge-intensive organization, universities should nurture and strengthen their core competence.
Wang, Lin, & Shi (2004) [18]	As a special knowledge-intensive organization, universities should nurture and strengthen their core competence. Given the definition of university's core competence and knowledge management (KM) is the process of creating, acquiring and using knowledge.
Ramachandran, Chong, & Ismail (2009) [19]	This paper raises awareness and provides initial guidelines to the HEIs as knowledge-intensive organizations in formulating strategies on how to properly implement and manage their KM processes.
Ditzel & Ebner (2007) [20]	Universities are knowledge-intensive organizations.
Bratianu (2010) [21]	Knowledge dynamics reflects the very essence of any university, since the teaching, learning and research are activities of knowledge generation, knowledge transfer and knowledge dissemination. A university may be considered from this point of view a knowledge intensive organization.
Shen & Liu (2010) [22]	University is knowledge-intensive organization and its knowledge network is important for promoting teaching and scientific research.
Benitez et al. (2011) [23]	Higher education institutions, as knowledge-intensive organizations, produce huge volumes of knowledge through direct teaching-learning experiences.
Howell & Annansingh (2013) [24]	As economies become more knowledge intensive it has become evident to most organizations that knowledge is a valuable resource. This is particularly true in academic organizations, which have the generation and dissemination of knowledge as their principal mission. This research assesses whether path-dependency exists in relation to cultural expectations of knowledge generation and sharing in knowledge intensive organizations.

Special attention should be given to [18] and [17], which have the same saying, probably due to have two authors in common. In addition, [17] and [19] strengthen the importance of Knowledge Management (KM) in such organizations (universities, HEI, etc.). The six articles shown in Table 4 emphasized the importance of relations of universities with KIBS, mainly in the national innovation systems. As there were no specific sayings about the relations, only the titles of the articles are shown in Table 4.

Table 4: Relations of universities with KIBS

Author	Article Title
Yu (2006) [25]	University sci-tech innovation platform: A new mode of industry-academic links
Birchall (2007) [26]	The impact of academics in start-ups emerging from universities
Koch & Strotmann (2008) [27]	Absorptive capacity and innovation in the knowledge intensive business service sector
Chen, Zhang & Zao (2008) [28]	Factors influencing within knowledge-intensive services cluster: An empirical investigation of architecture design cluster around Tongji University
Laine (2009) [29]	The Role of Knowledge Intensive Business Service Firms in University Knowledge Commercialization
Ferreira & Fernandes (2012) [30]	Cooperation between KIBS and Universities: An Empirical Study

The three articles shown in Table 5 argue that R&D of universities or higher education institutions is a knowledge intensive service, as a service of a KIBS provider. This is coherent with the classification given by NACE (cod 73), as shown in Table 1, which classifies R&D as a sector of services of KIBS.

Table 5: R&D as a knowledge intensive business service

Author	Concept Indication
Koschatzky & Stahlecker (2010) [31]	[...] services as a subgroup of knowledge-intensive business services are considered to be increasingly crucial for the technological competitiveness of mature as well as high-tech industries. RD services are provided by firms and other organizations, which are able to transform heterogeneous knowledge stocks into high-value-added problem-solving activities.
García-Quevedo et al. (2013) [32]	Knowledge intensive services and, in particular, R&D services contribute significantly to innovation in firms.
Probert, Connell & Mina (2013) [33]	R&D service firms are highly innovative knowledge-intensive businesses.

Articles shown in Table 6 argue that TT, mainly conducted by Technology Transfer Offices (TTO) of universities, is considered KIBS. In [35] the importance of TTO to the financial sustainability of universities R&D projects is emphasized. Even though TT does not appear in NACE's classification of KIBS, based on the concept of a KIBS (produce and diffuse knowledge, which is crucial for innovation processes), it could surely so be classified as such.

Table 6: TT as a knowledge intensive business service

Author	Concept Indication
Sparrow (2011) [34]	Viewing knowledge transfer activities as knowledge intensive business services (KIBS), is one way to more fully understand the ways in which universities are supporting innovation in its broader sense. Understanding the competence of a university in terms of its service capability allows

	a university to develop strategies, tactics and initiatives to develop infrastructure and capacity.
Manderieux & Gasperoni (2011) [35]	For the above reasons and without any doubt TTOs are as well Knowledge-Intensive Service Providers that are in charge of the financial sustainability of universities' R&D projects and University/Industry R&D projects. [...] Bearing in mind the complex role and position of TTOs, thanks to this study we also assess some evidence of the way TTOs work as important service-providers in an environment where different interests, people, logics, methods and processes are affected and need to be considered.

According to the articles in Tables 5 and 6, only a part of the services provided by universities (R&D e TT) are classified as KIBS. On the other hand, the articles of Table 8 try, even though very smoothly, characterize universities (or HEIs) as KIBS. Reference [37] in particular argues that even polytechnics can act as universities or KIBS in providing science and technology related services. The concept of a polytechnic as KIBS is implicit in this case.

Table 7: Universities as knowledge intensive business services

Author	Concept Indication
Farkas & Dobrai (2012) [36]	The question is, how do HEIs relate to KIBS? Their service is based on knowledge, and, although not necessarily, but their activities often bring them close to business services. Hence, the same issues can be examined as in the case of business services.
Marttila, Lytinen & Kautonen (2008) [37]	Particularly in regions with no university of their own or with only few knowledge-intensive business services (KIBS) providers, they [polytechnics] may become, and in some cases already are, important providers of science-and-technology-related services.

Reference [36] presents an overview and analyzes the research on universities and other Higher Education Institutions (HEIs) from the perspective of knowledge and shows their role in providing knowledge intensive services: "The question is, how do HEIs relate to KIBS? Their service is based on knowledge, and, although not necessarily, but their activities often bring them close to business services. Hence, the same issues can be examined as in the case of business services" [36].

Further, these authors argue that through their research and lecturing activities, HEI belong to a group or services providers in the for-profit, the public and the nonprofit sector who are the forefront of knowledge creation, transfer and dissemination.

B. From the Case Study

The Research Group in Archaeology and Patrimonial Education – GRUPEP is a reference in the research of the archaeological heritage of the south of Santa Catarina, being a research group of the University of Southern Santa Catarina (UNISUL). It is an interdisciplinary research group that brings together teachers and students of History, Education, Geography, Agronomy, Architecture, Information Systems,

Life Sciences, Veterinary Medicine and Tourism to investigate the importance of archaeology to academy and to the productive sector, giving visibility and generating extensive discussions regarding the preservation, conservation and organization of the local archaeological heritage. GRUPEP was created in 2004 and until 2009 it was mainly focused on academic basic research. But, given the amount of knowledge created over time about the archaeological heritage of southern Brazil, companies and government start contact GRUPEP for projects related to archaeology services needed for infrastructure works, such as roads, railways, buildings, residential and industrial condominiums, etc. Since then, a significant number of projects, including research and services were executed, being the main services of GRUPEP's portfolio:

- Archaeological prospection;
- Archaeological monitoring;
- Archaeological saving;
- Trusteeship of archaeological artifacts;
- Patrimonial Education.

Analyzed on the aspects of an innovative and entrepreneurial university, where an entrepreneurial university adopts the mission of contributing to regional and national development [3] and a university that translates knowledge produced within the university into economic and social utility [1], without doubt, GRUPEP represents a sample of such definition. At the same time that GRUPEP's services enable companies to better project and execute infrastructure works, surrounding communities are affected by patrimonial education, getting more knowledge about their local archaeological heritage and being sure that the archaeological heritage is not negatively affected by the constructions. GRUPEP's activities are also coherent with Etzkowitz arguments that in entrepreneurial universities research groups operate as firm-like entities [1]. Those projects sponsored by companies bring resources needed to keep GRUPEP labs, technical/administrative activities and a series of other academic research and other activities. Etzkowitz arguments that those firm-like entities (research groups) lack only the direct profit motive can also partially be considered coherent. Even though GRUPEP do not strive for profit, it surely strives for its and for UNISUL's sustainability, as UNISUL is a non-profit organization. Analyzed on the aspects of a knowledge intensive business service, where KIBS are firms performing, mainly for other firms, services encompassing a high intellectual value-added [4], also, without doubt, GRUPEP represents a sample of such definition. Those services provided by GRUPEP to other firms and companies encompass high intellectual value-added and knowledge intensive services, affecting the services provided by those firms and companies. In the case of infrastructure constructions, such as roads, railways, buildings, residential and industrial condominiums, etc., projects and their respective executions are highly dependent and affected by the archaeological findings, monitoring and savings provided by GRUPEP.

V. CONCLUSIONS AND FUTURE WORK

The objective of this paper was to present an exploratory and descriptive study based on scientific literature on the relation between universities and KIBS, and to analyze a university's research group in the context of an innovative and entrepreneurial university and on knowledge intensive services provided to other firms. According to our findings, only a few attempts were made to study and categorize universities as KIBS providers, even though it is accepted that universities contain, create, disseminate and transfer much knowledge that is needed to innovate companies and society. There are studies that categorize universities as knowledge intensive organizations, others that discuss the importance of the relation between universities and KIBS in the context of national innovation systems, and a few articles that discuss research and development (R&D) and technology transfer (TT) as services of KIBS. Only two articles very smoothly argued that universities or HEI could, in some extent, be equivalent to KIBS. However, there are no deep studies about universities as KIBS providers, neither study arguing that universities are no KIBS providers. The university's research group analyzed in the contexts of an innovative and entrepreneurial university and on knowledge intensive business services, showed that in both cases activities and services provided by GRUPEP (the analyzed research group) are coherent with the respective concepts. By providing knowledge produced within the university to companies and to society, GRUPEP contributes to the economic and social development of the region where the services are provided. In addition, the services provided by GRUPEP contribute to its and to UNISUL's sustainability. This truly represents innovative and entrepreneurial university characteristics: contribution to regional and national development, translation of knowledge produced within the university into economic and social utility, and sustainability of the university. In addition, by providing knowledge through services that affect other firms and companies products and services, GRUPEP acts as a KIBS provider to these firms. Given the importance of the topic and that it is still incipient in relation to available studies; we expect an increase interest from researchers in the subject. Given the multiple existing views regarding the role of universities in the creation, dissemination and transfer of knowledge, theoretical insights that allow to establish similarities and differences between these visions can enable to advance in the field, and the analysis of the role of universities from the already relatively developed field studies of KIBS can help in this endeavor. Limitation of this study reside on the fact that the theoretical study considered only articles published on Scopus and Web of Science, and that the empirical study was based on a single research group, what eventually does not give the dimension of an entire university and does not allow generalizations. As future work, it is suggested to do a detailed mapping of all activities and services that characterize and are offered by innovative and entrepreneurial universities and further evaluate those that

could be categorized as KIBS. In addition, further exploratory and explanative studies should be conducted to better understand the knowledge lifecycle in innovative and entrepreneurial universities when interacting with the productive sector, the government and society. This could explain how the knowledge provided by universities affects companies and society.

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- (AGETEC), where he actively participates in the innovation management processes of the university. He is also a doctoral student at the Knowledge Management and Engineering Graduate Program (ECG) of the Universidade Federal de Santa Catarina (UFSC) and member of the Innovation, Management and Information Technology Research Group (IGTI) of UFSC.
- Piery Teza** is a doctoral student at the Knowledge Management and Engineering Graduate Program (EGC) of Universidade Federal de Santa Catarina (UFSC). He holds a master's degree in Production Engineering from the Universidade Federal de Santa Catarina (UFSC), a specialization degree in Production Engineering from Centro Universitário Leonardo da Vinci (UNIASSELVI), an undergraduate degree in Business Administration from Faculdade Estácio de Sá de Santa Catarina (FESSC) and an Electrical Technician degree from the Instituto Federal de Santa Catarina (IFSC). He is an assistant professor at the Universidade Estadual de Santa Catarina (UDESC) at the Business Administration Program. He has teaching experience in disciplines of innovation management, business strategy, market aspects, information systems, academic works, sales and promotional compound. He has professional experience in technical consulting and project management and execution in engineering. He is a member of the Innovation, Management and Information Technology Research Group (IGTI) of UFSC, conducting research in the area of innovation with focus on the front-end of innovation.
- Gertrudes Aparecida Dandolini** has an under-graduate degree in Mathematics (200), a master's degree in Production Engineering (1997) and a doctoral degree in Production Engineering (2000) from the Universidade Federal de Santa Catarina (UFSC). She was a professor at Universidade Federal de Pelotas between 2003 and 2007, where she coordinated the Mathematics Programs (classroom and distance learning). Currently, she is an associate professor at the Universidade Federal de Santa Catarina (UFSC) at the Knowledge Management and Engineering Department and a researcher at the Universidade Aberta do Brasil (UAB). At undergraduate level, she works with the disciplines of statistics and artificial intelligence. At graduate level, she collaborates with the Knowledge Management and Engineering Graduate Program (EGC) of UFSC in quantitative research methods and knowledge media courses. Research areas: distance learning, artificial intelligence (neural networks, fuzzy sets, and pattern recognition), assistive technologies, and intelligence for innovation.
- João Artur de Souza** has an under-graduate degree in Mathematics (1989), a master's degree in Mathematics and Scientific Computation (1993), a doctoral degree in Production Engineering (1999) and a postdoctoral degree from Universidade Federal de Santa Catarina (UFSC). He worked at the Universidade Federal de Pelotas from 1993 to 2007 as a professor of mathematics, including distance learning education. At the Universidade Federal de Pelotas he was also the coordinator of the Mathematics Distance Learning Program, where he obtained extensive experience with virtual learning environments, preparation of teaching materials and learning objects. Currently, he is an associate professor at the Universidade Federal de Santa Catarina (UFSC) at the Knowledge Management and Engineering Department. At the undergraduate level he works with disciplines of statistics, artificial intelligence and mathematical logic. At the graduate level he collaborates with the Knowledge Management and Engineering Graduate Program (EGC) of UFSC in quantitative research methods, intelligence for innovation, and management of information technology courses. Research Areas: distance learning, information and telecommunication technology, artificial intelligence (neural networks, fuzzy sets, and pattern recognition), assistive technologies, and intelligence for innovation.

AUTHOR'S PROFILE

Ademar Schmitz holds an undergraduate degree in Computer Science from the Universidade do Sul de Santa Catarina (Brazil, 2001), a master's degree in Computer Science from DePaul University (USA, 2004) and a specialization degree in Strategic Management of Higher Education Institutions from the Universidade do Sul de Santa Catarina and Fundação Dom Cabral (Brazil, 2010). He is a professor at the Universidade do Sul de Santa Catarina (UNISUL), with extensive experience in teaching programming languages and techniques, algorithm analysis and development, data structures and artificial intelligence (neural networks, fuzzy systems, case-based reasoning, etc.). In research, he emphasizes the application of methods and techniques of artificial intelligence, knowledge management, knowledge engineering, and innovation. Currently, he is the manager of the R&D Project Management Office of the Management, Scientific Development, Technology and Innovation Agency of UNISUL