



KNOWLEDGE INTENSIVE BUSINESS SERVICES AND TRADITIONAL SERVICES: AN INTERSETORIAL OVERVIEW OF SMALL AND MICRO ENTERPRISES

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Purpose: Verifying if the longevity of the Small and Micro Enterprises (SMEs) of Knowledge Intensive Business Services (KIBS) is different from the SMEs of Traditional Services Sectors (TSSs).

Methodology/approach: Quantitative analysis based on secondary data collected at the Junta Comercial do Estado de Minas Gerais (JUCEMG) and at the Instituto Brasileiro de Geografia e Estatística (IBGE) were carried out.

Main results: The first hypothesis of this study, which states that KIBS companies have a higher percentage of people employed with a higher education level in relation to TSSs companies, was not rejected by the survey. The second hypothesis, which states that KIBS firms have a longer longevity than TSSs companies, was rejected.

Theoretical/methodological contributions: Previous studies argued that KIBS are primary sources of innovation, however no studies were found that compared the longevity of SMEs of KIBS and TSSs. The previous studies did not show a uniform classification about KIBS. In this study, it was made an analysis of the longevity of SMEs of KIBS and a unification of several definitions of KIBS with an association with the national classification of industries of Brazil. This association can be applied by future studies.

Relevance/originality: SMEs are recognized as having great social and economic importance, mainly for the creation of jobs. KIBS are recognized for the generation of innovation for other companies, which can be decisive for the competitiveness. Therefore, the study of SMEs related to KIBS has significant importance for the economy.

Keywords: Knowledge Intensive Business Services; Small and Micro Enterprises; Longevity.

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1 INTRODUCTION

The Brazilian Micro and Small Business Support Service (SEBRAE - Portuguese acronym) and the Inter-union Department of Statistics and Socio-economic Studies (DIEESE - Portuguese acronym) identified in 2013 that the small and micro enterprises responded for 99% of the total number of the establishments, 52% of formal urban and private establishments and almost 42% of the wages paid to the employees of this establishments. SEBRAE (2015) datas indicates the social and economic importance of MPEs in Brazil.

Besides the evidence of the relevance of the SMEs on the Brazilian economy, the services industry also has a key role around Brazil and the world. According to Annual Service Survey, produced and provided by Instituto Brasileiro de Geografia e Estatística (IBGE), was estimated that 1.332.260 companies whose mains activity was in the field of non-financial services. These added up R\$ 1,4 trillion in net operational revenue, hired 13.0 million people and paid R\$ 289.7 billion in wages, withdrawals and other remunerations (IBGE, 2014).

In the economical services sector there is a special type of enterprises labeled as Knowledge Intensive Business Services (KIBS). They include organizations that are primary sources of information and knowledge. The activities developed by them are dependent on a specialized professional knowledge, such as engineering services, consulting, computer services, advertising etc. (Miles *et al.*, 1995).

The interest for these sectors becomes relevant due to the economic impact of this type of enterprise and to the shortage of academic studies on the subject. Therefore, the main aim of this study is verify whether the longevity of KIBS' SMEs is different from that of Traditional Service Sector SMES (TSSs). There are also other specific objectives, namely, compare such as the proportion of employed people with higher education in the KIBS and TSSs and draw up a descriptive overview of KIBS in the states of Brazil.

The KIBs' SMEs' longevity analysis is economically relevant, since the MPEs represented nearly 44% of the formal services jobs and around 70% of jobs generated in trade between 2009 and 2011. In addition, in the same period, its representativeness in service, trade and industry activities, was respectively about 98%, 99% and 95% of all formalized companies (Sebrae, 2014).



Despite its importance in the economy, the service sector presents a mortality rate higher than the other sectors index. According to SEBRAE (2013), which conducted a study on the survival rate of companies with up to two years of activity in Brazil, the service sector had a mortality rate of about 28%, while trade and industry sectors accounted for around 22% and 20% respectively. Based on this information, the questioning about the longevity of companies classified as KIBS, namely: Do Knowledge Intensive Business Services (KIBS) have a longevity rate higher or lower than the rate of service companies considered traditional?

From the academic point of view, the KIBS study is relevant, because there is still the need to evaluate its real impact on the economy, according to Freire (2006):

Although there are different levels of knowledge-intensive service activities in different countries, the impact of these services on economic performance has been highly significant in some locations. Studies show that there are relevant links between productivity and value added and KIB.(FREIRE, 2006, p. 111)

Bernardes and Andreassi (2007) assert that, economically, the KIBs represent a significant participation in the added value production, but do not show the same competence for job creation, in other words, they generate more value by employing fewer human resources, these resources with levels of qualification higher than those of other service segments. This outlook also helps to understand the choice of this research subject, considering that it presents as an opportunity to verify if there is a difference in the longevity of micro and small enterprises in the KIBS sectors, besides being able to evaluate the qualification levels of the employed people in the service sectors in Brazilian SMEs.

2 TRADITIONAL SERVICES SECTORS (TSSS)

According to Fitzsimmons and Fitzsimmons (2014), as the country's economy develops, the sector becomes even more important. He adds, it is essential to adopt great and competitive strategies, since the enterprises, of this sector, compete in an environment with relatively low entry barriers. There are several definitions for service, as inviolability and simultaneous consumption are common features among them. Since it is not possible to store a service, it is consumed as soon as it is produced resulting in immediate consumption (Meirelles, 2006). This section is also characterized for its heterogeneous activity regarding



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the companies size, average earnings and an intense use of technologies. Moreover, according to the Annual Service Search - PAS IBGE, 1.332.260 companies, whose principal activity was in the non-financial services field, have been estimated, which resulted in R\$ 1.4 trillion in net operational revenue, 13 millions employments and R\$ 289,7 billion reais in wages, withdrawals and other expenses, further strengthening the importance of this section in the Brazilian economy (IBGE, 2014).

The traditional services can be recognized as the opposite of the innovative services (Kleinknecht, Van Montfort & Brouwer, 2002). However, these same authors conclude in their study that low investment in Research and Development (R&D) and trademarks can carry several weaknesses such as the most frequent indicators of innovation in companies. Miles et al. (1995) replace the term Traditional Services by non-KIBS Services, and give as example the following sections: medical services; postal services, transportation and distribution, financial services and real state agency for the consumer; Educational services (except for specialized training for industry); **DIFUssion** and other types of medias (some possible exceptions); Retail and wholesale; Welfare services; Hotel business; Leisure/ tourism; Serviços de consumo pessoal; Entertainment.

Regarding the TSSs classification, besides Miles et al. (1995) classification, other authors, whose have quote TSSs' examples in this divergent context to the KIBS, weren't found in any other literature. Therefore, a TSS classification has been proposed based on former TSS classification made by IBGE, denominated Sectors Provided Mainly to Families, as described in Table 1. These sectors, besides being part of the characteristics of TSS, because, in their majority, invest little in innovation and present less frequent and significant changes, also have a predominance of small companies (IBGE, 2014), this factor can help to realize data collection and analysis of SME.

Table 1 - Classification of the sectors mainly provided to the families

Sectors (IBGE 2014)	Classification CNAE 2.0	Nº CNAE 2.0
Accommodations services	Hotels and alike	55.10-8
	Other types of accommodation not previously specified	55.90-6
Food services	Restaurants and other food and beverage service establishments	56.11-2



	Traveling food service	56.12-1
	Catering and other other types of prepared food services	56.20-1
Cultural, leisure and sporting activities	Performing arts, spectacle and complementary activities	90.01-9
	Artistic creation	90.02-7
	Spaces management for performing arts, spectacles and other artistic activities	90.03-5
	Gambling and betting activities	92.00-3
	Management of sports facilities	93.11-5
	Physical conditioning activities	93.13-1
	Sports activities not previously specified	93.19-1
	Amusement parks and theme parks	93.21-2
	Recreation and leisure activities not previously specified	93.29-8
Personal Services	Dry Cleaners and Laundromats	96.01-7
	Hairdressers and other beauty treatment activities	96.02-5
	Funeral activities and related services	96.03-3
	Personal service activities not previously specified	96.09-2
Atividades de ensino continuado	Activities supporting the education	85.50-3
	Sports teaching	85.91-1
	Art and culture teaching	85.92-9
	Language teaching	85.93-7
	Teaching activities not previously specified	85.99-6

Source: IBGE (2014).

3 KNOWLEDGE INTENSIVE BUSINESS SERVICES (KIBS)

The KIBS can be characterized by their relationship with the supply of innovation to other companies, as primary sources of information and knowledge (Hertog, 2000; Freire, 2006). This way, for a better KIBS approach, it is necessary a previous understand of how the various sectors of companies can be classified according to their innovations to, then carry out a theoretical deepening on its characteristics, functions and possible classifications.



The definition of the term innovation is important not only for a better understanding of KIBs, as well as for a deeper analysis of the longevity of companies, one of the key elements of this study. According to some studies, the innovation is recognized as a key success factor for the survival of companies, occupying a prominent role in the search for competitiveness (Benedetti, 2006; Brito, Brito & Morganti, 2009; Da Silva Néto & Teixeira, 2011). However, based on Da Silva Néto & Teixeira (2011), there isn't an only definition that defines the term.

Drucker (1986) points out innovation as a specific tool for entrepreneurs, a means for exploring business opportunities. According to the author, innovation can be learned and practiced as a subject of study. Drucker (1986) also states that innovation can be recognized as the ability to assign new functions and characteristics to the various business resources so that they generate financial returns. Despite different conceptual ways, several authors agree that innovation is characterized by the introduction of new and relevant ideas. Either through internal improvements, new product development or process changes (Pavitt, 1984; Girardi, 2002; Schumpeter, 2003; Rogers, 2010).

The Oslo Manual, published by the Organization for Economic Cooperation and Development (OECD), divides innovation into four types: product innovation, process, marketing and organizational. According to the Manual, innovation is a decisive factor for social and economic development. According to the OECD, the innovation degree contributes to the development of countries by increasing industrial productivity and the life quality of the population (OECD 2005).

According to Pavitt (1984), the innovations characteristics and variations can be classified into a taxonomy divided into three types of companies: (1) dominated by suppliers; (2) intensive production; (3) based on science. According to the author, the first type is composed by mostly small companies with limited R&D structure. Most of their innovations come from their suppliers and are process-oriented. According to this classification, companies in a given sector and in a given institutional context follow the same path of innovation. In this case, companies in the service sector that offer innovations to other firms would fit in the first type, according to Pavitt's taxonomy. These companies would be, later, classified as Intensive Services Knowledge Organizations by several other authors, as discussed below.

3.1 KIBS features and functions



The KIBS – *Knowledge Intensive Business Services*, are increasingly valued services in a world where knowledge and innovation have an increasing value. According to Freire (2006), in a scenario that has been consolidated in recent decades, innovation has become an essential factor for the competitiveness of companies. In this new socio-economic context, investment in knowledge, networking and technology appropriation become essential elements. And it is in this context that KIBS appear as core elements.

The large capacity of KIBS to generate high rates of knowledge and innovation, both internally and externally, for their clients, make them important pieces in this scenario where knowledge has become one of the main sources of competitive advantage. Several studies address the importance of these sectors for generating innovation and knowledge (Santos & Spring, 2015; Miozzo et al., 2016; Pina & Tether, 2016). In addition to the evidence of their influence on the performance of companies, KIBs are generators and users of knowledge that has been identified as a crucial resource for companies according to Nonaka & Takeuchi (2007) and Donate & Paul (2015).

Miles et al. (1995), responsible for the first mention of the term Knowledge Intensive Business Services, relate the following characteristics to KIBS: strongly depend on professional knowledge; are sources of information and knowledge; they use their knowledge to produce intermediation services for their customers; they are of competitive importance and are mainly supplied to companies. According to Miles et al. (1995), the KIBS include those institutions that promote generation, dissemination and accumulation of knowledge within economic systems.

According to Freire (2006), these services have some specific characteristics, as an expressive participation in generating value, the use of a greater number of highly qualified human resources and the operation as primary sources of information and knowledge. According to Freire (2006), the significant revenue production of KIBS is not accompanied by the jobs generation, because, despite being activities that produce much value, employs little skilled labour compared to other sectors of the economy. Lafuente, Vaillant and Vendrell-Herrero (2017) investigated the link between the growth of KIBS activity and the startups of the manufacturing sector, concluding that this connection between industry and service activities feeds territorial development, contributing to job creation in regional industries.

Freire (2006) also identified that KIBS have higher proportions of employed staff in higher education than any other sector of activity, proving the information that the sector uses



more skilled labor in comparison with other sectors of the economy. Freire (2006) concludes by stating that KIBS form a group with distinct characteristics: revenue generator, employer of skilled labour and trend of growth in recent years, following the trend of other countries, as shown in international literature. However, Freire (2006) uses a very broad analysis unit, for example, sectors SICs (various groups in this category) and manufacturing industry and "other services". Based on the terminology of the IBGE's National Classification of Economic Activity (CNAE), Freire (2006) used the "section" analysis unit of the CNAE which is very broad, as it encompasses the divisions, which contains the groups, and the groups in turn contain the classes. In this study it was decided to use a more precise analysis unit to reflect the specific nature of the different activities of the sectors KIBS and TSSs, specifically the unit of analysis "group" of the sectors was used. Therefore, based on the evidences of Freire (2006), we have the first hypothesis of this research. Hypothesis 1: companies of KIBS have higher percentage of people employed with higher education level in relation to TSS companies.

3.2 KIBS Classification

According to Freire (2006), the selection of sectors constituting KIBs is a challenge for analysts, researchers and statistical agencies. To find a consensus on the sectors classified as KIBs, a bibliographic study was conducted among the authors who explored this classification, resulting in the information listed in Table 2. It is noteworthy that the selected authors used different classifications of companies, varying, for example, according to the business classifications in force in the countries where each study was conducted or even according to the date of completion of the research. To illustrate this, the study by Muller and Doloreux (2009) used the NACE classification (European Classification of Economic Activities), while the Freire survey (2006) used the CNAE in its version 1.0, Brazilian classification which was later updated to version 2.0.

Table 2 shows a list of all the activities listed by the selected studies with those that would be their respective CNAE 2.0 classes. A decreasing ordering of activities was also performed according to the number of citations, to allow a later selection of the activities most cited by the main authors of the theme.



Table 2 – Survey of the classification of sectors considered KIBS

Sectors (nomenclatures used by authors)	Number of citations	Authors	KIBS' Classes (MILES <i>et al.</i> , 1995)	Classification CNAE 2.0	CNAE 2.0
<ol style="list-style-type: none"> 1. <i>Legal services</i> 2. <i>Legal activities</i> 3. <i>Legal, accounting and business advisory activities</i> 4. <i>Legal activities</i> 	4	<ol style="list-style-type: none"> 1. Miles <i>et al.</i>, 1995 2. Freire, 2006 3. Bernardes; Andreassi, 2007 4. Muller; Doloreux, 2009 	KIBS I	Legal activities other than notaries	69.1 1-7
<ol style="list-style-type: none"> 1. <i>Management Consultancy involving new technology</i> 2. <i>Consulting in computer systems</i> 3. <i>Consulting in computer systems and development of computer software</i> 4. <i>Software consultancy and supply</i> 	4	<ol style="list-style-type: none"> 1. Miles <i>et al.</i>, 1995 2. Freire, 2006 3. Bernardes; Andreassi, 2007 4. Muller; Doloreux, 2009 	KIBS II	Information Technology Consulting	62.0 4-0
<ol style="list-style-type: none"> 1. <i>Accounting and bookkeeping</i> 2. <i>Accounting and auditing</i> 3. <i>Legal, accounting and business advisory activities</i> 4. <i>Accounting, book-keeping and auditing activities; tax consultancy</i> 	4	<ol style="list-style-type: none"> 1. Miles <i>et al.</i>, 1995 2. Freire, 2006 3. Bernardes; Andreassi, 2007 4. Muller; Doloreux, 2009 	KIBS I	Accounting, consulting and auditing activities	69.2 0-6
<ol style="list-style-type: none"> 1. <i>Software</i> 2. <i>Software development</i> 3. <i>Consulting in computer systems and development of computer programs</i> 4. <i>Software consultancy and supply</i> 	4	<ol style="list-style-type: none"> 1. Miles <i>et al.</i>, 1995 2. Freire, 2006 3. Bernardes; Andreassi, 2007 4. Muller; Doloreux, 2009 	KIBS II	Development of custom computer programs	62.0 1-5
				Development and licensing of customizable computer software	62.0 2-3



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				Development and licensing of non-customizable computer programs	62.03-1
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<p>1. <i>Office services involving new office equipment</i> 2 and 3. <i>Maintenance and repair of office and computer machinery</i> 4. <i>Maintenance and repair of office, accounting and computing machinery</i></p>	4	<p>1. Miles <i>et al.</i>, 1995 2. Freire, 2006 3. Bernardes; Andreassi, 2007 4. Muller; Doloreux, 2009</p>	KIBS II	Repair and maintenance of computers and peripheral equipment	95.11-8
				Technical support, maintenance and other information technology services	62.09-1
<p>1. <i>Marketing/advertising</i> 2 and 3. <i>Advertising</i> 4. <i>Advertising</i></p>	4	<p>1. Miles <i>et al.</i>, 1995 2. Freire, 2006 3. Bernardes; Andreassi, 2007 4. Muller; Doloreux, 2009</p>	KIBS I	Advertising agencies	73.11-4
<p>1. <i>Building services</i> 2 and 3. <i>Architectural and engineering services and expert technical advice</i> 4. <i>Architectural and engineering activities and related technical consultancy</i></p>	4	<p>1. Miles <i>et al.</i>, 1995 2. Freire, 2006 3. Bernardes; Andreassi, 2007 4. Muller; Doloreux, 2009</p>	KIBS I	Architectural services	71.11-1
				Engineering Services	71.12-0
				Technical activities related to architecture and engineering	71.19-7
<p>1. <i>Management Consultancy</i> 2. <i>Consultancy on business management</i> 4. <i>Business and management consultancy activities</i></p>	3	<p>1. Miles <i>et al.</i>, 1995 2. Freire, 2006 4. Muller; Doloreux, 2009</p>	KIBS I	Business management consultancy activities	70.20-4
<p>2 and 3. <i>Ensaio de Materiais e de Produtos</i> 4. <i>Technical testing and analysis</i></p>	3	<p>2. Freire, 2006 3. Bernardes; Andreassi, 2007 4. Muller; Doloreux, 2009</p>	-	Tests and technical analysis	71.20-1



1. R&D Consultancy and "high-tech boutiques" 3. Research and development 4. Research and development	3	1. Miles <i>et al.</i> , 1995 3. Bernardes; Andreassi, 2007 4. Muller; Doloreux, 2009	KIBS II	Research and experimental development in physical and natural sciences	72.10 -0
				Research and experimental development in social and human sciences	72.20 -7
1, 2 and 3. Telecommunications	3	1. Miles <i>et al.</i> , 1995 2. Freire, 2006 3. Bernardes; Andreassi, 2007	KIBS II	Wireline Telecoms	61.10 -8
				Wireless telecoms	61.20 -5
				Satellite telecoms	61.30 -2

				Cable pay TV services	61.41 -8
				Pay TV operators by microwave	61.42 -6
				Satellite pay-TV operators	61.43 -4
2. Market research and public opinion polling 4. Market research and public opinion polling	2	2. Freire, 2006 4. Muller; Doloreux, 2009	-	Market and public opinion research	73.20 -3
1. Training	1	1. Miles <i>et al.</i> , 1995	KIBS I	Educational Support Activities	85.50 -3
1. Design	1	1. Miles <i>et al.</i> , 1995	KIBS I	Interior design and decoration	74.10 -2
				Graphic design	74.90 -1
				Technical activities related to architecture and engineering	71.19 -7



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1. <i>Some Financial Services</i>	1	1. Miles <i>et al.</i> , 1995	KIBS I	Administration of exchanges and over-the-counter markets	66.11 -8
4. <i>Research and experimental development in natural sciences and engineering</i>	1	4. Muller; Doloreux, 2009	-	R&D. Exp. in physical and natural sciences	72.20 -0
4. <i>Research and experimental development in social sciences and humanities</i>	1	4. Muller; Doloreux, 2009	-	R&D Exp. in social and human sciences	72.20 -7

Source: Developed by the author on the basis of the sources mentioned in Table 2.

4 METRICS OF PERFORMANCE

There are so many difficulties in calculate the performance of companies, especially when the object of analysis are SMEs. Some studies explore this difficulty in defining a performance metric of companies precisely because it's a complex and multidimensional construct (Combs, Crook, Shook, 2005; Richard et al., 2009; Venkatraman & Ramanujam, 1986). Richard et al. (2009) points out the limited effectiveness of commonly accepted measurement practices in explore this multidimensionality.

Standard (2011) also explores the difficulty in defining performance metrics in certain sectors. According to the Standard (2011), the performance of companies must be calculated according to the characteristics of each segment, in addition, in some cases, organizations may not have easily accessible financial data, making other forms of measurement more efficient and assertive.

To exemplify this growing concern with the use of alternative performance metrics, Peregrino de Brito and Ledur Brito (2012) proposes a model that combines profitability results and market growth and is operationalized via multilevel modeling, where each company's performance is tested against the industry average.

In this study, longevity was used as a performance metric for SMEs service sector for two reasons. First reason, what most impacts this sector is its high mortality rate. The high mortality rate of SMEs service sector was explored in a study by Sebrae, which



analyzed the survival rate of companies with up to two years of activity in Brazil (Sebrae, 2013). According to this study, the service sector had a higher mortality rate than the other sectors of the economy. Second reason, because measuring the performance of SMEs through financial data would be impractical due to the difficulty of accessing such data. No studies were identified that compared the longevity of SMEs in KIBs sectors to those in TSSs sectors. However, we can make a hypothesis based on two arguments. First, Fleck (2009) specifically argues that even centenary organizations risk terminating their activities, if they are embedded in environments that do not facilitate value creation. Secondly, companies in the KIB sector have the role of learning and creating innovations based on the nature of their knowledge-based activities, as argued, for example, by Fischer (2015) and Milbratz and Gomes (2017).

Therefore, the following hypothesis can be made: Companies in the KIBs sectors have a longer longevity than companies in the TSSs sectors.

5 METHODOLOGICAL PROCEDURE

Based on the classification presented by Farias Filho and Arruda Filho (2013), the methodological procedure used in the research is described in Table 3.

Table 3 – Classification of the methodological procedure of this study

Research Classification	
The Scientific Field	Monodisciplinary
Purpose	Applied
Time scope	Transversal
Aim	Exploratory and Descriptive
Character	Quantitative
Technical Procedure	Documentary research
Accomplishment Place	IBGE e Junta Comercial
Datas	Secondary datas

Source: The author



5.1 Methods of collecting and analyzing data

A geographic delimitation was made to make possible the obtaining of data and the accomplishment of the research, for that reason the city of Uberlândia was chosen, in the state of Minas Gerais. Some data collected justified the choice of the city of Uberlândia to host the study. As can be seen in Table 1 on page 18, the state of Minas Gerais has, in large part of the sectors, average growth similar to the national average, allowing the survey to be carried out in the state. In addition, Uberlândia is among the main cities of the country in relation to the economic and social aspect, is one of the main highlights of the Brazilian countryside and is the second most populous city in the state of Minas Gerais, behind only the capital, Belo Horizonte, in addition to the second largest GDP in the state (IBGE, 2017).

From the choice of sectors and the geographical region for the research, were acquired, together with the Commercial Board of the State of Minas Gerais, data referring to SMEs belonging to the selected sectors as representatives of KIBs and TSSs in Uberlândia, for comparative analysis. In order to enable the analysis, data were requested from all the companies opened in Uberlândia, Minas Gerais, and belonging to each of the selected sectors. The data obtained were the corporate name and CNPJ of the companies, besides a separation between active and extinct companies. When consulting the CNPJ of each company on the IRS website, the opening dates of all companies and the closing dates of extinct companies were surveyed. Through these data, the longevity variable was obtained to allow the analysis. This variable shows the number of days the company remained active. In the case of active undertakings, the calculation of longevity took into account the number of days between its opening and the date of calculation. In the case of extinct companies, the longevity calculation took into account the number of days between their opening and closing.

Regarding the analysis methods, the secondary data obtained were analyzed taking into account all the values that, in any way, were not or could not be provided and cannot be ignored or misinterpreted, known in the statistical field as missing values (Juster and Smith, 1997). In the case of this study, companies that did not have data to calculate longevity were excluded from the analysis. It was also performed an identification and



analysis of data that have high degree of divergence from the others, known as outliers. These divergences may be caused by some data entry failure or the result of an extraordinary event (HAIR et al, 2005). In the case of this study, outliers were also excluded from the analysis.

Statistical Package for Social Sciences (SPSS), version 23, was used to perform statistical analyzes to calculate the following measures: mean, standard deviation, asymmetry and kurtosis to analyze the positioning and dispersion of the longevity of companies. In order to analyze the necessary assumptions for multivariate analysis, the Kolmogorov-Smirnov test was performed to evaluate the normal distribution of data. As the Kolmogorov-Smirnov test is very rigorous, in cases where its results were negative, asymmetry and kurtosis indices were also analyzed. Another necessary premise for multivariate analysis is homoscedasticity, for this we used the Levene test that is provided by the SPSS in the comparison calculation of means.

To compare the mean longevity of the samples, the t-student test was used, which was used to calculate the mean comparison using the SPSS software. In order to verify the hypothesis that companies in the KIB sectors have a higher distribution of higher-level employed persons, the chi-squared test was performed between a KIB sector and a TSS sector. It was hypothesized in the chi-squared test that the expected distribution of employees by level of education in an KIB sector is not the same as a TSS sector.

5.2 Choice of research sectors

The studies of Freire (2006) and Bernardes and Andreassi (2007) opted for the use of sector identification according to IBGE CNAE. Therefore, this study chose to relate all sectors selected for analysis to CNAE 2.0.

5.2.1 Choice of KIBs' sectors

To choose the sectors of CIS, we selected the twelve sectors that obtained the highest number of citations in this research, as shown in frame 2, section 3.2. Among these most cited sectors, data were collected at IBGE to find and select the three fastest-growing KIB sectors in Brazil over the past three years with available data (2012-2015), as shown in Table 1. The choice of the three-year period of data collection and analysis considered the data available at IBGE and the average time frame suitable for the



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development of strategies in various sizes and segments of companies, as verified by Powell (2003).

In order to achieve the result, the number of active SMEs was calculated in those years, taking into account the categorization of Sebrae (2014), in which micro-enterprises employ up to nine people and small enterprises up to 49. In addition to the selection of the three sectors of KIBs, Table 1 was also prepared for a comparison between the growth of the sectors in Brazil and in the state of Minas Gerais. The KIBS sectors selected for research according to their growth rate were: Advertising – CNAE 73.1, Accounting Activities– CNAE 69.2 and Legal Activities – CNAE 69.1.

Tabela 1– Growth of KIBs’ SME in Minas Gerais and Brazil

CNAE	Local	Year		Sector growth
		2012	2015	
CNAE 62.0 Information technology services Activities	Local			
	Brasil	71.080	63.979	-10%
	Minas Gerais	5.571	4.945	-11%
CNAE 69.1 Legal activities	Local			
	Brasil	31.850	36.981	16%
	Minas Gerais	3.588	3.884	8%
CNAE 69.2 Accountant activities, accounting and tax consulting and audit	Local			
	Brasil	47.665	54.593	15%
	Minas Gerais	5.178	6.016	16%
CNAE 71.1 Architectural and engineering services	Local			
	Brasil	53.928	58.433	8%
	Minas Gerais	8.110	8.428	4%
CNAE 73.1 Publicity	Local			
	Brasil	29.579	34.051	15%
	Minas Gerais	2.390	3.008	26%
CNAE 95.1	Local			

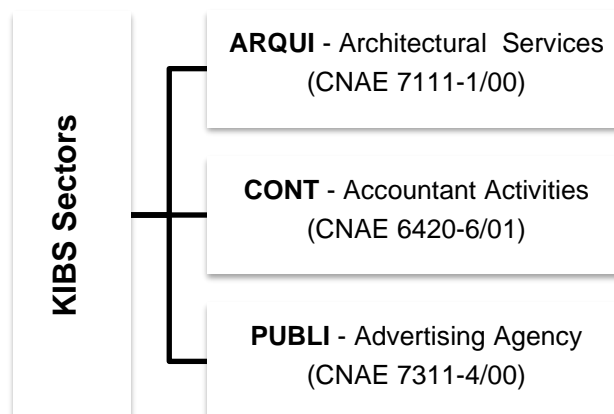


Computer Equipment Repair and Maintenance		2012	2015	
	Brasil	24.740	22.878	-8%
	Minas Gerais	2.133	1.954	-8%

Source: IBGE -Table 987. Adequacy and calculation of growth made by the author.

As can be observed in Table 1, IBGE provides data from sectors relating them to the CNAE 2.0 classes, limiting the three-digit categorization of the CNAE, which has a division of up to seven digits. However, the JUCEMG requires, for the acquisition of data, that the CNAE be supplied detailed in its subclasses, that is, with the seven digits. To make this choice, the sectors most representative in number of companies within each class were selected. The final choice of sectors of SICs is illustrated in Figure 1 below, along with their respective CNAE codes and an identifier code of each of the sectors, which served to relate them in tables and other data below:

Picture 1- Chosen KIBS section



Source: The author.

5.2.2 Choice of TSSs

For the selection of the representative sectors of STSs, the sectors mentioned in Picture 1 in Chapter 2 were selected, those that had the highest growth in the last three years of data available at IBGE. For this purpose, the indexes of growth between 2012 and



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2015 of the ten sectors available for research were analyzed according to the CNAE group 2.0 to which they belonged, as shown in Table 2 below. The STSs selected for the research were: Catering services, catering and other food services prepared – CNAE 56.2, Activities supporting education – CNAE 85.5 and Other teaching activities – CNAE 85.9. The choice of the three-year period for data collection and analysis followed the same logic presented for the SCI sectors in section 5.2.1.

Table 2– Growth of TSS MPE in Minas Gerais and Brazil

	Location	Year		Sector growth
		2012	2015	
CNAE 55.1 Hotels and similar	Brasil	28.880	29.771	3%
	Minas Gerais	3.612	3.697	2%
CNAE 55.9 Other types of accommodation not previously specified	Brasil	4.921	4.708	-4%
	Minas Gerais	596	537	-10%
CNAE 56.1 Restaurants and other food and drink services	Brasil	257.294	255.424	-1%
	Minas Gerais	28.700	28.553	-1%
CNAE 56.2 Catering and other types of prepared food services	Brasil	21.777	24.048	10%
	Minas Gerais	1.678	1.879	12%
CNAE 90.0 Artistic, creative and entertainment activities	Brasil	17.662	16.913	-4%
	Minas Gerais	1.469	1.429	-3%
CNAE 92.0 Gambling and betting activities	Brasil	473	124	-74%

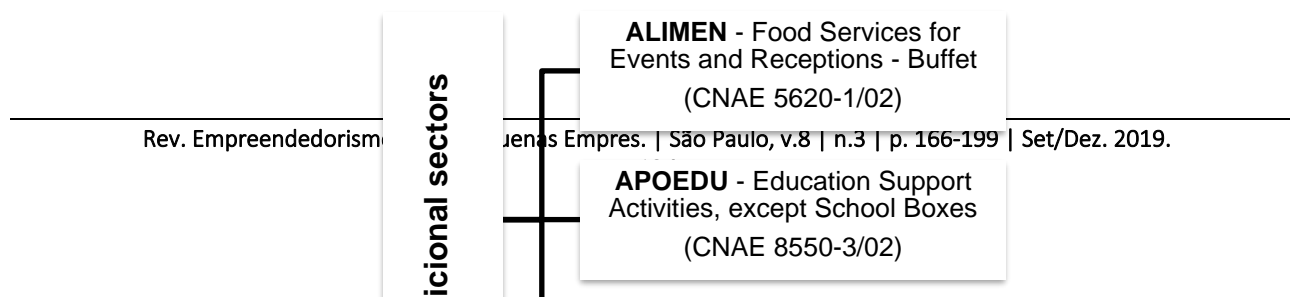


	Minas Gerais	53	19	-64%
CNAE 93.2 Recreation and leisure activities	Location		Year	
		2012	2015	Sector growth
	Brasil	11.564	8.898	-23%
	Minas Gerais	1.313	969	-26%
CNAE 96.0 Other personal service activities	Location		Year	
		2012	2015	Sector growth
	Brasil	61.543	58.447	-5%
	Minas Gerais	5.314	5.205	-2%
CNAE 85.5 Activities to support the Education	Location		Year	
		2012	2015	Sector growth
	Brasil	16.915	62.084	267%
	Minas Gerais	4.956	6.776	37%
CNAE 85.9 Other types of teaching activities	Location		Year	
		2012	2015	Sector growth
	Brasil	52.328	61.261	17%
	Minas Gerais	5.648	6.532	16%

Source: IBGE -Table 987. Adequacy and calculation of growth made by the author.

Also to work around the numerical divergence between CNAE data provided by IBGE and JUCEMG, were selected the most representative sectors in number of companies within each class of traditional sectors. The final choice of TSS is illustrated in Picture 2 below, along with their respective CNAE codes and an identifier code of each of the sectors, which served to relate them in tables and other data below:

Picture 2- Chosen traditional sectors



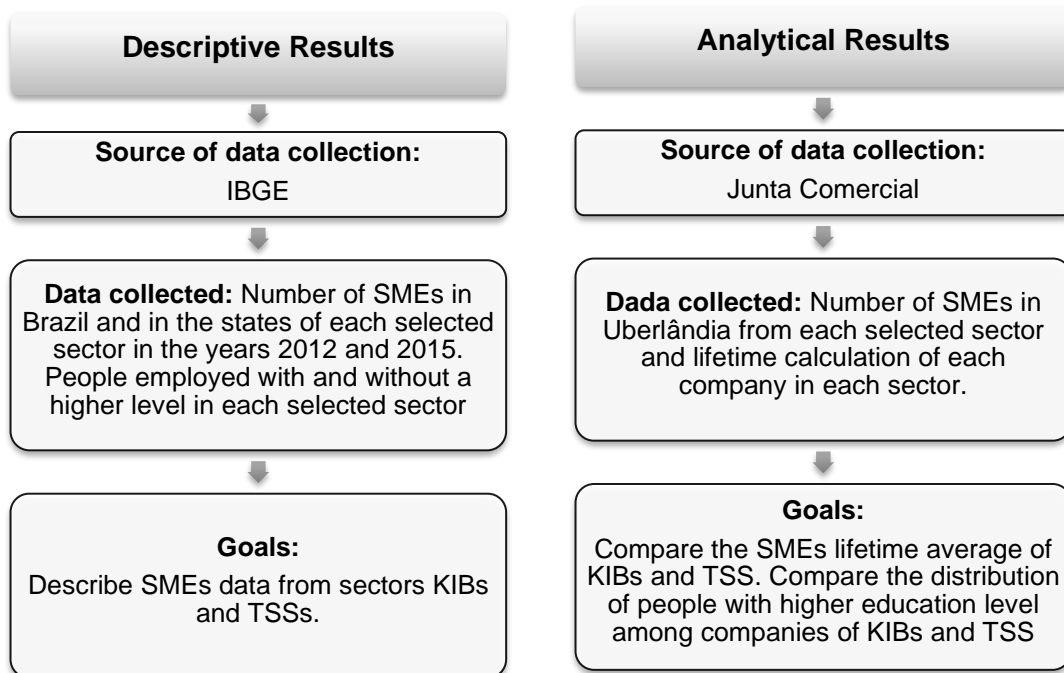


Fonte: O autor.

6 RESULTS AND ANALISES

The results obtained in this research have been divided into descriptive and analytical diagrams, as shown below in Figure 3:

Figure 3 - Descriptive and analytical Results



Source: The author.

6.1 Descriptive Results



6.1.1 Comparison between KIBs and TSSs in Brazil and states

Table 3 shows the number of SMEs of TSSs and TSSs selected and a comparison between the percentage of companies of TSSs and KIBs by state. When analyzing the numbers, it is possible to observe that the state of Tocantins, contrasts with the others indices of the North region, has the highest percentage of KIBs companies (63.5%) when compared to the other states of the country, while the state of Acre has the lowest percentage of KIBs companies (17.6%).

We can also observe observe that all the states that make up the Southeast and Center-West regions have a larger number of KIBs companies than the traditional ones. It contrasts with all the states that make up the Northeast of the country have a smaller number of KIBs companies than TSSs.

Table 3- SME analysis of KIB x TSS by Geographic Region

Region	State	Total SME TSS	Total SME KIB	Total TSS (%)	Total KIB (%)
Southeast	SP	44201	50065	46,9%	53,1%
	MG	15187	17452	46,5%	53,5%
	RJ	11345	13486	45,7%	54,3%
	ES	2851	2834	48,1%	51,9%
South	PR	11169	11271	50,2%	49,8%
	RS	10008	11083	47%	53%
	SC	6758	5458	55,3%	44,7%
Northeast	BA	8085	7627	51,5%	48,5%
	CE	4917	4278	63,4%	36,6%
	PE	4306	3161	59%	41%
	MA	2343	1743	67,6%	32,4%
	PB	2173	1302	69,1%	30,9%
	PI	1846	1125	71,3%	28,7%
	RN	1827	970	58,4%	41,6%
	AL	1386	782	64,7%	45,3%
	SE	916	755	53,9%	46,1%
Midwest	GO	3971	3073	48,1%	51,9%



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	DF	2465	2378	43,8%	56,2%
	MT	2221	1574	48,3%	51,7%
	MS	1634	909	48,4%	51,6%
	PA	3507	2993	69%	31%
	AM	1508	849	62,4%	37,6%
	RO	819	743	53,6%	46,4%
North	AC	749	709	82,4%	17,6%
	AP	526	166	76%	24%
	TO	487	160	36,5%	63,5%
	RR	188	131	58,9%	41,1%

Source: IBGE - Table 992. Adequacy and calculation of percentage made by the author.

6.1.2 Comparison between growth rate and number of SMEs of the selected KIBs sectors in the states

Through the obtained datas of the number of companies and the calculation realized of the growth rate of the KIBs sectors, each state has been ranked according to its size (number of KIBs) and growth (growth rate of the companies with respect to the median), specifically, whether the state is below or above the median. The results are shown in figures 4, 5 and 6 below.

Picture 4 - Growth Rate x Companies by Sector and by State - Advertising – 73.1

^ GROWTH

High growth and low size: AL, PI, RN, SE	High growth and high size: CE, ES, GO, MT, MS, MG, PR, PE, RS, SC
Low growth and low size: AC, AP, AM, MA, PA, PB, RO, RR, TO	Low growth and high size: BA, DF, RJ, SP

SIZE >

Source: Developed by the author based on IBGE data.

Picture 5 - Growth Rate x Companies by Sector and by State - Architecture – 71.1

^ GROWTH



High growth and low size: AL, AP, PB, PI, RO, RR, TO	High growth and high size: GO, MT, MS, PR, PE, RS, SC
Low growth and low size: AC, AM, MA, PA, RN, SE	Low growth and high size: BA, CE, DF, ES, MG, RJ, SP

SIZE >

Source: Developed by the author based on IBGE data.

Picture 6 - Growth Rate x Companies by Sector and by State - Accounting – 69.9

^ GROWTH

High growth and low size: AL, AP, AM, MS, PB, PI, RN	High growth and high size: CE, GO, MT, MG, PA, PR, PE
Low growth and low size: AC, MA, RO, RR, SE, TO	Low growth and high size: BA, DF, ES, RJ, RS, SC, SP

SIZE >

Source: Developed by the author based on IBGE data.

We can observe that the states that have a high number of companies in comparison with the national average and that present a high rate of growth between 2012 and 2015. Only the states of Paraná, Goiás, Mato Grosso and Pernambuco presented good indicators of size and growth in the three KIB sectors selected for this analysis. Among the three states with the largest number of companies, only Minas Gerais showed good growth rates in two of the sectors analyzed, while São Paulo and Rio de Janeiro had growth rates below the national average. By analyzed states, sixteen presented a low growth rate in all the analyzed sectors.

6.1.3 Number of persons employed with and without upper level in the KIB and TSS sectors

Tables 4 and 5 below show a comparison between the number of people employed with and without upper level in all selected analyzed sectors.



Table 4 - People employed with higher education degree – Brazil (KIBS)

KIB sectors	Number of employees	Number of employees with higher education degree	% people without higher education degree
69.2 – CONT	243.665	24,75%	75,25%
71.1 – ARQUI	78.426	23,21%	76,79%
73.1 – PUBLI	45.180	32,38%	67,62%

Source: Elaborated by the author based on data from IBGE – Table 992.

Table 5 - People employed with higher education degree – Brazil (TSS)

TSS sectors	Number of employees	Number of employees with higher education degree	% people without higher education degree
56.2 – ALIMEN	88.674	4,29%	95,71%
85.5 – APOEDU	13.547	9%	91%
85.9 – ESPOR	201.426	26,23%	73,77%

Source: Elaborated by the author based on data from IBGE – Table 992.

Table 4 shows that the three KIB sectors analyzed have an employed rate with an upper level above 20%, and the KIB Advertising Agency sector has the highest rate among all surveyed persons (32.38%). On the other hand, in Table 5 it can be seen that the TSS Food Services and Education Support Activities have an employed personnel rate with a higher level below 10%, and the lowest rate among all sectors surveyed is in the Food Service sector (4.29%).

6.2. Analytical Results

6.2.1 Distribution of employed persons with upper education



The **Chi-squared** test was performed using the following conditions and the results are shown in Table 4.

Variable: Distribution of employees with upper education

HA - We can observe a difference between KIB and TSS (upper level)

HB - We can observe no difference

Table 4 - Chi-squared test results

KIBS	TSS	<i>p-value</i>	Hypothesis Test results
69.2 – CONT	56.2 – ALIMEN	0,000	HA Not Rejected
71.1 – ARQUI	85.5 – APOEDU	0,000	HA Not Rejected
73.1 – PUBLI	85.9 – ESPOR	0,000	HA Not Rejected
69.2 – CONT	85.5 – APOEDU	0,000	HA Not Rejected
71.1 – ARQUI	56.2 – ALIMEN	0,000	HA Not Rejected
73.1 – PUBLI	85.9 – ESPOR	0,000	HA Not Rejected
69.2 – CONT	85.9 – ESPOR	0,000	HA Not Rejected
71.1 – ARQUI	85.5 – APOEDU	0,000	HA Not Rejected
73.1 – PUBLI	56.2 – ALIMEN	0,000	HA Not Rejected

Source: The Author.

The results of the tests, shown in Table 4, did not reject the HA hypothesis, which states that there is a difference between people employed with an upper level in the TSS and KIB sectors. Thus, Hypothesis 1, assumed in item 3.1, is not rejected in a more precise unit of analysis (CNAE group).

2. Multivariate Analysis Assumptions

2.1 Normality



In order to evaluate the normal distribution of data, the Kolmogorov-Smirnov tests were performed in all selected sectors. As it was a high-precision test, the asymmetry and kurtosis indexes were collected in sectors whose Kolmogorov test result was negative. As we can see in Table 5 below, only the APOEDU and ESPOR sectors showed positive results in the test, with retention of the null hypothesis. The tests were performed with a significance level of 5%.

Variable: Distribution of company longevity

HA - Longevity distribution is normal

HB - Not normal

Table 5 - Results of the Kolmogorov test

Sector	Test Results
TSS - ALIMEN	HA Rejected
TSS - APOEDU	HA Not Rejected
TSS - ESPOR	HA Not Rejected
KIB - ARQUI	HA Rejected
KIB - CONT	HA Rejected
KIB - PUBLI	HA Rejected

Source: The author.

As shown in Table 5, the Kolmogorov-Smirnov test has a high rigor level and some distributions have been rejected, like in the KIB-ARQUI sector case. That is why, the asymmetry and kurtosis indexes are shown in Table 6 below. According to Souza Miguel and Ledur Brito (2010), so that there is no interference in the multivariate analysis, the indices of asymmetry can not exceed two and those of kurtosis should not be higher than seven.

Table 6 - Asymmetry and short-term index

Sector	Asymmetry	Short term
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TSS - ALIMEN	0,620	-0,450
KIB - ARQUI	1,007	0,198
KIB - CONT	0,452	-0,890
KIB - PUBLI	0,598	-0,325

Source: The author.

According to the results of Table 6, one can assume the normality hypothesis, since both the asymmetry and the kurtosis indices allow to conclude that there will be no interference in the multivariate analysis.

2.2 Homoscedasticity (Levene Test)

Another necessary premise for the multivariate analysis is the homoscedasticity, to detect the degree of dispersion of the variances related to the longevity of the sectors. For this purpose the Levene test, performed by the SPSS software, will be used.

The Levene test was performed with a significance level of 5% as shown in Table 6. In seven of the fifteen comparisons, the hypothesis of homoscedasticity was rejected, which may have occurred due to the difference of samples size, according to Hair et al. (2005). In these cases, we can concluded that the variances are different in both groups, since the significance associated to the test is less than 0.05. As the homogeneity of the variances is not assumed, the values of Non Equal Assumed Variations in Student's t test will be used to evaluate the difference between the average longevities between the sectors.

Table 6 - Levene test results for equality of variances

Kind of Comparison	KIB sectors	TSS sectors	<i>p-value</i>	Test Result
KIB x TSS	ARQUI	ALIMEN	0,000	Rejected
	ARQUI	APOEDU	0,000	Rejected
	ARQUI	ESPOR	0,000	Rejected
	CONT	ALIMEN	0,057	Not Rejected
	CONT	APOEDU	0,082	Not Rejected
	CONT	ESPOR	0,270	Not Rejected



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	PUBLI	ALIMEN	0,129	Not Rejected
	PUBLI	APOEDU	0,224	Not Rejected
	PUBLI	ESPOR	0,586	Not Rejected
TSS x TSS		ALIMEN x APOEDU	0,029	Rejected
		ALIMEN x ESPOR	0,043	Rejected
		APOEDU x ESPOR	0,340	Not Rejected
KIB x KIB	ARQUI x CONT		0,000	Rejected
	ARQUI x PUBLI		0,000	Rejected
	CONT x PUBLI		0,681	Not Rejected

Source: The author.

6.3. Comparison between the average longevity of the sectors

Table 7 below shows data of companies longevity, showing the average and margin of error of longevity measured in days and referring to the six analyzed sectors.

Tabela 7 - Média e desvio padrão da longevidade dos setores

Sector	KIB ou TSS	Number of enterprises	Average longevity (days)	Standard deviation of longevity (days)
69.2 – CONT	SIC	391	1436,90	899,75
71.1 – ARQUI	SIC	119	2029,73	1702,30
73.1 – PUBLI	SIC	105	1655,14	930,08
56.2 – ALIMEN	STS	452	1370,53	985,36
85.5 – APOEDU	STS	26	1367,50	749,93
85.9 – ESPOR	STS	76	1666,39	847,46

Source: The author

The Table 7 results indicate that only the Architecture Services sector presented the average longevity over 2,000 days, and the other sectors an averages between 1,300 and 1,700 days.



Student t tests were performed to compare the average and margin of error among all sectors. The results are shown in Table 7 below.

Variable: Longevity

HA - We can observe a difference in the average longevity

HB - We can observe no difference

Table 7 - Student t test results for comparison of averages

Setor	SIC ou STS	Nº de empresas	Média da longevidade (dias)	Desvio padrão da longevidade (dias)
69.2 – CONT	SIC	391	1436,90	899,75
71.1 – ARQUI	SIC	119	2029,73	1702,30
73.1 – PUBLI	SIC	105	1655,14	930,08
56.2 – ALIMEN	STS	452	1370,53	985,36
85.5 – APOEDU	STS	26	1367,50	749,93
85.9 – ESPOR	STS	76	1666,39	847,46

Fonte: O autor.

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Student t tests were performed to compare the average and margin of error among all sectors. The results are shown in Table 7 below.

Variable: Longevity

HA - We can observe a difference in the average longevity

HB - We can observe no difference

Quadro 7 - Student t test results for comparison of averages

Kind of Comparison	KIB Sector	TSS Sector	Difference between the averages	<i>p-value</i>	Test Result
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SIC x STS	ARQUI	ALIMEN	659,20	0,000	HA Not Rejected
	ARQUI	APOEDU	662,23	0,003	HA Not Rejected
	ARQUI	ESPOR	363,34	0,050	HA Not Rejected
	CONT	ALIMEN	-66,36	0,310	HA Rejected
	CONT	APOEDU	69,40	0,655	HA Rejected
	CONT	ESPOR	229,49	0,041	HA Not Rejected
	PUBLI	ALIMEN	284,61	0,008	HA Not Rejected
	PUBLI	APOEDU	287,64	0,146	HA Rejected
	PUBLI	ESPOR	11,25	0,934	HA Rejected
STS x STS		ALIMEN x APOEDU	3,03	0,984	HA Rejected
		ALIMEN x ESPOR	295,86	0,007	HA Not Rejected
		APOEDU x ESPOR	298,89	0,114	HA Rejected
SIC x SIC	ARQUI x CONT		592,83	0,000	HA Not Rejected
	ARQUI x PUBLI		374,59	0,040	HA Not Rejected
	CONT x PUBLI		218,24	0,030	HA Not Rejected

Source: the author.

The results in Table 7 indicate that there are no differences between the means of longevity of the sectors in six of the fifteen comparisons. As for the comparisons between SICs and STSs, which can be observed in the first nine lines of comparisons in Table 7, it can be observed that there was no difference in longevity in four of the nine comparisons. The ARQUI sector has a greater longevity than the three STS sectors, being the only sector that complies with Hypothesis 2. The CONT and PUBLI sectors have a greater longevity than only one STS sector each. This result points to a rejection of Hypothesis 2.

7 CONCLUSION



The main objective of the study was to verify if the longevity of SMEs of KIBs was different from the SMEs of Traditional Sectors of Service (TSSs). In addition, it was proposed as secondary objectives to check if the proportion of employed persons with an upper level in the companies considered KIBs was different from the proportion of companies considered TSSs, besides elaborating a descriptive panorama of the KIBs in the Brazilian states. Two hypotheses were formulated for the tests performance and results analysis. Hypothesis 1 states that KIB companies have a higher percentage of employed people with an upper education level compared with TSS companies. Hypothesis 2 states that SMEs in KIB sectors have a higher longevity than those in TSS sectors.

In relation to Hypothesis 1, the conclusion derived from Table 4 indicates that one can not reject the hypothesis that KIB companies have a higher percentage of employed people with an upper education level in relation to TSS companies. This result indicates that even when analyzing more specific KIBs sectors, and more accurately representing the nature of their activities, the logic that SICs companies have a higher proportion of skilled workers than TSSs companies is still valid. This verification was an academic contribution of this study in relation to the previous study of Freire (2006). Regarding Hypothesis 2, the results presented in Table 7, indicate that there is no difference of longevity between SMEs, KIBs and TSSs. This result, which is the main academic contribution of this study, is an evidence that information, knowledge and innovation, which characterize KIBs companies (Miles et al., 1995), may not be sufficient in longevity of SMEs in KIBs sectors.

In relation to the descriptive panorama of SMEs of KIBs in the Brazilian states, the data in Table 3 and Figures 4, 5 and 6 indicate that the number of SMEs in KIBs is higher in the state of São Paulo and that only the states of Paraná, Goiás, Mato Grosso and Pernambuco showed good indicators of size and growth in the three KIB sectors selected for this analysis. This study shows some limitations, specially the possibility of some inactive companies did not give information, which influences the calculation of longevity and the difficulty of framing companies in sectors that diverge from their main activity.

In relation to the possibilities of future researches derived from this study, we have carried out researches related to other KIBs sectors and to the KIBs sectors that had low growth rates. Analyzes of schooling rates can be approached in a deeper way, including



other levels of education beyond university. It is also possible to develop a research with a qualitative approach involving the outliers of the present study who presented a longevity far superior from the average of the other companies, in order to investigate the possible causes of the divergence and if these causes are related to the adopted strategies by the entrepreneurs. Finally, the study can be replicated in other places of Brazil and of the world, so that its validity and applicability can be verified.

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