

**THE DYNAMICS OF LOCATION OF THE KNOWLEDGE INTENSIVE
BUSINESS: AN EMPIRICAL STUDY**

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Abstract

The main objective of the present research is to identify the existence of distinct types of Knowledge Intensive Business Service (KIBS) and to analyse possible differences between them as to the factors that influence the location of new KIBS firms. To this effect, we advance a conceptual research model of location factors. A survey involving 66 KIBS in the Beira Interior region (Portugal) was conducted. Data were submitted to two types of statistical analyses: bivariate and multiple analyses. We classified companies according to two types of KIBS: professional and technological and according the results it was possible to classify a typology of KIBS and identify the location factors as well as decision-making model for location of firms.

Key Words: KIBS, innovation, location factors, regional development

1. Introduction

Interest on economic information services goes back to 1980, at a time when regional development in Europe and North America was concerned with desindustrialization. Until then, those services were seen as mere subsidiaries of transforming activities. Over the last 20 years, special attention has been paid to the roles performed by those services. Desindustrialization has continued, yet, some services' sectors have shown a progressive rise (Wood, 2005).

Despite growing awareness that innovation is not confined to sheer technical processes and products, some recent research on innovative activities has focused its attention only on technical innovation and, in particular, on the transforming industries sector (Becker and Dietz, 2004; Huergo and Jaumandreu, 2004; Lynskey, 2004; Nieto and Santamaria, 2005).

The importance of the services industry has only been acknowledged recently (Gallouj and Weinstein, 1997; Tether, 2003). According to Tether *et al.* (2001) innovation in the service industry companies is perceived as something that occurs very slowly. Services are perceived as being incapable of innovation, ending up adopting innovation generated by transforming industry firms. Alongside Tether *et al.* (2001), Pavitt (1984) also believes that smaller services firms are less likely to develop R&D roles, thus becoming recipients of technology and innovation produced in other sectors.

Within the services industries, the rapid growth of Knowledge Intensive Business Service (KIBS) have exposed their major role in innovation processes (Muller, 2001; Howells and Tether, 2004; Toivonen, 2004; Koch and Stahlecker, 2006). The role played by KIBS in the innovation process is affirmed, above else, by the fact that they do not have a simple performing role in the innovating activity, such as meeting demand and, more specifically, their clients' wishes. Rather, they act as builders of "knowledge bridges", or "innovation bridges", between firms and science (Miles *et al.* 1995; Czarnitzki and Spielkamp, 2003). Nevertheless, few studies have been made on the innovative activity carried out by this sector of services (Koch, and Strotmann, 2008). In the opinion of Howells (2000), the fact that very few studies on innovation in the sector of services exist lies, basically, in the fact that this sector in particular is very heterogeneous in its origin, which disheartens many researchers. However, and according to Howells (2000) there has been a constant rise in the number of firms

operating in the sector of services. Particularly with regard small KIBS, their place as dynamic and core players in the “new” knowledge-based economies has been acknowledged. This position has been achieved thanks to their innovative creations, in their own benefit, which means that they have ceased to be perceived as mere adopters or users of new technologies developed by others. This recognition has fostered recent research on this sector of services – KIBS (Wong and He, 2005).

In this context, the present research aims identify the existence of distinct types of KIBS, and to analyse the possible differences between them as to the factors that influence the location of new KIBS firms in a particular region.

The research is structured as follows: next to this introduction, comes the nature and characteristics of the KIBS and their relationship to regional development, innovation. In the third section, theoretical approaches on firm’s location are developed, research hypotheses are formulated, and the research model is proposed. In the fourth section the research methodology is presented. In the fifth section, the analysis and discussion of the research results is presented, where the locations factors are identifies and the typology of KIBS developed. In the end, the final considerations, limitations and future lines of research are addressed.

2. KIBS: Characteristics and nature, Innovation, Regional Development and Location

Although the debate on the growth of KIBS swirls around their new specializations and the rise of the tertiary sector in general, it is becoming increasingly obvious that both the new manufacturing processes and the new services and innovations in general find their origin more and more on KIBS (KaraÅmerlioglu and Carisson, 1999; Tomlinson and Milles, 1999).

Hauknes (1999) draws our attention to a particularly significant question: what is, after all, Knowledge Intensity? (This question is posed in terms of the transactions’ conditions and provenance of services). This author suggests the existence of two dimensions of Knowledge Intensity, which are: (i) the knowledge one aims to obtain from a particular services supplier. Depending on the level of specialization in intensive knowledge on the part of the supplier, whoever requires a supplier of this type of services, will chose one type of supplier or another. (ii) the knowledge one aims to obtain from a particular intensive knowledge service. In this case, Knowledge Intensity

allows consumers to choose a service in detriment of another, taking into account its higher or lower degree of knowledge intensity.

Miles *et al.* (1995) distinguish three fundamental characteristics in KIBS: (i) these firms pay a lot of attention to professional knowledge; (ii) these firms wish to be, in their own right, primary information and knowledge resources, or use their knowledge to produce services that act as intermediaries between themselves, clients and their production processes; (iii) the services that KIBS offer firms are extremely important to the latter, in terms of competition and competitiveness.

Frell (2006) concluded that technological KIBS¹ employ higher qualified people, and that this relates to their level of innovation. In the case of professional KIBS, the author noticed that the relationship between them, suppliers and clients fosters innovation. As for the transforming industries, as it is not in their interest to invest in R&D, their level of innovation is extremely low (Freel, 2006).

According to Amara *et al.* (2008), KIBS arise out of knowledge-based services. In this type of industry, transactions take place at the level of knowledge, and outputs are often intangible. In most cases, innovations are the product of new knowledge combinations, instead of new combinations of physical artefacts.

Coffey (2000) stresses the growing interest in High-Order Producer Services (HOPS), as their important role in Western economies since the late 1970s and beginning of the 1980s has been amply acknowledged. As service producers, their rapid growth in this specific segment of the economy has been perceptible (Daniels, 1985; Coffey and Shearmur, 1997). On the other hand, their role in the competitiveness of regions has also been observed and deserved the attention on the part of regional geographers and scientists (Beyers and Alvin, 1985; Coffey and Polèse, 1987; Drennan, 1987 and Illeris, 1996).

Nevertheless, there is a great deal of difficulty in finding distinct definitions for KIBS and HOPS (High-Order Producer Services), as both expressions are used to define the services sector.

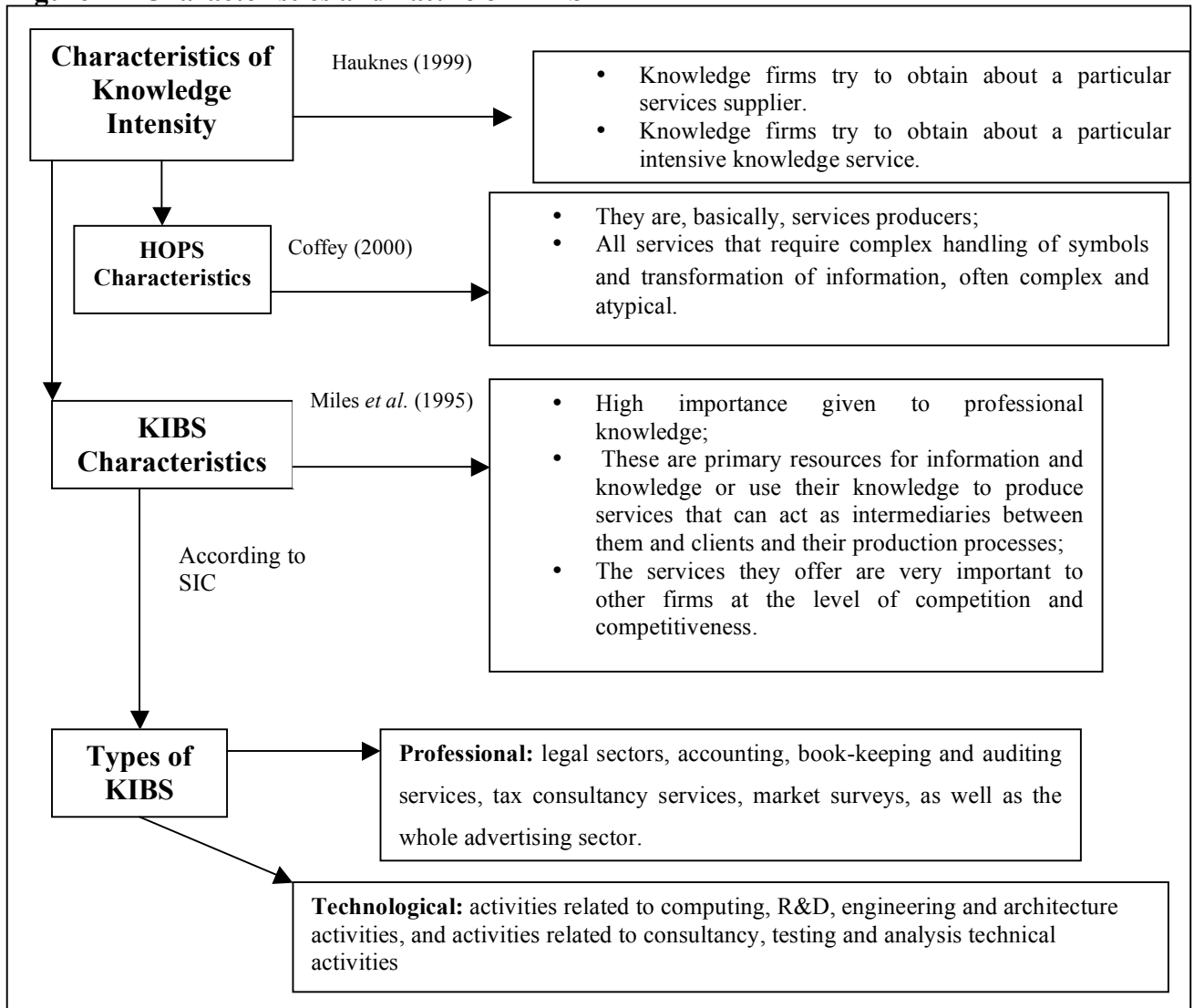
In other words, business services and producer services are sectors whose clients are mainly firms and rarely individual customers. HOPS are all those services that require complex handling of symbols and transformation of information, which is often complex and atypical (Reich 1992; Daniels 1985; Bryson, Daniels and Warf 2004).

¹ The difference between technological and professional KIBS will be explained in methodology section.

According to Alvesson (1995), the meaning of knowledge intensive” may be explained as service rendering firms that perform operations of complex intellectual nature, where the human factor assumes a vital importance.

Hence, the nature and characteristics of KIBS can be systematised as follows (figure 1):

Figure 1 – Characteristics and nature of KIBS



Source: Own elaboration

According to Wood (2005), research on regional innovation merely echoes national studies that focus primarily on regional competitiveness, as a process that is oriented and technologically pushed by innovation. However, the growing importance of innovation on institutions, especially that offered by KIBS, for that same regional

development has been acknowledged (Wood, 2005). According to the same author, the provision of information services for innovation purposes must be acknowledged as a service that is inbuilt within a scientific and technological services division, whose adoption by firms from other sectors is vital for its own success.

In actual fact, whereas non-technological innovations may or may not be stimulated or facilitated by new technologies, technological innovations always require other forms of innovation, including new designs and marketing strategies, and agreements between organizations. For Wood (2005), a process-based service may be:

- Innovations: these must be directed and defined if they are to be successful in specific situations, and the way they are to be applied and for what purposes must be taken into account;
- A service set up through the conjugation of the main individuals or groups, with technologies, creativity, management, financial and human resources, logistics, marketing and regulation specialists throughout the various production stages;
- Regulation specialists come not just from the main innovation in the organization, but equally from a wide range of external sources, including from other sectors;
- In the case of services in general, agencies may resort to temporary workers according to distinct sets of values, such as, for instance, in the public and private sectors;
- A specific service or transforming roles may sometimes lead to the adoption of innovation processes different from those initially expected.

These complex relationships have their corresponding geographical dimension, both within regions, through the articulation and knowledge exchange between places and regions, and at an international scale.

Distinct authors have mentioned the role of KIBS in regional innovation systems, especially as support activities in the transforming industries and SMEs in general (Cooke, 2001; Wood, 2005).

Some progress has been made regarding recognizing services, including KIBS, as contributors to the increase in technology and innovation (Den Hertog, 2000; Haukness, 2000; Muller and Zenker, 2001; Gallouj, 2002). According to Miles (2001), nowadays KIBS are acknowledged as playing a key role as intermediaries in the innovation of systems.

The relationship of KIBS with firms from different sectors has a visible positive influence on the latter (Freel, 2006). According to this author, this relationship increases

resorting to R&D, enhances the performance of staff, and encourages cooperation relationships, thus increasing the ratio of innovation.

In the viewpoint of Sheamur and Doloreaux (2008), there are two perspectives that indicate how KIBS contribute towards regional development: (i) the way KIBS interact with other local players with the aim of producing innovation and subsequent regional development. Thus, this first perspective suggests that KIBS should be involved in the development of regions as long as synergy effects occur in the very same regions; (ii) on the other hand, KIBS may be involved in regional development, but instead of being in the regions, they may be located elsewhere in the country, and so be involved at a distance.

From the two perspectives supported by Sheamur and Doloreaux (2008), we are inevitably led to the question of location of KIBS. The location of these firms and their contribution to local economies have been analysed by several researchers ('O hUallach'ain and Reid 1991; Coffey and Shearmur 1997; Gong, 2001). Their localization in the urban system, their sensitivity to the economies' general agglomeration (Eberts and Randall, 1998; Poehling, 1999; Wernerheim and Sharpe, 2003) and their tendency to set up around spatial clusters (Coe, 1998; Keeble and Nachum 2002), have been documented through several tools and methodologies. A large part of these studies has been motivated by interest in researching the dynamics of local economies, regional development and the reason why some regions grow faster and more than others (Moyart, 2005). According to Malecki, *et al.* (2004), KIBS are essentially located in cities, as the latter are the optimum places for corporate innovation, as well as for networks leading to innovation. Sheamur and Doloreaux (2008) present a distinct viewpoint, based on their study in Canada, whereby the sample was selected from Censuses carried out in 1991 and 2001. They selected KIBS from 152 urban agglomerations and KIBS from 230 rural areas. The authors then noticed that in the beginning of the 1990s, this service providing companies were, in their large majority, based in urban areas. The information yielded by the 2001 Census indicated, however, that these firms had moved out of cities into rural areas, thus leading to a drop in the KIBS sectors in urban agglomerations.

3. THEORETICAL APPROACHES ON FIRM LOCATION

According to Silva (2005a) the spatial distribution of economic activities results from opportunities and location strategies devised in accordance with particular

objectives. However, decision-making processes are complex and involve an important economic component, since a large part of human activities require the use and sharing of limited resources.

According to Capello (2007) there are two groups of theories (which she refers to as regional economics) that look into the issue of economic logic, which intends to explain the location of firms or, in other words, the existence of areas that are more developed than others: (i) Location theories: economic mechanisms that cause the distribution of activities in space; (ii) Growth and regional development theories: they focus on spatial aspects of economic growth and on territorial distribution of income.

On the other hand, Hayter (1997) set off to analyse the location of economic activity through three distinct approaches: (i) the neoclassical, which focuses mostly on the location theory and centres its analysis on profit maximization strategies and minimization of costs (transportation costs, human resources costs and external economies); (ii) institutional, which states that it is important to consider not just the firm's search for an appropriate location but also the institutional milieu it is part of (clients, suppliers, commercial associations, regional systems, the government and other companies); and (iii) behavioural, which focuses on situations of uncertainty and lack of information.

According to him, these three approaches have the purpose of demonstrating how complex the reasons that motivate the location of a particular economic activity are, and they allow us to analyse factors of location at a more "micro" level.

Galbraith (1985) studied 98 entrepreneurs of high technology firms in Orange County, California (USA). He concluded that high-technology firms, in their location decision process operate within a framework of factors that are different from those observed in traditional industries. These conclusions are similarly shared by Arauzo and Viladecans (2006) in their study on the level of spatial concentration of new firms (in the period 1992-1996) in the municipalities of Spanish urban areas. In fact, smaller cities appear to be preferred for the location of technology-based firms, as they offer a quieter environment, better quality of life and become highly advantaged by the presence of qualified individuals working in these industries.

Felsenstein (1996) based on a study on a sample of 160 firms, both in urban and non-urban areas in Tel Aviv (Israel), he analysed the trend of high-technology firms to choose urban areas as a location. The author concluded that the location of firms does not follow a strategy or a calculation; in other words, it is not a founded decision.

In turn, Ferreira, *et al*(2009) identified three types of approach on the location of technology-based firms (behavioural, neoclassic and institutional) and argue that the rurality constitutes no obstacle to the location of firms.

According to Hayter (1997) the location of many firms is explained by behavioural approach, since many entrepreneurs, when deciding on where to set up their firms, end up choosing the places where they were born, pushing neoclassical factors aside. According to Hayter, this perspective goes against economic principles, since only behavioural factors are subject to assessment. Nevertheless, this approach accounts for the appearance of the majority of small and medium-sized companies. Thus, the following research hypotheses, related to behavioural factors, are considered:

H1a: The founder's wish to live in this locality influences the location of KIBS.

H1b: The employees' wish to live in this locality influences the location of KIBS.

H1c: Proximity to the founder's residence influences the location of KIBS.

H1d: Access to good housing conditions influences the location of KIBS.

H1e: The founder's birthplace influences the location of KIBS.

H1f: Recreational and leisure opportunities influence the location of KIBS.

H1g: The climate in the region influences the location of KIBS.

H1h: The community's attitude to business influences the location of KIBS.

Several research studies, as will be shown, focus on the location factors of firms. However, few of these insights reflect on the motives which led firms of high technology to set up in rural areas. The reason behind this lack of information lies, probably, in the small number of firms located in rural areas. Nevertheless, and thanks to the development of information technologies, particularly the Internet, Grimes (2000) identified an increase in the number of firms which set up in those areas.

According to Ouwersloot and Rietveld (2000), one of the key factors for economic development is technological innovation: the introduction of new production techniques, products or services. These researchers concluded that the factors that make firms decide to set up in a particular region depend on the type of firms. In other words, for traditional transformation firms, the industrial composition of the place where they will be based is a key factor. If the firms are service-based, what influences them most in their choice of location is physical infrastructures and knowledge.

Holl (2004) focused his research on the impacts that the new transport infrastructures, in Spain, had on emergence of new transforming firms. Through empirical results, the author concluded that in a country such as Spain, where the

highway road system was developed recently (1980-1994) and where intra and inter-regional differences are clearly visible, access to road infrastructures makes all the difference when it comes to deciding where to set up a new firms.

Costa *et al.* (2004) analysed the mechanisms behind the location of new technology based firms in Spain and proposed that it was linked to the type of industry and the life cycle of the product on which the firm based its activity. Nonetheless, through their empirical study, they came to the conclusion that the most populated and developed cities have lost their attractive edge, regarding the location of firms, to their smaller and more rural counterparts.

Focusing now on Hayter's (1997) viewpoint, it can be said that, according to the neoclassical approach, the location of firms lies essentially on the power of economic forces. The truth is that, in practice, and depending on the profile of the entrepreneur, he may well ignore the power of these forces. According to the aforementioned author, this situation often has a perverse influence in the theories of researchers who strictly defend the neoclassical approach, given that, through "common sense", as well as a result of economic advantages, the entrepreneur, when choosing the location for his firm, takes into account all types of costs, thus deciding where to set up where costs are lower. It is precisely because of these issues, and because, in Hayter's view, this factor does not explain, in itself, the location of firms. Therefore, the following research hypotheses are formulated:

H2a: Distance from the capital of the municipality influences the location of KIBS.

H2b: The cost of real estate influences the location of KIBS.

H2c: Road infrastructures influence the location of KIBS.

H2d: Other physical infrastructures influence the location of KIBS.

H2e: The level of economic activity of the municipality/region influences the location of KIBS.

H2f: The level of specialisation of companies in the region influences the location of KIBS.

Elgen *et al.* (2004) analysed the role which public research institutes play in capturing/attracting new technology-based firms. They resorted to 20000 new German firms specifically on the basis of their deep knowledge of research institutions. The results demonstrated that these start-up high-technology firms tend to trust science with a high degree of intensity, which made them set up near research institutions. Audrestch

et al. (2005) stressed the importance of access to knowledge spillovers when new technology-based firms decide on their location. Their results revealed that new high-technology firms are influenced by factors other than regional traditional characteristics, such as the opportunity to access knowledge generated by universities.

Autant-Bernard *et al.* (2006) analysed the determining factors in the creation of new biotechnology firms in France over the last decade (1993-1999). Their results demonstrated the need for the existence of a large and diversified scientific basis inside a region to enable these firms, after they were set up, to continue their activity for many years.

Looking at the example provided by another country in the Iberian Peninsula, Spain, Alonso (1999) and Trullén (2001) argued that the major technology-based firms tend to group together in the periphery of large urban areas, particularly when these newly set up firms have over 100 employees, so that they can benefit from the technology created by other agents, at lower costs. According to Hayter (1997), there are also entrepreneurs who prefer to set up business near universities, research centres and governmental bodies, in order to have more adequate support to the activities they intend to develop within their firms.

Consequently, the following research hypotheses are considered:

H3a: The existence of a business incubator in the region influences the location of KIBS.

H3b: Access to knowledge generated by universities, technology parks or research centres influences the location of KIBS.

H3c: R&D, company or job creation incentives in order to locate business in this region influence the location of KIBS.

H3d: Technology fairs organised regularly in the region influence the location of KIBS.

H3e: The “role models” in the region influence the location of KIBS.

In sum and according to the literature review, we present our research model (figure 2). The model intends to highlight the main factors that influence location decision of KIBS.

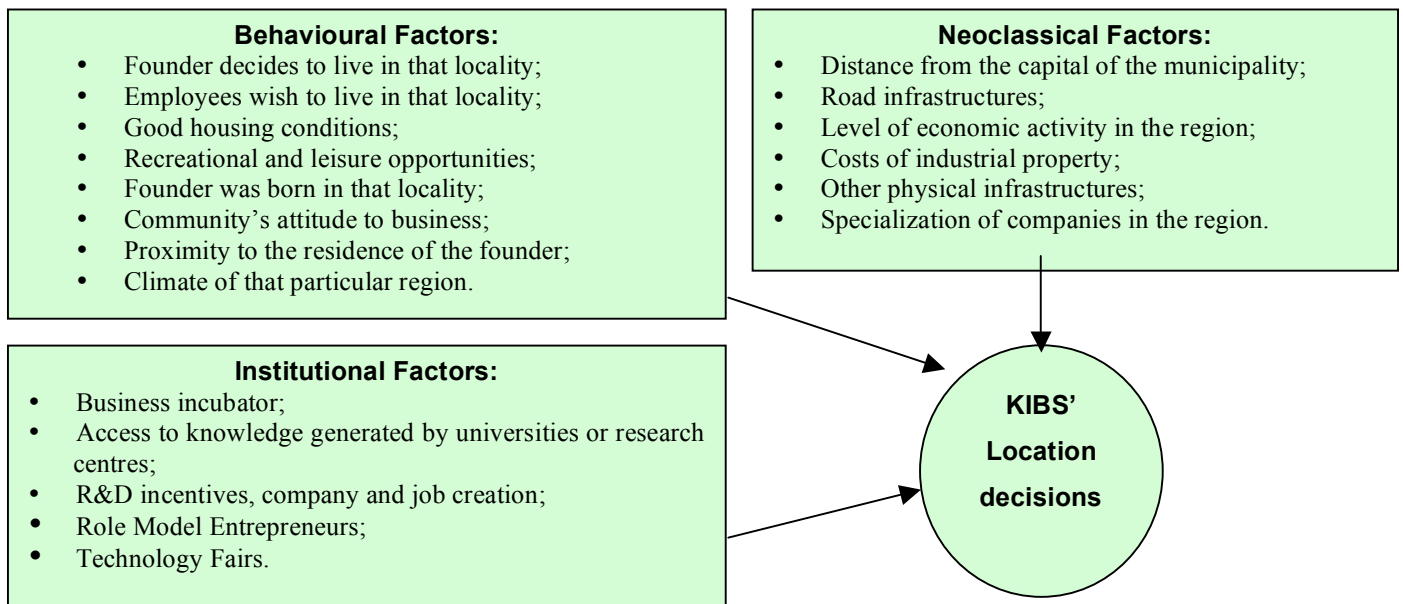


Figure 2: Proposed research model

4. Methodology

According to the Standard Industry Classification (SIC), the definition of KIBS is not uniform in the various existing studies. In line with this classification (SIC), KIBS may be divided into two groups: (i) Technological KIBS (t-KIBS) encompassing activities related to computing, R&D, engineering and architecture activities, and activities related to consultancy, testing and analysis technical activities; and (ii) Professional KIBS (p-KIBS) comprising legal sectors, accounting, book-keeping and auditing services, tax consultancy services, market surveys, as well as the whole advertising sector. Activities are selected according to Portuguese Classification of Economic Activities CAE² codes, as has happened in other research that used NACE codes, which correspond to the CAE (Muller, 2001; Shearmur and Doloreaux, 2008).

Data gathering were made through an inquiry by questionnaire and sent to 330 new firms that embody the studied population (KIBS). The response rate was 20% corresponding to 66 companies. To sum up, the table 2 summarize these methodological aspects.

² The CAE was obtained through consultation of "Boletim do Contribuinte", Decree -Law no 381/2007, of 14 November.

Table 1 - methodological aspects

Region	Beira Interior (Guarda and Castelo Branco districts) – Portugal
Population	330 KIBS firmsss.
Sample unit	KIBS created between 2003 and 2007.
Size of sample	66 responses (20% response rate) corresponding to 77,3% of p-KIBS and 22,7% of t- KIBS .
Respondents	Entrepreneurs – firms owners .
Questionnaire model	The questionnaire is formed by closed questions, using a likert scale.
Statistical models used	Factor analysis of the main components; Mann-Whitney Test Statistics.
Data analysis	SPSS 15.0

5. Analysis and Discussion of Results

5.1 Identification of Location Factors

To enable us to identify the location factors of KIBS in the Beira Interior region, we subjected the 19 items of the questionnaire to a factorial analysis. Factorial analysis is a set of statistic techniques that aims to explain the correlation between observable variables by simplifying data by means of reducing the number of variables that are necessary to describe them. It presupposes the existence of a lesser number of non-observable variables that are subjacent to data (factors), which express the common denominator in the original variables (Maroco, 2003). This way, the main objective of using factorial analysis on data was to obtain a reduced number of factors that enable us to identify the structural relations between the nineteen variables that measure the importance of firm location factors.

In order to use the factorial model, there must be a correlation between the variances. If those correlations are small, it is unlikely that they share common factors. Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity test are two statistical procedures that enable us to gauge the quality of the correlations between variances, in order to conduct a factorial analysis. KMO is a type of statistics that compares zero-order correlations with partial correlations observed between variables, while the Bartlett's sphericity test checks the hypothesis of the correlation matrix being the identity matrix, in other words, it tests if the correlations between the original variables are sufficiently high to make the factorial analysis useful when estimating common factors. In this case, recommendation based on factorial analysis is acceptable (KMO=0,684). Bartlett's

sphericity test ($\div_{GL=171}^2 = 645,987$ and $p\text{-value}=0.000<0.001$) indicates that the variables are significantly correlated.

After evaluating the quality of the appropriateness of this model to the data, the actual factorial analysis was carried out. The main components' method was used in the extraction of factors. Kaiser's criterion was used to decide the numbers of factors to be extracted, i.e., the number of singular values above unity, which can be analysed analytically through the total variance table, and graphically through a Scree-Plot. In the components' matrix, coefficients with absolute values below 0,40 were eliminated. The Bartlett's method was used, that is, ponderated quadratic minimums to estimate the loads/weights to interpret the factorial solution, the Varimax rotation method was used in factor extraction, since it allows us to obtain a factorial structure in which one, and only one of the original variables is closely associated to one single factor, and loosely associated to the remaining factors (Maroco, 2003).

The factorial analysis for the nineteen variables is showed in table 3. It indicates the factorial solution for 5 factors: the weight/load of each item in the factor; the variance percentage explained by each factor; the interval consistency of each factor; the KMO value and Bartlett's sphericity test.

Table 2: Decision factors for the location of technology-based companies: factorial analysis of the main components, following Varimax rotation.

	Factor 1 Innovation and Incentives to the formation of firms	Factor 2 Individual Motivations	Factor3 Characteristics of the locality	Factor 4 Economic expansion of the region	Factor 5 Conditions of the Surrounding Milieu
Business Incubator in the municipality /region	,921				
I&D incentives, creation of firms or of jobs to locate business in the area	,893				
Regular technology fairs in the area	,748				
“Role” models in the area	,707				
Access to knowledge generated by universities, technology parks or research centres	,635				
Other physical infrastructures	,617				
Company specialization in the municipality /region	,477				
Founder's wish to live in the locality		,900			
Proximity to founder's residence		,866			
Founder was born in the locality		,807			
Employees' or managers' wish to live in the locality		,719			
Community's attitude to business			,809		
Access to good housing conditions			,770		
Distance from the municipality's capital			,668		
Level of economic activity in the region				,882	
Road infrastructures				,829	

Cost of real estate					,481
Climate in the area					,763
Recreational and leisure opportunities					,560
Explained Variance (%)	21	16,97	13,16	10,83	7,89
Consistency α Cronbach	0,836	0,849	0,707	0,648	0,336

KMO = 0,684 and Bartlett's Sphericity Test = 645,987 (p-value= 0,000)

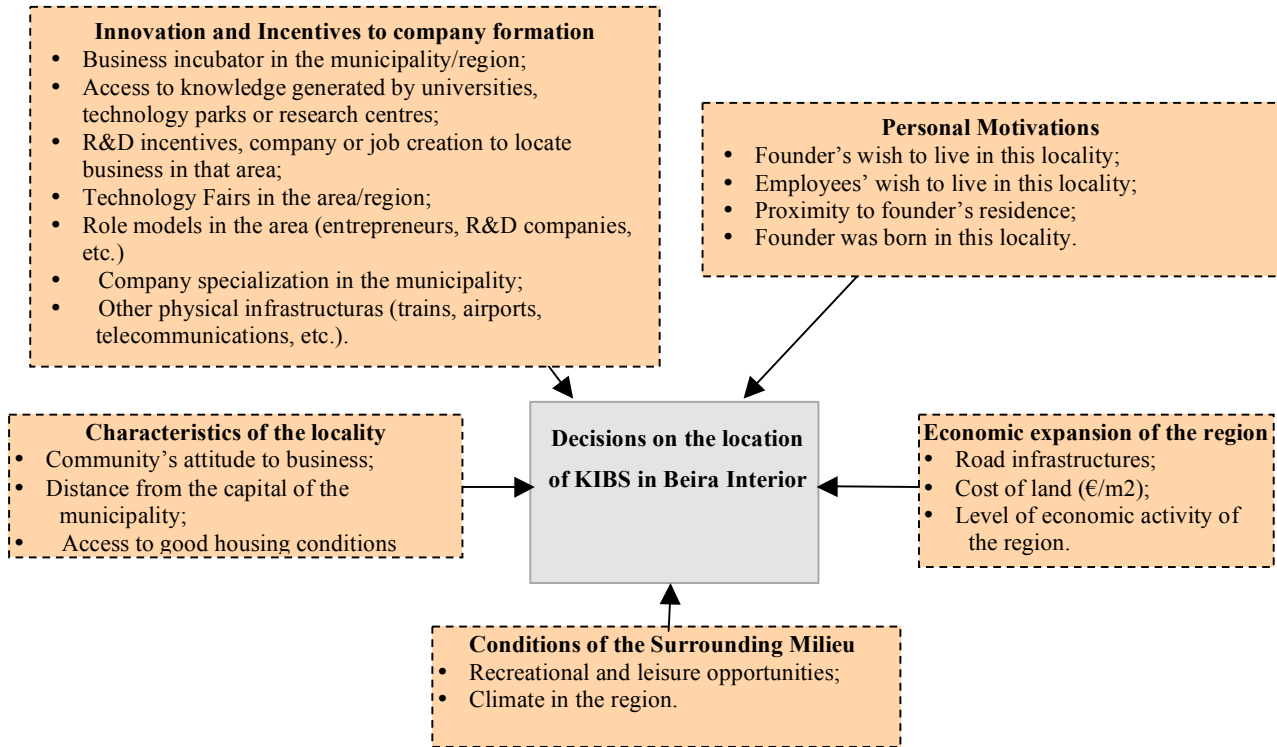
In accordance with the rule of retention of factors with singular values higher than 1, five factors were retained, which explain 69% of total variability: factor 1 explains 21% of the variance; factor 2 explains 16,97% of the variance; factor 3 explains 13,16% of the variance; factor 4 explains 10,83% of the variance; and factor 5 explains 7,89% of the variance. Factorial weights with absolute value lower than 0.40 were eliminated from the matrix of components.

The creation of scores requires verification of their internal consistency, and that scales are additive. On the one hand, the Cronbach's *alpha* coefficient for the 19 items was 0,638, which shows a reasonable consistency of the instrument. The analysis of the internal consistency of each factor also revealed acceptable *alpha* values for all the factors, with the exception of factor 5, which indicated an *alpha* value lower than 0.5. On the other hand, the testing statistical analysis ($F = 41.028$ with $p\text{-value} = 0.000$) associated to the use of the Tukey's additivity test allows us to reject the null hypothesis of absence of additive effect between items. Hence, we can conclude that the scales are additive, which means that each variable is linearly related to the value of the scale.

Once the factorial solution is achieved, it is necessary to interpret the factors that have been identified: factor 1 is related to the level of innovation (business incubator, proximity to universities and technology fairs), entrepreneurs that act as role models and incentives to the creation of companies. Factor 2 is associated to the company's founder personal motives (residence preferences on the employees' and founders' part, residence near the place where the company is located and place of birth). Factor 3 is linked to the locality's characteristics (attitude of the community to new entrepreneurs, housing conditions and distance from the capital of the municipality). Factor 4 refers to the possibility for economic expansion that the region can give (level of economic activity, existence of road infrastructures and price of land). And factor number 5 is associated to issues around the surrounding milieu (climate and leisure opportunities). The factorial analysis reveals that the proposed conceptual model has a slightly different application when used in the Beira Interior region, in what concerns factor aggregation.

Thus, and according to the factor analysis results, our empirical model is as follows (figure 3):

Figure 3 - Research model



5.2 Typology of KIBS

In order to extend our knowledge of the differences regarding the level of agreement of the 19 location factors of our study, and in accordance with the two groups of professional and technological KIBS, we used the Mann-Whitney test, which is an appropriate test for this measurement scale (Likert's scale, varying from "1-no importance" to "5-very important"). Accordingly, the aim is to test if there are differences regarding the importance of company location factors, if there are differences in the degree of agreement with factors relative to the type of KIBS. Table 3 shows the test statistics associated to the application of the non-parametric test in two independent samples.

Table 3: Mann-Whitney Test – applied to the nineteen Location Factors

Location Factors	Ch-square	g.l.	Assymp Sig.
E1- Founder's wish to live in this locality	4,276	1	0,039
E2- Employees or managers' wish to live in the locality	9,506	1	0,002*
E3- Proximity to the founder's residence	6,645	1	0,010*
E4- Access to good housing conditions	2,950	1	0,086

E5- Founder born in this location	5,158	1	0,023*
E6- Recreational and leisure opportunities	1,075	1	0,300
E7- Climate in the region	,001	1	0,970
E8- Community's attitude to business	4,817	1	0,028*
E9 - Distance to the capital of the municipality	3,951	1	0,047*
E10- Road infrastructures	3,714	1	0,054**
E11- Other physical infrastructures	,113	1	0,736
E12- Cost of land	12,345	1	0,000*
E13 Level of economic activity in the municipality /region	5,513	1	0,019*
E14- Specialization of firms in the region /region	,547	1	0,460
E15- business incubator in the municipality /region	,622	1	0,430
E16 - Access to knowledge generated by universities, technology parks or research centres	3,002	1	0,083**
E17- R&D incentives, company or job creation to set up business in the region	,929	1	0,335
E18- Regular technology fairs in the region	,135	1	0,713
E19- "Role models" in the region	,948	1	0,330

* = $p < 0,05$; ** = $p < 0,10$

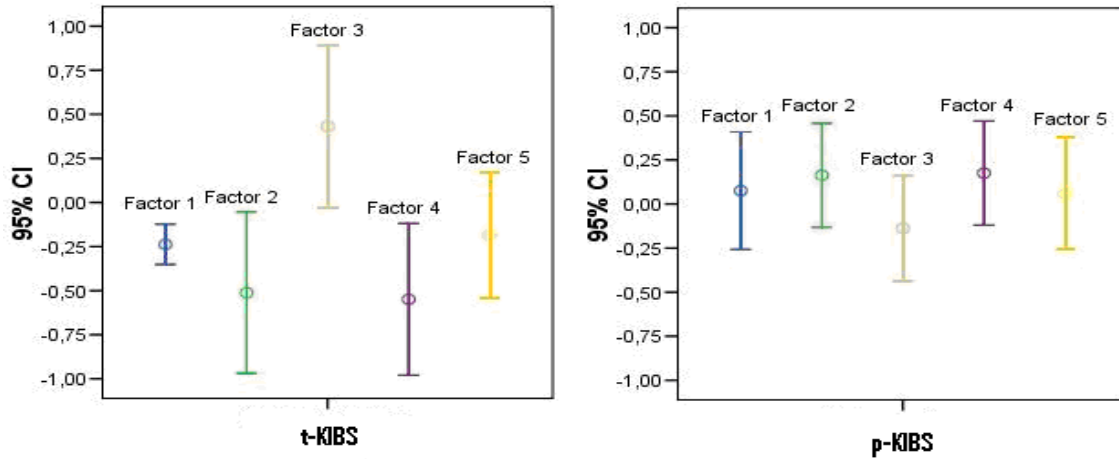
The analysis of table 3 enables us to conclude that the degree of agreement associated to each original factor for the two groups of KIBS, the professional and the technological, are significantly distinct regarding the following location factors: "Employees' wish to live in this locality", "Proximity to the founder's residence", "The founder was born in this locality", "Community's attitude to business", "Distance from the capital of the municipality", "Level of economic activity of the municipality/region" and "Company specialization in the municipality/region", for a 5% level of significance. It was observed that the factors "Road infrastructures" and "Access to knowledge generated by universities, technology parks or research centres" reveal differences between types of KIBS, for a level of significance of 10%. There were no significant statistical differences regarding the remaining factors.

The empirical model that results from the use of factorial analysis allows us to consider 5 latent factors that represent the information contained in the 19 original variables associated to the decision to locate KIBS in the Beira Interior region. A score was estimated for each factor, allowing the intensity of agreement of each individual relative to that particular location factor to be measured. One should check if the average scores associated to each factor vary according to the type of KIBS.

The analysis of the Error-bar graph allows us to see that the average importance of location factors differ according to the type of KIBS: the factors innovation and incentives to the creation of companies, personal motivation, economic expansion of the region and conditions of the surrounding milieu reveal a higher average score when it comes to professional KIBS and compared to technological KIBS; only the factor

characteristics of the locality appears to have a higher average influence on the location decision when it comes to technological KIBS.

Table 4: Error-bar to the score average of the KIBS location factors



According to the results, we are in a position to draw the verification of the research hypotheses:

Table 5 - Results of Tested Hypothesis by type of KIBS

Hypotheses	Type of KIBS	
	t- KIBS	p-KIBS
BEHAVIOURAL FACTORS		
H1a: Founder's wish to live in the locality influences the location of KIBS	Not Verified	Not verified
H1b: Employees' wish to live in the locality influences the location of KIBS	Not verified	Verified
H1c: Proximity to the founder's residence influences the location of KIBS	Not Verified	Verified
H1d: Access to good housing conditions influences the location of KIBS	Not Verified	Not Verified
H1e: The founder's birthplace influences the location of KIBS	Not Verified	Verified
H1f: Recreational and leisure opportunities influence the location of KIBS	Not Verified	Not Verified
H1g: The climate in the region influences the location of KIBS	Not Verified	Not Verified
H1h: The community's attitude to business influences the location of KIBS	Verified	Not verified
NEOCLASSICAL FACTORS		
H2a: Distance to the capital of the municipality influences the location of KIBS	Verified	Not Verified
H2b: Road infrastructures influence the location of KIBS	Not Verified	Verified

H2c: Road infrastructures influence the location of KIBS	Not Verified	Not Verified
H2d: Cost of land influences the location of KIBS	Not Verified	Not Verified
H2e: The level of economic activity in the municipality/region influences the location of KIBS	Not Verified	Verified
H2f: The specialization of firms in the region influences the location of KIBS	Not Verified	Verified
INSTITUTIONAL FACTORS		
H3a: The existence of a business incubator in the region influences the location of KIBS	Not Verified	Not Verified
H3b: Access to knowledge generated by universities, technology parks or research centres influences the location of KIBS	Not Verified	Verified
H3c: R&D incentives, company or job creation to set up business in the region influence the location of KIBS	Not Verified	Not Verified
H3d: Regular technology fairs in the region influence the location of KIBS	Not Verified	Not Verified
H3e: The “role models” in the region influence the location of KIBS	Not Verified	Not Verified

6. Final Considerations

In the present research, we aimed to focus on two theoretical topics, which, due to their complexity, have gained increased importance. We started by referring to the growing interest on the study of KIBS, due to their influence on innovation and regional development. Subsequently, we talked about theories on company location, and, on this point, we focused basically on three location theories: neoclassical, behavioural and institutional. It was precisely at this point that we formulated our research question, which we now intend to answer: *what are the reasons that make KIBS establish them in a particular region? And, in particular, what are the KIBS’s location factors in Beira Interior?*

Based on the results obtained in the statistical tests made, it was possible to identify the factors that influence the location of KIBS in the Beira Interior Region, as follows: (i) Employees’ wish to live in that locality, (ii) Proximity to the founder’s residence, (iii) The founder was born in the locality, (iv) Community’s attitude to business, (v) Distance from the capital of the municipality, (vi) Road infrastructures, (vii) Level of economic activity in the municipality/region, (viii) Specialization of firms in the municipality/region, (ix) Access to knowledge generated to universities, technology parks or research centres.

According to our model, we observed that the first four factors are part of the behavioural approach. Factors four to seven denote a neoclassical approach, whereas factors eight and nine pertain to the institutional approach. We may thus conclude that

with regard KIBS located in Beira Interior, personal reasons dominate when it comes to deciding on location and these factors are different for t-KIBS and p-KIBS. In other words, decisions were fundamentally influenced by behavioural and neoclassical factors, which mean that factors of an institutional nature weighted little in the location decision of KIBS.

Every study has unavoidable limitations which differ depending on deliberate or unconscious choices. In a general way, the limitations of the present study come from the following aspects: the small number of the studied population caused some limitations on the choosing and application of the some statistic techniques. Moreover, the nature of these data does not enable us to measure the effect on the KIBS of some important location factors.

Although these limitations are important and must be taken into account, we are nevertheless convinced that this study should contribute to a better understanding of location factors of KIBS and it can be seen as a further step to provide to the study and development of KIBS sector.

In sum, further research is needed to improve our understanding of the dynamics of location of the KIBS sector. Longitudinal studies and case studies are suggested. It should explore which endogenous and exogenous factors might explain why firms decide different location factors. At last, the replication in different service sectors of the proposal research model beyond the limited period retained in this research as well as the introduction of other location factors.

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