Innovation Processes and Factors on Peripheral Regions of Portugal and Spain

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Abstract

The innovation is the main locomotive of the economic growth and competitiveness. The understanding about innovation process has updated in last decades. The innovation concept not only includes the innovation, but also increases innovation, that can be operated in products but also in the production process, that can be in the conception of the product but also at the level of the market and even at the organizational level. The interactive models of innovation process are put upon linear models and are related with the context, environmental territory. The innovation as a system of innovation became fundamental to competitiveness. Based on these observations, this work intends to analyze the processes and innovation factors, but also enhancing the importance of innovation in system and discussing the main factors which stimulate innovation. The analysis happens on 5 NUTS III at the border of Portugal and Spain. We used the clusters analysis to verify how the companies are positioned in relation to the innovation activities. We intend to characterize the factors and processes of innovation, which distinguish the company's groupings. The results appear to reveal the existence of three groups of companies and the distinction factors are linked to: general characteristics of companies and its director; initial objectives and innovate sources; cooperation relationships; financial support and obstacles to innovate.

Key Words: Process of Innovation, Regional Innovation Systems, Innovation.

1. Introduction

Innovation is the main locomotive of economical growth and competitiveness. The end of the XX century, the technological changes, mainly information technology, and the paradigm designed for the XXI century made evident the need of a new posture by the territories to win and survive in an ever more competing world. For territories to improve their competitiveness it is fundamental for the actors to have a proactive attitude in face of innovation. The interactive and network involvement of the territorially relevant actors is fundamentally in the innovation process.

In relation to the innovation process, the understanding of the theme has altered in the last decades. The concept of innovation started to include not only novelties, but also incremental innovations, which can be operated in the products and also in the production processes, in the conception of the product (goods or services) and also in the market standard, in the marketing and organizational level. The interactive models of the innovation process overlap the linear models and are more related to the territorial environmental. The innovation in systems became fundamental to competitiveness.

Considering these observations, the present analysis paper of innovation processes and factors presents the following structure. In point two a brief bibliographical review is done regarding innovation processes and factors. In point three the hypotheses to be tested are presented as well as the methodology and in point 4 the results. Finally in point 5 some final considerations are made.

2. Literature Review

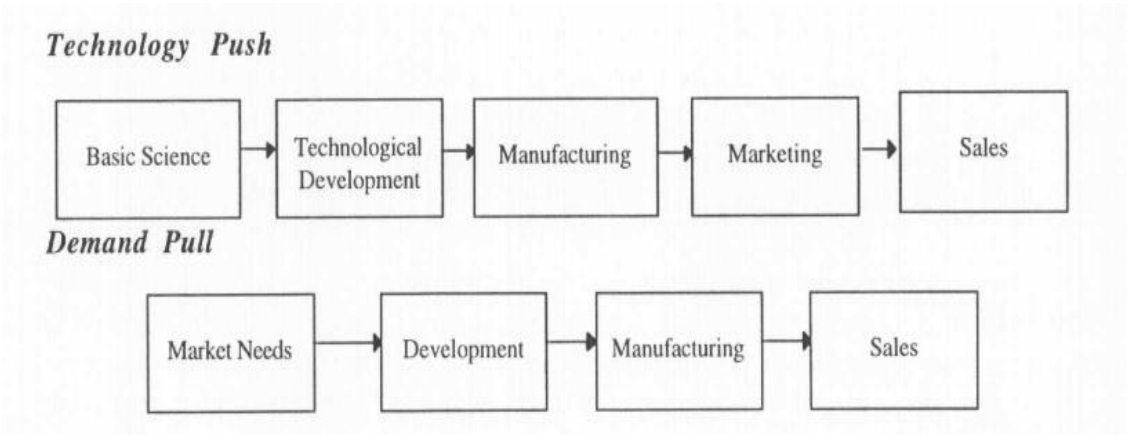
The term innovation has a certain ambiguity; it may designate a process and/or its result. According to the definition proposed by OECD in it's Frascati Manual (1963) in the 1992 version (Oslo Manual), innovation is the transformation of an idea into a product or service which is possible for commercialization, into a fabrication procedure or operational distribution (new or improved) or still into a social service method. This conception

designates process. On the contrary, when a product is evoked, the equipment[1], and the new or improved service which is imposed on the market, the tone is the result of the process.

When the product is produced by a new mean there is an innovation process; when the product is altered or a new product is introduced it is considered an innovation product (Hall, 1994). However, some innovation products are also innovation processes[2]. Thus, as an innovation process we are considering how the innovation is conceived and produced, the relation between inputs and outputs, the different stages it conducts (creativity, marketing, R&D, conception, production and distribution) and its articulation.

On the subject of the innovation process not so long ago it was thought that innovation was a result of a chain process with an origin in applied investigation, which would give origin to new or improved productive product or process. However, in the last years many important papers on innovation have been published rejecting such idea, and today it is verified by consensus that innovation is not such a linear process (Freeman, 1988), (Dosi, 1988), (Dosi et al, 1988) (Barata, 1992), (Hall, 1994), (CE, 1995), (OECD, 1997a), (Edquist, 1997), (Clark and Guy 1998), (Laranja, 1999), (Simões, 1999), (Hauknes, 1999), (Cowan and Paal, 2000), (David, 2000), (Saviotti, 2000), (Lopes, 2001), (Ferrão, 2001), (Asheim et al, 2003); (Doloreux, 2004); (Vang et al., 2007). The linear model of innovation presents itself in two versions, according to Clark and Guy (1998): *technology push* e *demand pull* (Illustration 1).

Illustration 1: Linear Models of Innovation



Source: Clark e Guy (1998:366).

[1] The equipment can be either *output*, which is the case, or *input* which is the more vulgar case.
[2] In the case of the air conditioning, referred to by Barata (1992), initially used in textile factories and graphics, it can be considered a process innovation. But given the crescent vulgarization of its use, it can be seen as a new product.

In the linear innovation model the relationships among research and market are organized in a linear and sequential chain, being from research to market (*technology push* model) or from market to investigation (*market pull* model), or to respond to the new theories of endogenous growth. The *technology push* model (of Schumpeter) represents innovation as a result of new ideas in basic science when a commercial potential is recognized. However, this linear model presents the deficiency of not considering the market demand. A *demand pull* shows the process detected by the market needs and explored by innovators.

This model, although being elucidative and pedagogical, presents important limitations:

a) The division in established phases is arbitrary, due to the fact that the process is evolutionary, continuous and cumulative;
b) The model is unidirectional and does not consider the innumerous and complex links, feedbacks and many existing overlaps;
c) The model seems to describe well the evolution of the *radical innovations*, but less the *incremental innovations*. However, the latter are the ones that make the everyday of the company and territory.

Thus, the innovation process was no longer considered a linear process, with a well defined sequence and automatic series. *The modern theory of innovation recognizes that the companies do not innovate in isolation, and a variety of forward* and *backward linkages is verified in the economical and technological relationships in the value chain* (Roelandt et al., 1997:5). It is a system with internal interactions, of *forward* or *backward linkages* among different functions and different actors (Lundvall 1994) and in which the experience and knowledge reinforce each other mutually and accumulate. Therefore the importance of internal interaction mechanisms in the company (collaboration among different units, associations and participation of workers in the organizational innovation), and also the networks which are tied to the company and its environment (other companies, support services, competency centers, R&D laboratory, etc.).

It was during the decades of 1970 and 1980 that literature related to the innovation process started to contest the designated *linear model* which assumes that technology develops directly based on scientific efforts and lead the investigation followed by the development of a progressive and sequential form. The empirical studies show that most innovations reflected

a feedback process from the markets and the interaction of user/producer of knowledge and company initiative on the offering side (Lundvall, 1999). Besides this the systemic perspective, according to which innovation is seen as deriving of complex interactions among many individuals, organizations and factors, and placed in a non linear path, from the new knowledge to the product, has received more support from the various innovation authors.

Innovation as a unidirectional process which involves basic investigation, application of the investigation, development and marketing, in which each function is separated by principle and by location, was overpast and the economists today use the network model or system model for the innovation process. This means that the relationships among the various actors and institutions are *multidirectional and interdependent* (Cowan and Paal, 2000:1).

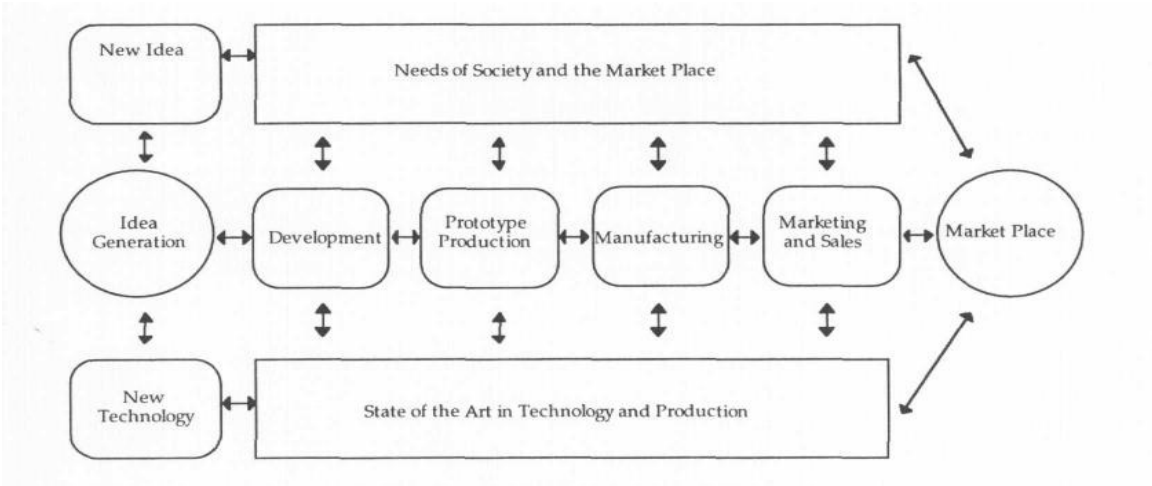
The innovation procedures may not be reduced to a sequence of stages previously dated and planned (Maillat et al., 1991). They are random, non linear and in network. David (2000:2) refers that the linear model ignores the important feedbacks and connections among the different stages, and therefore the potential reactions, synergies and interactions among policies which serve as target to affect or not the next stage.

Thus, opposing the *linear model of innovation*, we see the rise of the systemic approach through the *National, Regional and Local Innovation Systems* in many works and published papers: Nelson (1988, 1993, 2000), Lundvall (1992), OECD (1997a), Edquist (1997), Guimarães (1998), Braczyk et al (ed) (1998), Edquist and Mckelvey (ed) (2000), Edquist (2005), Asheim and Coenen (2006) among others. In the linear model the knowledge flows are presented in a very simple form: the beginning of innovation is science and an increase in the scientific *inputs* directly increases the number of new innovations. However, the ideas for innovation may come from many sources and from the many stages in investigation, development, marketing and diffusion. The technological change does not occur in a perfectly linear and *hierarchical* sequence (Ferrão, 2001) but through the networks and feedbacks in the system.

Illustration 2 shows the interaction of the process, where two types of interaction may be identified. The first, regarding the relationships with consumers, suppliers and collaborators, shows how the functioning of supply and demand conditions may influence part or all phases of development, production and marketing, and which creates feedback among these phases.

The second ensemble of interactions happens when the technological or production capacities in the companies prove to be inadequate for the control of tasks and when it is necessary to turn to the scientific and technological system.

Illustration2: An Interactive Model of Innovation



Source: Clark e Guy (1998:366)

Summarizing, the process through which innovations emerge is extremely complex. Innovations result from the occurrence and diffusion of the knowledge as well as it's *translation* in to new products and production processes. This translation does not follow a linear path from basic research to its application and the development and implantation of new products and new processes. On the contrary, it is characterized by complex feedback mechanisms and interactive relationships which involve science, technology, knowledge, politics and demand.

Effectively the central point of knowledge in the innovation process and in the innovative performance of the economy began being emphasized by many investigators. The invention process is globally conceived as a production of knowledge and almost all innovations consist in the recombination of existing ideas or knowledge to build a new product or process (Cowan and Paal, 2000). A great part of innovation is based essentially in the available knowledge (Barata, 1992) where the innovation process is more and more the result of the collective effort determined by the institutional system and the sharing of knowledge (OECD,1997a). Martins (2000), Murteira (2001), Murteira et al. (2001), Conceição and Heitor (2001), also accentuate the importance of knowledge in the innovation process and in particular the localized process of innovation (Ferrão, 2001).

In fact the modern theory of innovation, the alliances and strategic behavior of the companies, as well as the interaction, knowledge exchange among companies, research institutions, universities and other institutions, are in the center of the innovation process. Innovation and the improvement of the productive capacity is a dynamic social process which develops in network and the intensive interaction with "production", "acquisition" and the use of knowledge. (Hauknes, 1999:1).

Consequently, innovation is an interactive process (Lundvall, 1999:62), and has its origin in an interactive knowledge process (Lundvalll, 1998:409). It is the result of the complex interactions among various actors and institutions (OECD, 1997:12). The relationships among the various actors, institutions and innovation forms are multidirectional and interdependent. The activities, institutions and agents are connected to each other in a dense connection network (Cowan and Paal, 2000:1). Besides being interactive, the innovation process is systemic according to Edquist (1997), Cowan and Paal (2000), and according to Cooper (1994:8) and Dosi (1988:1130) it is cumulative: the technologies used today influence in the learning process and the nature of the accumulated experience, and what a company will do in the future is also conditioned by what it was capable of doing in the past.

Therefore, we are in an innovation context in which dominates the interactive and interdependent, cumulative, systemic, multi-actors, multidirectional and multicultural, and also the reinforcement of scientific and technological cooperation among the actors, and interdisciplinary action.

In this context, in the process of company and territorial innovation there is a vast range of factors which may influence in a definite form. The enlargement of the traditional perspective of the innovation policy was determined for innovation (Edquist, 1997). This perspective emphasizes the innovation policy instruments of the offer side (Support and subvention for R&D) and is influenced by the linear perspective. The emphasis on the innovation policy instruments on the demand side (such as laws, taxes, regulations and subventions that may influence the diffusion of technologies) is also an innovation factor.

The tactic know-how and the physical proximity of the technology source are seen as relevant factors for the success of the innovation (CE 2000). The relationships with the users, as well

as the anticipation of market and society needs are of greater importance than the dominium of the technologies. But the anticipation of needs requires information about the markets and about the economic environment as well as the offer. From this we attribute a growing importance to the role information plays as a factor which influences innovation. However, information will only be relevant if it is processed and converted into knowledge which is useful to draw, produce and sell new products and new processes.

The suppliers and the consultant services are also factors of innovation, being that many companies are acquiring innovation in the form of installations and equipment. The new technology does not reach them directly from the base of academic knowledge or internal research, but through suppliers and consultancy services. In fact, innovations are strongly motivated by the horizontal fight among competitors, but the vertical relation between suppliers, producers and users are also of great importance for the creation of innovations (Edquist, 1997) (Vang et al., 2007); given that 60% of innovations result of interactions among producers, clients and suppliers (De Bernady, 2000:270).

Under this perspective of analysis, regarding the innovative behavior of the companies, Roelandt et al. (1997:12) concludes that:

- *The R&D activities and the technological opportunities in the company improve the innovative performance;*
- *Long life cycles of product discourage innovation;*
- *The market concentration, size of company and market power do not have a significant correlation with the innovation activities, by which support is not found for the shumpeterian hypotheses;*
- *In the global view the efficient patents discourage innovation activities;*
- *A dense network of users/suppliers as well as cooperation between consumers and suppliers when innovating increase the innovative capacity of the company*.

Among the factors of R&D activities, which may influence the innovation process, the dimensions of the national culture and the management style adopted are highlighted (Couto and Vieira, 2002). For Dosi (1988:1164), the general characteristics associated to the technological progress are the variety of the base of knowledge (tactic and specific), the methods of investigation and the opportunity, the uncertainty, the cumulative process and

irreversibility. The cooperation, the possibility of establishing technological alliances among companies, do fusions and acquisitions and the degree of openness to international commerce and the direct foreign investment are factors which notably influence innovation. Some changes related to the innovation process would not have space without the new ICTs (Information and Communication Technologies). The fast diffusion of the ICTs transformed the relation between innovation, science, technology and economy (OECD, 2000).

But to innovate it is important to have a genuine innovation culture, the legal, regulation and financial system, and the research near to the innovation and also stimulate the mobilization of academics and students (Cowan and Paal, 2000:17). But more importantly than the proximity are the linkages of scientific institutions and further education institutions to the business sector for innovation and diffusion. The academic institutions are growingly seen as influencers in the innovation capacity in a triple perspective or mission: *triple helix* (Vang et al. 2007) acting as a spiral of knowledge capitalization. They produce and coordinate the available scientific and technological knowledge; they give superior graduation and skills for the industry and a third mission becomes the active part they must assume, through the interaction with the industry and the creation of incubators, directly contributing to the development of the region (Vang et al. 2007).

The psychological and demographic factors also influence in the attitude to innovate (Kitchell, 1997). The psychological profile is less evoked than the demographical issues to explain the adoption of innovation, probably because it is more difficult to evaluate. However, the personality of each individual may influence positively or negatively in the innovation activities. The individual may promote a collective innovation culture and influence initiatives and risky jobs or, on the contrary, may have a rigid and conservative attitude which suffocates creativity. Thus the importance of flexibility and openness to risk, as well as perseverance to promote innovation.

Flexibility becomes important because individuals are more receptive to suggestions and alternative points of view, to promote creativity and adopt new technologies. The psychological dimension of perseverance is rarely evoked in the adoption of innovation, probably due to the lack of *prima facie* among the notion of perseverance with the innovation activities. However, this principle is important for the success in the adoption of new technologies as well as to fight against resistance to change. The predisposition to risk is

important to promote the necessary changes to the new company structures, and to undertake training and transferring of specialized personnel and fundamental in the adoption of new technologies.

Regarding the demographical factors, age, education, stability and work experience are emphasized. According to Kitchelll (1997), many studies which examine the relation between innovation and age have observed a negative relation usually attributed to the life styles, decline in the cognitive capacities and energy levels. Besides this, the capacity to learn, such as the memory, declines with age and the managers with more age are less capable to rapidly evaluate new ideas and integrate them effectively in their decisions, simultaneously they are more averse to risk which is a component of innovation. On the contrary, the young executives are probably more capable of learning, and have a more recent graduation, along with more flexibility and inclination to risk, although having less experience and skill. A long stability in the job tends to develop a strong commitment to the *status quo* and limits the perspective of innovation. This dysfunctional rigidity it is counterbalanced by the benefits deriving from the accumulated experience and knowledge. With stability, the ability can increase and gain credibility and experience and also develop a crafty policy.

The *success of innovation increasingly depends on the quality and availability of knowledge* (Cowan and Paal, 2000:28) and also the interaction between codified knowledge and the knowledge process (Hauknes, 1999:17). In this context, human resources are a key element of innovation, being fundamental to the continual development of innovation and education, the increase in qualifications and competencies and management of human resources. The initial education/formation is not enough in an economy where the searches change continually, and the permanent formation is increasingly more important. The international mobility of specialized workers, the mobility of workers among regions and in the region and rotation favor the transmission and access to tacit knowledge and assume today an increasing importance in the territorial innovation process.

The access to information, qualified personnel and risk capital, the weight of administrative regulations, the company and infrastructure environment can influence innovation. But the psychological, demographical, historical, social, cultural and institutional factors, habits and values and the policies and governmental action instruments can also influence in the

innovation action. As a whole they act on company innovation and also territorial innovation as a factor do differentiate and promote competitiveness of the companies or territories.

3. Hypotheses to be Tested and Methodology

Considering the theoretical presuppositions exposed above, we may consider the following dimensions or groups of factors which influence the innovation factors and processes: the general characteristics of the company and of the director, the initial objectives and the sources to innovate, the network cooperation relationships, the financial support and the obstacles to innovate and the environment of the region. Thus, the innovation processes are conditioned by the characteristics specific to each territory based on each of these five dimensions.

The first hypothesis this paper intends to put forward the influence that some characteristics of companies may have on the results in the level of the dynamic of innovation. According to Lundvall (1992), Edquist (1997), Hauknes (1999), Murteira et al (2001), Doloreux (2004), Lundvall et al (eds) (2006) and Vang et al (2007) and in the fact that human resources are a key element of innovation, and innovation growingly depends on the quality and availability of knowledge, thus being fundamental the qualification of resources, supported in the different community innovation surveys (CIS), in the importance of the ICTs to innovate (Camagni, & Capello, 2005), it was admitted that the general characteristics of the company influence the innovation processes. Besides this, the personality and profile of the company director may influence positively or negatively in the innovation activities, by promoting a collective innovation culture, by encouraging the development of initiatives and risk, or on the contrary, by having a rigid and conservative attitude which suffocates creativity (Kitchell, 1997). The matter is to find in the employer his entrepreneur spirit, in terms of initiative and inclination to risk, if he is more or less innovative. The first hypothesis was then formulated as:

H1: The innovation processes vary according to the general characteristics of the company and its manager and the attitude in terms of product divulgation

According to Conceição and Ávila (2001), Natário et. al (2006) there are significant differences in the companies regarding the goals which were underlying the development of

innovation introduction. These differ from company to company, concerning the sector, size and attitude to innovate.

The information sources are important for innovation, since from them result suggestions for innovation projects or they contribute to the implementation of innovations. The importance of the information sources to innovate has been emphasized in the many community surveys (CIS). In less favored regions, with low basic investigation efforts and characterized by specialization in traditional sectors with a reduced scientific base, as the ones we are here analyzing, the important thing to know is which are the sources of innovation for the companies. Considering the diverse objectives and innovation sources, the second hypothesis was established:

H2: The innovation processes vary according to the initial objectives and the sources to innovate

In the region there is a particular importance to promote the regional innovation, the artificial creation of the milieu through technological parks and the cooperation between the various local actors and the network linkage (Landabaso, 1997). The cooperation relationships have been shown in many studies as an efficient vehicle to promote innovation and competitiveness in a region (Lundvall, 1992) (Edquist, 1997), (OECD, 1997), (Bramanti, 1999), (Doloreux, 2004), (Henttonen, 2006), (Vang et al, 2007). The network relationships of cooperation facilitate the production and transmission of the knowledge flow, determine the innovative performance of the companies and influence the territorial innovation process. In face of these considerations the following hypothesis was established:

H3: The dynamic of innovation depends on the cooperation relationships in networks

The lack of financial support from public institutions is many times pointed out as an obstacle to the development of innovations. The small and medium companies present disadvantages regarding large companies, particularly in financial terms, in response, the governments and the European Union developed many measures and support to stimulate the innovation in these organizations (Avermate et al, 2006), (Riding and Haines 2001). The fourth hypothesis was then formulated as:

H4: Innovation depends on institutional support and on the obstacles to innovate

The conditions of the milieu influence the attitude to innovate because the company does not live in isolation (Aydalot, 1986), (Maillat et al. 1991, 1993), (Bramanti, 1999). In face of these considerations the fifth hypothesis was stipulated:

H5: Innovation depends on the satisfaction of the entrepreneur regarding the general characteristics of the region and the effects of public intervention

In this paper we will seek to characterize the factors and innovation processes at Raia Central Ibérica[3] (RCI) and analyze which factors are associated to the dynamic of innovation. RCI is constituted by 5 NUTS III on the border of Portugal and Spain. These NUTS are characterized by being sub-regions in the periphery. They having a very similar social-economical reality, both regions have decreased in population, both in the quantitative and qualitative point of view. They present weakness in the company tissue, and a scarce economical capacity. Besides this, these NUTS present a much reduced population density and their economies have a reduced weight in the economies of their countries (Table 1).

Table 1: Some Economic indicators of NUTS III of RCI

NUTS III	Population Density 2001	GDPpm Nuts/Country 2003 (%)	GDP per capita Nuts/Country 2003 (%)	Productivity Nuts/Country 2003 (%)	Employment Nuts/Country 2003 (%)
BIN	28,34	0,77	70,40	67,11	1,14
BIS	20,9	0,65	88,80	81,78	0,79
CB	68,17	0,64	72,80	73,78	0,87
Salamanca	27,98	0,72	84,02	94,37	0,74
Cáceres	30,09	0,71	66,52	80,23	0,84

Source: Own elaboration based on data of National Institute of Statistic of Portugal and Spain

To do the analysis, the main data source resulted from the inquiry done in different companies selected in the 5 sub-regions of RCI. As the universe of study, all the sectors are considered, whichever its legal forms are, with headquarters on Raia Central Portuguesa (RCP) and Raia Central Espanhola (RCE) and only the companies with over 10 workers are selected. Resuming the sample of the companies of Raia Central Ibérica[4] is: BIN = 23%, BIS = 18%, CB= 21%, Salamanca= 20% and Cáceres = 18%.

[3] A Raia Central Ibérica includes in the range of INTERREG II, the Portuguese sub-regions (NUT's III), from the Central Interior Region **Beira Interior Norte (BIN)**, **Beira Interior Sul (BIS)** and **Cova da Beira (CB)** and the totality of the territories of the Spanish provinces of **Salamanca** and **Cáceres** situades respectively in the Autonomous Communities of Castilla y Léon and Extremadura.

[4] It must be accentuated that obeying the conditions exposed beforehand, the universe of analysis is as follows: 699 companies from RCP and 696 companies from RCI (237 companies from BIN, 193 companies from BIS, 269 companies from CB, 268 companies from the Province of Salamanca and 428 companies from the Province of Cáceres).

The methodology used for analysis is based on the application of multivariate statistics: clusters' analysis to verify how the companies organized themselves regarding their involvement in terms of innovation activities and in order to group the companies according to their innovation dynamics. To verify the hypothesis we have applied multiple mean's comparisons test and the chi-square test to distinguish the unique characteristics of each cluster.

4. Results

The use of the cluster analysis methodology showed to be adequate and the variables used to classify the companies in terms of their innovative dynamic were significant to the solution found, as can be verified by the results of the ANOVA analysis (annex 1). The cluster analysis allowed the identification of 3 groups of companies: the first in where the results obtained in terms of innovation dynamics are at a medium level; the second is constituted by the companies which have a modest or reduced innovation dynamic and a third where the best results were found in terms of dynamic innovation.

Table 2: Cluster Analysis

Variables used in cluster analysis	Cluster one: N=61	Cluster two: N=62	Cluster three: N=43
R&D inside the company	0	0	1
Acquisition of external services – R&D	0	0	1
Acquisition of new technologies	1	1	1
Acquisition of information technologies	1	0	1
Acquisition of other external knowledge	0	0	1
Training of human resources	1	1	1
Introduction of innovation into markets	0	0	1
Management strategy /techniques	0	0	1
Changes in organizational structure	0	0	1
Marketing innovation	0	0	1
Company introduced innovation	1	0	1
Product innovation	1	0	1
Process innovation	0	0	1
Organizational innovation	0	0	0

Source: Own elaboration

We proceeded the analysis testing the influence of the contextual variables, related to the region where the company operates and the operational variables associated to the funding year, the size, the activity sector (Extraction Industry, Transforming Industry, Construction, Commerce or Other Services) and the internationalization of the company over the results obtained in terms of the dynamic of the innovation. The results of chi-square test lead to the

conclusion that all variables showed to be relevant to the results obtained in terms of innovation dynamic, except the definition of if the company is or not an exporter (annex 2).

To interpret how you establish the relation between the explaining variables and the variable dependent on the innovation dynamic we recur to the analysis of the differences of the average of the groups. We can observe that regarding the general characteristics of the company in terms of number of employees and human resources with higher education and in terms of use of ICTs, group 3 contrasts from groups 1 and 2 (annex 3). In the level of the main means of propagation of the product, group 3 also contrasts from groups 1 and 2 namely regarding the use of media/publicity/marketing; mailing, prospects/flyers; and internet (annex 4).

The differences between the groups are significant for a vast ensemble of objectives and sources to innovate. In this case we verified that the companies in group 3 are the ones that evidence a greater diversification of objectives to innovate. However, no differences are verified in the following objectives to innovate: the increase in product quality, the improvement of production flexibility, the increase in the production capacity, the reduction of work costs and the reduction in the consume of energy/materials (annex 5). Also in terms of the main sources to innovate, the pattern is similar to the one observed regarding the objectives, where group 3 distances from groups 1 and 2 regarding the use of many sources, internal, external, institutional and of market to innovate. It must be said that no differences in the groups were revealed regarding the use of suppliers, competition, and the personal and professional contacts as sources of information to innovate (annex 6).

Regarding the network linkages of cooperation or of sub-contracting or of competition, the difference among the groups are significant, especially the companies in groups 1 and 3, which evidence a greater preference to the cooperative relationships as opposed to group 2 (annex 7). In the level of the main and most important actors to develop the cooperation relationships, we verify that the companies in groups 2 and 3 valued more the cooperation with suppliers then group 1, while the cooperation with other companies sustains the previous pattern regarding the network relationships. Regarding actors as the consultants and higher education institutions, the companies in group 3 showed the most interest in cooperating with them (annex 8).

Regarding the differences in the institutional support levels we observe a greater number of differences among the groups and those that exist (in the community support level) present a pattern which is identical to the one previously observed regarding the cooperation networks (annex 9). Regarding the obstacles to innovate (annex 10), the results of the Chi-Square test allow to conclude that the perception of excessive risks, the exaggerated costs of innovation, the lack of appropriate financing sources, the low flexibility organizational structure, the lack of qualified personnel, the lack of information on technology and markets, the rules and regulations and the reduced market dimension and lack of cooperation with other local agents have not evidenced influence in the obtained results regarding the innovation dynamics. On the other hand, the lack of receptivity of the clients and the weak customer demand show to be relevant factors, as well as the weak mobility of workers among companies in the region.

Regarding the influence of contextual variables in the region in terms of entrepreneur satisfaction over innovation processes (annex 11), we can conclude that a smaller number of differences is observed among the groups and those that exist evidence a greater satisfaction of the entrepreneur in group 3 in comparison to groups 1 and 2. We point out that this greater satisfaction is verified in the aspects linked to the presence of Higher Education Institutions, the opening/transparency in the circulation of information, the environment and crowding and value system and local culture, to the popular culture and dynamics of the region. Regarding the offering of work force with the desired qualification, it's professional and social realization, safety and health, traffic, culture and leisure, geography and landscaping and relationship, these contextual variables do not interfere in the results in terms of innovation. The differences among the groups are significant also for the intervention effects (annex 12) in terms of equipments and support infrastructure to the economical activity, education, health, culture and in terms of support to the development of innovation processes. Group 3 continues to contrast from the other groups with greater levels of satisfaction.

5. Final Considerations

The innovation process does not follow the linear model, which is discredited, recognizing the interactive and interdependent character, cumulative, systemic, with many actors, multidirectional and multicultural, and interdisciplinary among all actors of the innovation. Among the main factors which foment innovation these are stressed: the knowledge, access to information, qualified human resources and risk capital, the weight of administrative

regulations, the company and infrastructure environment, the psychological, demographical, historical, social, cultural and institutional factors, the policies and the instruments of governmental action. Together they act upon the company innovation and also the regions as a factor of distinguishing the territories and promoting their competition.

Based on the data collected and the application of the described methodology we can stress the following results of the present work: (1) the verification of the hypothesis that the innovation procedures vary according to the general characteristics of the company and the director and the attitude in terms of publicizing the products; (2) that the initial objectives and the sources to innovate can affect the innovation dynamics; (3) that the impacts are greater in the companies which explore the network cooperation relationships in diverse ways to promote innovation (4) that the innovation processes are associated to the level of satisfaction of the entrepreneur with the context conditions and the involving company mean and the effort and interest of public intervention.

As practical implications of this study we can point out that these results suggest that the companies and regions need to have a clear and unmistakable effort in terms of innovation as a strategic and differentiation element. The benefits are greater for the companies which bet in a more complete innovation, in terms of objectives as well as sources to innovate, and from that point are already better positioned in the market, with greater volume in business, greater levels of graduation and the use more of diverse means do publicize their product. Another aspect which results as an implication for companies is the fact that ICTs, in particular the internet coming as such an especially capable mean not only as a promotion and sales, but also relationships. The results obtained show greater innovative success of the companies which bet on an integrated perspective of acting in the level of creating cooperative networks with diverse institutional actors and on the level of suppliers (where the information flow assumes a more tacit character) and which has a better relation/satisfaction with the involving mean where they are inserted.

As limitations of the study we can point some aspects which, in our understanding, were not sufficiently approached and need future analysis, namely the use of a broader sample of companies which includes a greater number of countries and regions and which allows to evaluate the effects in other countries.

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Annex 1: Cluster Analysis Anova

ANOVA

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
R&D inside the company	4.334	2	.123	163	35.174	.000
Acquisition of external services - R&D	3.244	2	.111	163	29.235	.000
Acquisition of new technologies	1.225	2	.186	163	6.581	.002
Acquisition of information technologies	2.451	2	.201	163	12.165	.000
Acquisition of other external knowledge	3.509	2	.164	163	21.442	.000
Training of human resources	1.942	2	.220	163	8.821	.000
Introduction of innovation into markets	6.439	2	.145	163	44.558	.000
Management strategy /techniques	6.500	2	.121	163	53.501	.000
Changes in organizational structure	6.497	2	.150	163	43.337	.000
Marketing innovation	4.984	2	.172	163	28.951	.000
Company introduced innovation	17.992	2	.023	163	777.032	.000
Product innovation	11.786	2	.110	163	107.309	.000
Process innovation	3.524	2	.146	163	24.106	.000
Organizational innovation	1.640	2	.123	163	13.369	.000

Annex 2: Results from the Chi-square Test

	X2	Sig.	Remarks
Address/NUTS	18,08	0,02	Y
Age of the Company	131,96	0,03	Y
Volume of sales	30,89	0,06	Y
Exporting companies	4,55	0,10	X
Sectors	22,48	0,01	Y

Annex 3: Differences of Averages between Groups: General Company and Top Manager Characteristics

	Sum of Squares	Mean Square	F	Sig.	Average Dif.
Numbers of employees	6,90	3,45	3,04	0,05	1,2<3
Numbers of employees with higher education degree	368,44	184,22	3,62	0,03	1,2<3
Leadership Habilitations	1,18	0,59	0,80	0,45	
Use ICTs for electronic commerce	2,11	1,06	4,63	0,01	1,2<3
Use ICTs for customers / suppliers	2,24	1,12	4,64	0,01	1,2<3

Annex 4: Differences of Averages between Groups: means of propagation of the product

	Sum of Squares	Mean Square	F	Sig.	Average Dif.
Media/publicity/marketing	1,97	0,99	4,08	0,02	3>1
Mailing	1,51	0,76	5,12	0,01	3>2,1
Placards	0,61	0,30	1,75	0,18	
Prospects/flyer	1,29	0,64	3,14	0,05	3>2
Face to face	0,11	0,05	0,34	0,71	
Cultural Agendas	0,04	0,02	0,39	0,68	
Internet	1,79	0,89	4,74	0,01	3>1,2
Other	0,51	0,26	2,03	0,13	

Annex 5: Differences of Averages between Groups: objectives to innovate

	Sum of Squares	Mean Square	F	Sig.	Average Dif.
New products lines	11,44	5,72	4,25	0,02	1<3
New Markets/Increased market share	7,88	3,94	3,04	0,05	1<3
Product quality improvement	6,69	3,35	3,03	0,05	1<3
Increased operational flexibility	2,47	1,23	0,67	0,52	
Increased production capacity	4,71	2,36	1,30	0,28	

Labour cost reduction	4,76	2,38	1,54	0,22	
Energy and Material reduction	0,42	0,21	0,21	0,81	
Security and environment improvement	27,14	13,57	9,63	0,00	1<3
Compliance with norms and regulations	12,42	6,21	3,38	0,04	1<3

Annex 6: Differences of Averages between Groups: sources of innovation

	Sum of Squares	Mean Square	F	Sig.	Average Dif.
Inside the company	10,63	5,32	5,63	0,00	1,2<3
Other companies	16,89	8,45	6,23	0,00	1,2<3
Suppliers	3,44	1,72	1,50	0,23	
Clients	11,07	5,53	4,44	0,01	2<1,3
Competitors	0,76	0,38	0,29	0,75	
R&D Laboratories and Institutions	8,12	4,06	4,02	0,02	1,2<3
Universities and Polytechnics	7,39	3,69	3,74	0,03	1,2<3
Conferences meetings and scientific journals	9,26	4,63	3,75	0,03	1,2<3
Expositions and fairs	11,63	5,82	4,59	0,01	2<1,3
Consulting firms	6,43	3,22	3,08	0,05	1,2<3
Personal contacts	1,42	0,71	0,55	0,58	
Professional networks	1,85	0,93	0,81	0,45	

Annex 7: Difference of Averages between groups: networks linkages

	Sum of Squares	Mean Square	F	Sig.	Average Dif.
The company established a cooperation agreement	3,97	1,98	8,68	0,00	2<1,3
There is direct competition with other companies	0,12	0,06	0,27	0,77	
The company has sub-contracting relationships	0,17	0,08	0,34	0,71	
Innovation was developed by the company	20,92	10,46	82,27	0,00	2<1,3
Innovation was developed in cooperation	1,11	0,55	6,83	0,00	2<1,3
Innovation was developed by other companies	0,54	0,27	4,19	0,02	2<1,3

Annex 8: Differences of Averages between Groups: most important actors to develop the cooperation relationships

	Sum of Squares	Mean Square	F	Sig.	Average Dif.
Affiliated company	13,80	6,90	4,10	0,02	2<1,3
Suppliers	16,37	8,18	5,23	0,01	1<2,3
Clients	3,67	1,83	0,96	0,39	
Competitors	2,30	1,15	1,28	0,28	
Consultants	12,00	6,00	4,49	0,01	1,2<3
R&D Laboratories and Institutions	6,09	3,05	2,57	0,08	
Universities and Polytechnics	18,59	9,30	8,23	0,00	1,2<3
Development associations	5,28	2,64	2,56	0,08	
Management associations	0,39	0,19	0,15	0,86	
Public Administration	5,04	2,52	2,12	0,13	
Local Administration	0,14	0,07	0,05	0,95	
Unions	1,03	0,52	0,99	0,37	

Annex 9: Differences of Averages between Groups: Financial support for innovation activities

Source of support	Sum of Squares	Mean Square	F	Sig.	Average Dif.
Local administration	0,14	0,07	0,88	0,42	
Central administration	0,22	0,11	0,68	0,51	
EU funds	4,71	2,36	12,66	0,00	2<1,3
EU initiatives	0,02	0,01	0,64	0,53	

Annex 10: Results from the Chi-square Test: Obstacles to Innovation

	X2	Sig.	Remarks
High risk perception	6,69	0,35	X
High innovation cost	7,76	0,26	X
Lack of financial means	7,76	0,26	X
Inflexible organizational structure	5,95	0,43	X
Lack of trained human resources	5,95	0,43	X
Lack of technology knowledge	3,68	0,72	X
Lack of market information	4,18	0,65	X
Norms and regulations	2,52	0,87	X
Lack of clients acceptance	12,42	0,05	V
Reduced market dimension	7,48	7,48	X
Lack of cooperation with local actors	4,57	0,60	X
Low consumers expectations	11,69	0,07	V
Low workers mobility	13,44	0,04	V

Annex 11: Differences of Averages between Groups: entrepreneur satisfaction relative to contextual variables

	Sum of Squares	Mean Square	F	Sig.	Average Dif.
Universities and polytechnics	5,34	2,67	3,25	0,04	3>2
Local Labor Offer	2,99	1,50	2,32	0,10	
Local Labor Offer of Qualified Workers	3,54	1,77	2,80	0,06	
Openness/transparency to Information Circulation	3,86	1,93	3,54	0,03	3>1,2
Profession Accomplish	0,02	0,01	0,02	0,98	
Social Approval	0,88	0,44	0,86	0,43	
Security	0,15	0,08	0,12	0,88	
Health	4,74	2,37	3,30	0,04	3>1
Environment and Traffic	3,00	1,50	2,51	0,08	
Culture and Leisure	1,29	0,64	1,04	0,36	
Geography and Landscape	0,85	0,43	1,16	0,32	
Local Value Systems	4,72	2,36	4,91	0,01	3,1>2
Popular local culture	4,38	2,19	4,84	0,01	3>2
Sociability	2,36	1,18	2,17	0,12	
Local Dynamics	3,23	1,61	3,15	0,05	3>2

Annex 12: Differences of Averages between Groups: Effects of Public Intervention

	Sum of Squares	Mean Square	F	Sig.	Averag e Dif.
Intra-regional accessibilities	1,51	0,76	0,96	0,39	
Inter-regional accessibilities	4,18	2,09	2,52	0,08	
Equipment and infrastructure to support economic activity	3,40	1,70	3,09	0,05	3>1,2
Equipment and infrastructure for education	6,51	3,25	6,38	0,00	3>1,2
Equipment and health infrastructure	5,54	2,77	3,50	0,03	3>1,2
Equipment and cultural infrastructure	6,85	3,42	5,43	0,01	3>1,2
Support for the conquest of new markets	0,23	0,12	0,17	0,84	
Support for the internationalization of enterprises	1,17	0,59	0,78	0,46	
Support for the implementation of infrastructure and initiatives of business cooperation	0,65	0,33	0,41	0,66	
Support for the restructuring of production processes	2,55	1,27	1,98	0,14	
Support for development of effects on production chain and diversification of products	1,71	0,86	1,54	0,22	
Support for the development of innovation processes	3,79	1,90	2,88	0,06	3>1,2