THE TRANSREGIONAL INNOVATION PROCESSES: THE KEY CHALLENGE FOR THE TRANS BORDERS REGIONS.

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ABSTRACT

The competitiveness of regions it is strong linked with innovation dynamics. This dynamics requires the involvement of different actors of the territory, namely, the set of actors with capacity and power to influence the territorial activities: the governance system. Thus, the vigorous attitude and participation of the firms and of institutional associative actors on innovation pressure the innovative performance of the territory. Hence, the aim of this paper is analyse the process of innovation in a transterritorial view and illustrate a perspective of innovation that reflect the better performance innovative of the territory depends of different characteristics of the milieu and evaluate the important conditions for dynamics of innovation. We use the results of survey applied to a vast set of firms and institutional/associative actors for distinguish profiles of involvement in innovation activities and for analyse and perceive which attributes or variables of territory are related with the best performance on innovation. The study looks at five sub regions of the transborder region of central region Portuguese and Spanish: Raia Central Ibérica (three Portuguese and two Spanish).

Key Words: Territorial Systems of Innovation and Innovation

1- Introduction

The study of regional systems of innovation by Braczyk et al., (eds.) (1998), Morgan and Nauwelaers, (eds.) (1999), Acs (eds).(2000) and Edquist and Mckelvey (2000), of innovative milieu by Aydalot (1986), Maillat (1995, 1997) and Camagni (1999) and of learning regions (see Florida, 1995; Asheim, 1996, Maillat and Kébir, 1999), are among the approaches taken to apply the new perspective of innovation in regional studies and to develop territorial models of innovation. In several respects, such as the inclusion of networks, knowledge, cooperation and interaction between

different actors, the different perspectives do not differ very much but each one emphasises different points.

The local and regional perspectives of systems of innovation are distinguished from the concept of innovative milieu because they relate to the analysis of the specificities of territorial processes of innovation and the definition of policies; they aim to specify the mechanisms and processes that promote innovation in certain regions. The concept of regional systems of innovation is therefore differentiated from other perspectives by having a more operational and policy related dimension. Thus the importance of these systems is related to the necessity, taking into account the specific characteristics of each region and, in particular, of border regions, to define and to co-ordinate politics and strategies for innovation. These require the involvement of the highest level of government as well as the local and border level of administration, working together with companies and the academic and research world to increase the innovative capacity of these regions. The aim of the regional systems of innovation is to strengthen the territorial platforms of competitiveness, encouraging a more innovative milieu and developing as 'learning' regions. This approach is required to stimulate innovation in border regions (Raia Central Ibérica) and to promote their competitiveness.

This paper seeks to analyze what extent local actors have been involved in fostering innovation in the Raia Central Ibérica (RCI). Five sub-regions of RCI (three Portuguese and two Spanish) in the Portugal/Spain border area were considered. The work was based on a survey of a large set of local companies of public organisations and associations that, directly or indirectly, might be involved in the promotion of innovation of these territories. Altogether the study includes 169 companies and 55 institutional and associative organizations. The paper is structured as follows. We begin with a brief review of regional and local perspective of systems of innovation. We then analyse companies and institutional behaviours by innovation activities. Finally, we present some final reflections.

2- A Regional and Local Perspective of Systems of Innovation

Some researchers welcomed the concept of system of innovation positively, but they were critical of the *national systems*. They found that the national level is not the

most relevant for analyzing innovation: *systems of innovation are to a certain point more local or transnational than of national extent* (Lundvall, 1988, p.412), *and important elements of the process of innovation tend to become regional rather than national* (Acs, 2000, p.3). In this sense, we found several contributions which reinforce the analysis at the regional and local level.

According to Niosi and Bellon[1](1994) it is possible to distinguish three types of systems: regional, national and international, which coexist and compete, but also sectoral in which one complement each other. We found increasing interaction among international, regional or local networks of companies and industry niches. These systems can confine, or not, to the borders of a nation, but the characteristics and the national contexts always have a decisive role in their creation. In spite of the regional perspective being important, some authors continue to defend that the national level is the most appropriate when studying system of innovation[2]. In fact, for Nelson (2000, pp.23-24) analysis of innovation in the context of the country is inevitable, namely in discussions of the job market, financial systems, fiscal, monetary, and trade policies, etc. The systems of innovation assume larger uniformity and connectivity within the nation.

Consequently, for Nelson (2000, p.25), Caracostas and Soete (1997, p.413) the system of innovation stays national because we noted earlier the striking continuity of a nation's basic institutions. Good examples are national education system, nations' systems of universities research and public laboratories will continue to be largely national. A nation's other public infrastructures and laws, its financial institutions, its fiscal, monetary and trade policies and its general economic ambience will still be a major influence on economic activity. Also for K. Smith (1995, p.79), *analyses on national scale are more useful to the general policy debate*.

Although national systems of innovation still play an important role in supporting and directing process of innovation and learning, both globalization and regionalization as process which weaken the coherence and importance of national systems. In fact, the pressures of globalization have put so much strain on the nation-state that sub-national

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[1] Gaffard et al (1993) (cited by Caracostas and Soete, 1997, p. 413) determined 4 types of local systems of innovation (industrial districts, metropolitan areas, territory gatherings and territories in transition).

[2] Krugman (1995) made a parallel comparison according to the concept of competitiveness when applied to the nation. For this author, to distribute the national system in subsystems constitutes a denial of the understanding of who develops them. In fact, systems of national also integrate the international economy and are the key to understanding their internal dynamics.

regions and communities have strongly felt a need for roots and anchors in regional and local bonds of culture, language, ethnicity and traditions. Also the dysfunctionality of the nation-state has triggered the emergency of genuine communities of economic interests at the regional level and it has led to the rise of the region-state. Like this, the sub-national governments, alliances among regional and local authorities, have become active as partners of foreign investors and providers of the indispensable infrastructure to leverage regional policies capable of make the region an active participant in the global economy.

Thus, according to Cooke (2000, p.53) today the regional dimension of innovation policy is receiving much more attention than the national level. This is for at least five reasons: 1) the development multi-level of the governance, particularly in E.U; 2) globalization has meant that financial markets influence national fiscal, monetary and budgetary policies significantly; 3) global competitiveness has caused global companies to re-evaluated the importance of regional level as part of their global strategies; 4) companies are reaping the benefits of externalization, as companies seek to source inputs from regionalized supply chains; 5) strong evidence has emerged to support the thesis advanced by Krugman (1995), that as economies become constrained by national frontiers they become more geographically *specialized*.

Therefore, the regions (subset of the nation-state) has been recognized as the more adequate geographical dimension for create competitive advantages rather than nation-state, such as confirm studies of Ohmae (1995), Braczyk et al. (1998), Fisher et al. (1999), Acs (2000), as well as Campos (1997), Couto (2000), Santos (2001), among others. Simultaneously, some of the largest companies are weakening their ties to their home country and are spreading their innovation activities to source different regional systems of innovation. *These changes are important and challenge the traditional role of national systems of innovation.* (Acs, 2000, pp. 3-4).

In the 1970s and 1980s, the objectives of technology policies were to increase national competitiveness. Though, these main aims were enlarged to regional policy of innovation to promote the regional and national development. In recent years for modernizing the national economy were developed and studied strategies of regional development relatively to the capacities of innovation and of R&D (Research and Development) activities within the region, as resulted of regional development policies had been conceived.

However, in the 1990s, the regional innovation policies were influenced by the discussions of national systems of innovation (NSI). For accompanying the systems approach emerge the concept of Regional System of Innovation (RSI). Thus, *when NSI concept is applied from regional development the RSI concept can be identified as sub-system of NSI*. Chung, (1999, p.2). This concept reflected the growing importance of region in S&T (Science and Technology), businesses and economic activities and can include the specific characteristics of region: economic structure, technological infrastructure and regional support system.

Moreover, at regional level, the systems of innovation involve a specific need of community and they have firstly a larger probability of mobilizing the community and the different regional actors to participate in this process for answering to that need. In this perspective RSI become a good concept to *generate, implement and adapt efficiently sectoral systems of innovations in the region*. Chung (1999). Thus, following the concept of Chung (1999, p.5), we can define RSI as the set of actors and institutions of innovation within the region. In the pursuit of innovation they interact with others actors to gain, develop and exchange various kinds of knowledge, information and other resources and to generate, diffuse and appropriate innovation.

Campos (1997), Coutinho et al (2001) and Couto (2000) enhance both Regional Systems of Innovation and Local Systems of Innovation. The local systems of innovation encompass *interaction/cooperation agreements among the responsible agents for learning and for the internalization of technological progress (private companies, government, technological institutions, education/training institutions, etc) in the local dynamics. This concept involves the market relationships and the role of government as well other actors which has different roles (within country and in exterior) and their interdependence relationships to generate and introduce innovations*. (Sicsú et al, 2001, p.7).

Although the nation state provides organizational structure in general, local institutional actors, working in accordance with national decisive strategies constitute the systems of innovation structure that operates at local level. (Smith, H., 2000, p.76).

In summary, regional systems of innovation encompass that available institutional infrastructure within the region to foment and sustain a regional dynamics of innovation. Regional systems of innovation are an instrument to create synergies and externalities and to promote the competitive performance of companies and of regions. According to Asheim and Isaksen (1997, p.307), it can be component regionalised of a

national innovation system, or be parts of productive and institutional structures located within the region but functionally integrated in NSI (*approach "top-down*"), and/or to be constituted by parts of institutional and productive structure that are territorially integrated and originally within the region (*approach "bottom-up"*)[3]. The system of innovation become more effective requires interaction and network. Different actors interact among both regional and national governance system, academy, industry and people for develop innovation. This perspective of the systems of innovation can become enlarged for borders perspective to foment competitiveness of border regions.

The regions have a important role to activated interfaces between private investigation and academic investigation, (Munier and Rondé, 2001, p. 517). In this context of growth importance of regions they still enhance the concepts of learning region (Florida, 1995; Ferrão, 1996) and of innovative milieu of Aydalot, Maillat, Crevoisier and Camagni. In the centre of the reflections of earning region paradigm they are the externalities of knowledge between companies and the scientific environment of region. In this perspective regional dimension has a decisive role in the innovation process. *The social aspects of learning region involve a strongly idiosyncratic dimension of interactions among companies and institutions which form region.* (Munier and Rondé, 2001, p.518). Thus, the systemic approach is necessary to generate *learning region*[4] and *learning state* (Chung, 1999, p.5).

The innovative milieu approach enhances the auto-organization, the productive interdependences, the complementarities and the indivisibility (Crevoisier et al, 2000) of milieus. The milieu leans on these characteristics to generate interactions and know-how, to increase the innovation capacity and to become innovative. It requests proximity (institutional, social, economic), capacity to be jointly in network with the exterior environment and with the governance system to determine a specific external image and to create an identity interns with collective and synergetic learning processes.

Like this, when we intended to analyze the border regions the specific characteristics of milieu and of learning region impede of considering the border regions as innovative milieu or learning region. Moreover, the concept of regional system of

[3] It is this perspective of Asheim and Isaken (1997), together with the actors of the system of innovation for Portugal that will help us to identify the main actors of the system of innovation of RCI.

[4] Munier and Rondé (2001,p.518) considered the concept of Boekema et al (2000) that learning region is the physical expression to understanding, that grew up in the 1990s years, as the economical growth is independent from innovation, and innovation is dependant of creation, dissemination and application of knowledge.

innovation has an instrumental role, related to innovation policies and implementation of regional strategies of innovation, and differs of previous approaches for having a more operative dimension. The aim of regional systems of innovation is to reinforce territorial landings of competitiveness, turning the milieu most innovative and the regions more learning.

Thus, in spite of the approaches of *learning regions*, of *innovative milieu* and of regional systems of innovation presents few different in the more relevant factors namely the importance of learning and knowledge in process of innovation, different actors involved, interaction among actors and relationships in network and in system, and the differences previously exposed, these territorial approaches of innovation still value in a different way other characteristics linked to territorial process of innovation as we will see to proceed.

Table 1: Characteristics more valued for the three different approaches

	Innovative Milieu	***Learning Region***	**Regional Innovation Systems**
The general characteristics of the companies/institutions/associations:			
Structure, head office, age	++	++	++
Characteristics of employees	+	+++	++
The director's characteristics	+	+++	++
Utilization of ICT	+	++	+++
Local Market	+++		+
Local Suppliers	+++		+
Localization Factors			
Personals	+++		+
Region Environment	+++	+++	+
Market	+++		+
Entrepreneur Relationships	+++		++
Materials Resources and others Inputs	++		++
Humans Resources	++	+++	++
Accessibility			
Characterization of relationships			
Origin territorial of the social capital	+++		
Costumers localisation	+++		+
Localisation of technological, financial, humans resources, of inputs and of information	+++	+++	+
Cooperation	+++	+++	+++
Cooperation with companies, suppliers, costumers competitors, consultants	+++	+	++
Cooperation with R&D and Higher Education Institutions	++	+++	++
Cooperation with company associations, with central and local Public Administration	++	+	+++
Competition relationships	+++		
Services externs	+++		
Subcontracting relationships	+++		
Innovation Behaviour's			

Innovation activities: R&D inside the company; acquisition of external services-R&D; acquisition of new technologies; acquisition of information technologies; acquisition of other external knowledge; training of human resources; introduction of innovation into markets; management strategy /techniques; changes in organizational structure; marketing innovation	++	++	+++
The development of innovation in cooperation or individual process	+++	+++	+++
Output of innovations	+	+	+++
Cooperation for innovate with companies, suppliers, costumers competitors, consultants	+++	+	+++
Cooperation for innovate with R&D and Higher Education Institutions	+++	+++	+++
Cooperation for innovate with company associations, with central and local Public Administration	++	+	+++
Innovation sources: internal to company; the suppliers, clients and competitors sources	++		+++
Innovation sources: institutional (institutions of higher education degree and R&D and public laboratories),	++	+++	+++
Innovation sources: other sources (including conferences, meetings and publications, fairs and exhibitions)	++	+	+++
Obstacles of innovation	+	+	++
Local promotion of products of region	+++		
Effect of collective learning	+++	++	+++
Local individual learning	+++	+++	+++
Mechanisms of Governance			
Region proprieties: problems and satisfaction	+++		++
Effect of public administration intervention	+++		++
Local Identity	+++		++

Source: Own elaboration
Legend: + correspond low; ++ correspond medium; +++ correspond high

Effectively the three approaches value in a different way, particularly the follow factors of company/institution and of their environment: the general characteristics of company/institution; the factors of localization; origin territorial of capital social, costumers and suppliers; relationships of competition; divers innovation activities (R&D inside the company; acquisition of external services - R&D; acquisition of new technologies; acquisition of information technologies; acquisition of other external knowledge; training of human resources; introduction of innovation into markets; management strategy /techniques; changes in organizational structure; marketing innovation), innovation sources and output (impact); cooperation with suppliers/costumers versus cooperation with R&D and Higher Education Institutions versus cooperation with company associations, with central/local Public Administration and mechanisms of governance.

3- Methodology

Selection of actors and data

The analysis was based on a survey which was used to collect information from a large set of actors that might be involved, directly or indirectly, in promoting the innovation and competitiveness of the Raia Central Ibérica. The main actors of innovation in the Raia Central Ibérica were identified following the approach of the National Innovation System of Guinett, (1999, p.68), and PRONOIV (Program Integrated of Support for Innovation in the Portuguese regions - see Rodrigues, 2000, p.22).

Four groups of actors in the RCI could have an important role in the process of innovation, namely:

A- Companies

B- Institutions offering support and assistance to enterprises: technological centres, enterprise and development associations

C- Education, training and R&D institutions: universities and polytechnics, Institute of Employment and Professional Qualification (IEFP)

D- Public institutions (central/regional administration, local administration and other public institutions (regional association of municipals, Institute of Commerce and Tourism of Portugal (ICEP), Institute of SME Support (IAPMEI)

The Portuguese database of establishments and companies (BELÉM) of INE (the Portuguese National Institute of Statistics) in 2002 was used to identify the set of companies (group A) for the Portuguese NUTS III areas studied. That database supplies the name, the address, the Classification of Economic Activities (CAE) and the number of workers for each company. No similar database is available for the Spanish regions of the RCI. The database of the Official Chamber of Commerce and Industry of Salamanca was used to identify companies in the Province of Salamanca and this has information of the name of the company, address and number of workers (among other variables). Database Árdan was used for the Province of Cáceres and the Extremeña Business Guide of the Junta of Extremadura for companies of Extremadura for the year 2002 as they supply the same variables.

Groups B, C and D were contacted using a listing published for the Commission of Coordination of the Region Centre (2002), of the organizations of the border region, with name, address and telephone number and/or e-mail address.

Selection of the Region

The Raia Central Ibérica (RCI) is made up of sub-regions on the border of Portugal and Spain. The Raia Central Ibérica, in the scope of the INTERREG II, covers the Portuguese sub-regions (NUTS III), of the Interior Central Region: Beira Interior Norte (BIN), Beira Interior Sul (BIS) and Cova da Beira (CB) within Raia Central Portuguesa (RCP), the Portuguese border of the interior region. It also includes the totality of the territories of Spanish provinces of Salamanca and of Cáceres, situated in Autonomous Communities of Castilla y Léon and Extremadura, in turn part of Raia Central Espanhola (RCE), the Spanish border interior central region.

These sub-regions are characterized by very similar social-economic features; the regions on both sides of the border have been losing population and have weak corporate sectors and poor economic capacity. In several studies (Reigado 2000; 2002; Santos and Caetano, 2002; Hernández, 2000; De La Fuente,2002; among others), the border region of Portugal and Spain is shown to be disfavoured and depressed. It presents a geographic and political situation of periphery, a territory that one could call *very marginal and distant from the national centres of decision*, (Hernández, 2000, p.17) and also from regional (in the case of Spain) and consumer centres.

The present interest in these peripheral regions is related to the possibility of evaluating the dynamics of innovation through an analysis of the participation of different actors within them in promoting innovation. The paper continues by discussing the data used in the attempt to perceive which environmental factors are associated with these dynamics.

Data Gathering and the Sample

The principal sources of fieldwork data resulted from two surveys. One inquiry was carried out with companies and the second inquiry was carried out with the different institutions and associations in these five regions.

In selecting the universe for the collection of company data, all legal companies with headquarters within RCI and more than ten employees in all *sectors* were included. In selecting the universe for the collection of institutions/associations data, all institutions/associations within RCI with a role in terms of territorial innovation were contacted. The information was initially collected through the months of January, February, March and April, 2003. However, given the lack of responses from the Spanish companies, the inquiry was sent by post to all the companies who had still not replied in August asking for a reply by the end of September. Table 2 summarizes the RCI actors studied and compares the data used with the population fitting the criteria.

Table 2: Summary of actors studied in the RCI

	RCP		RCE	
	No.	**Per cent of population**	**No.**	**Per cent of population**
A - Companies	105	15	64	9
B - Institutions providing support and assistance to enterprise activity: technological centres, company and development associations	14	70	6	35
C - Education and training and R&D institutions: polytechnics, universities and technological schools	7	100	2	33
D - Public institutions (local, regional/national public administration, other institutions)	16	59	10	36
Total (B+C+D)	37	71	18	47

Source: Own elaboration

Innovation Variables

Following Lundvall (1992 p. 46), innovation involves the creation of qualitatively different, new things and new knowledge. In this view innovation can take several forms: innovation of products; innovation of processes; organizational innovation, innovation of the services, innovations of markets, institutional innovation and environment innovations. In the study of innovation in small regions, such as the one analysed here, the adoption of a broad concept of innovation is advisable, including the diffusion and the imitation of technological, organizational, economic and cultural modifications and the training of human resources.

Thus the classification of innovation activities considered in the study are shown in Table 3. These follow the Community Innovation Survey II and III and 14 variables are used to capture different dimensions of company and institutional innovation.

To characterize the attitude of the different actors in innovation activities, a methodology similar to the one developed in Project INNOVALOC was used. The set

of variables given in Table 3 was analysed to classify the behaviour of the companies in activities of innovation and to classify the behaviour of institutional and associative actors:

Table 3: Variables used in the cluster analyses

Variables used to classify the behaviour of the companies	Variables used to classify the behaviour of the institutional and associative actors
R&D inside the company Acquisition of external services – R&D Acquisition of new technologies Acquisition of information technologies Acquisition of other external knowledge Training of human resources Introduction of innovation into markets Management strategy /techniques Changes in organizational structure Marketing innovation Company introduced innovation Product innovation Process innovation Organizational innovation	R&D inside the organisation Acquisition of external services - R&D Acquisition of new technologies Acquisition of information technologies Acquisition of other external knowledge Training of human resources Management strategy /techniques Changes in organizational structure Marketing innovation

Source: Adapted from CIS III

K-means clusters, a multivariate statistical technique within the Statistical Package for the Social Sciences, was applied to these two sets of variables. The aim of this analysis was to detect groupings of companies within the company sample with respect to involvement in innovation activities and, similarly, to detect groupings within the institutions/associations in terms of their involvement in innovation activities.

The resulting clusters of companies and of institutional actors were analysed, in turn, to identify the set of attributes of each cluster and to investigate the differences between the groups as well as which factors were associated with the best performance. The attributes considered for the different actors were the general characteristics of companies/institutions/associations, the factors of localization, the characterization of relationships, innovation behaviour's and the mechanisms of governance. The results of this analysis are now presented, together with the findings of concerning the factors that are associated with better performance.

4- Companies and Institutional Actors within RCI - Cluster Behaviour by Innovative Activities

To be innovative, territories require the involvement not only of the companies located there but also of several institutional and associative actors. The next sections report the results of the study of the behaviour of actors within RCI other than the companies themselves, which have been discussed above.

Applying *K-means clusters analysis* to the group of variables previously defined for the companies resulted in three groups of companies. Table 4 summarizes the results of each group relative to each of the variables previously presented. Note that 0 corresponds to 'no' (the cluster is not involved in this innovation activity) and 1 corresponds to 'yes' (the cluster is involved in this innovation activity).

K-means clusters analysis was applied using the group of variables previously defined for the institutional actors in Table 3. This resulted in three clusters, each representing a distinct behaviour as regards involvement in innovation. Table 4 summarizes the results by cluster for each of the variables previously presented. In this table, 0 corresponds to 'no' (the cluster is not involved in this type of innovation activities) and 1 corresponds to 'yes' (the cluster is involved).

Table 4: Involvement of RCI companies and institutions/associations in innovation activities - results of K-means analysis

Companies				**Institutions/associations**			
Variables used in cluster analysis	Cluster one: medium involvement **N=62**	Cluster two: low Involvement **N=63**	Cluster three: high involvement **N=44**	Variables used in cluster analysis	Cluster one: low Involvement **N=25**	Cluster two: high involvement **N=11**	Cluster three: medium involvement **N=19**
R&D inside the company	0	0	1	R&D inside the organisation	0	1	0
Acquisition of external services – R&D	0	0	1	Acquisition of external services - R&D	0	1	0
Acquisition of new technologies	1	1	1	Acquisition of new technologies	0	1	1
Acquisition of information technologies	1	0	1	Acquisition of information technologies	0	1	1
Acquisition of other external knowledge	0	0	1	Acquisition of other external knowledge	0	1	1
Training of human resources	1	1	1	Training of human resources	0	1	1
Introduction of innovation into markets	0	0	1	Management strategy /techniques	0	1	0
Management strategy /techniques	0	0	1	Changes in organizational structure	0	1	0
Changes in organizational structure	0	0	1	Marketing innovation	0	1	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

An ANOVA test was carried out and showed that the clustering of the selected variables was statistically significant – see Appendix 1 and Appendix 2. An F test ($p<0.05$) showed that each factor has a differentiated contribution in the three groups (see Pestana and Gageiro, 2000).

For the companies we have the following results:

Cluster one groups together 62 companies which are characterized by medium involvement in innovation activities (innovation exists in the introduction of new products in the market, new technologies and ICT, in the qualifications of human resources and in introducing innovations). In this group of companies, innovation is unlikely to be radical but it is linked with the constant necessity to introduce new products to survive. The companies within this group belong largely to the BIN and CB (34 per cent and 23 per cent, respectively) while the remaining companies are distributed in the other three regions in the following way: 16 per cent in BIS; 15 per cent in Salamanca, and 13 per cent in Cáceres. 60 per cent of the companies making up this cluster are in manufacturing (CAE 15-37) and 28 per cent are engaged in commerce (CAE 50-54).

Cluster two contains 63 companies characterized by a very low involvement in innovation activities. Their attitude is very passive and the only evidence of innovation efforts is related to acquisition of new technologies and the training of human resources. The companies within this group belong largely to Cáceres and to the BIS (29 per cent and 22 per cent respectively), the remainder being in Salamanca (19 per cent), CB (16 per cent) and BIN (14 per cent). Moreover, 33 per cent are in manufacturing industry and a much higher proportion is in the service sector with 32 per cent from commerce, 19 per cent from construction and 13 per cent from other services.

Cluster three groups together 44 companies and it is distinguished from the previous groups by its very considerable involvement in innovation activities and both radical and incremental innovation feature. In this group, only organizational innovation is unimportant. The companies are located in Salamanca (30 per cent), CB (27 per cent) BIN (18 per cent), BIS (16 per cent) and Cáceres (9 per cent). Manufacturing industry accounts for 64 per cent of the cluster and commerce for 27 per cent.

Looking first at the location of the companies in the different clusters, it appears that the 55 per cent companies based in BIN are in cluster one while 45 per cent of the

companies in BIS belong to cluster two and 32 per cent to cluster one; in CB, 39 per cent of the companies belong to cluster one and 33 per cent to cluster three. Salamanca has a distinct situation; 38 per cent belong in the more innovative cluster and 35 per cent are in the less innovative group. In the province of Cáceres, the situation is reversed. 37 per cent of companies belong to each of cluster one and cluster two.

Second, the sectors can be distinguished according to the cluster in which they appear. More than 66 per cent of companies in construction and other services (excluding commerce) belong to cluster two. 41 per cent of commercial firms are in cluster two and 35 per cent in cluster one. About 76 per cent of manufacturing firms are in the more innovative two clusters with 33 per cent in cluster three. Looking at the breakdown of manufacturing industries, 68 per cent of firms in agro industries (CAE 15) are in cluster one, 50 per cent of textile manufacturers (CAE 17) belong to cluster three and 38 per cent to cluster one while in the clothes industry (CAE 18), 73 per cent of the firms belong to cluster one and 18 per cent to cluster two.

For the institutional actors we obtain the following results:

Cluster one groups twenty five organizations which are characterized by don't have involvement in innovation. Eight of this group are located in BIN, five of this are located in CB, with the remaining organizations distributed over the three regions in the following way – four from each of BIS, Salamanca and Cáceres. The main types of organisations in this cluster are development associations (seven institutions) and local administration organisations (six institutions). It includes two company/commercial associations and two technological and training institutions, four of central/regional public administration organisations and four other public institutions.

Cluster two contains eleven organizations characterized by involvement in all the innovation activities. In this group of organizations, innovation is a priority. Three are from Salamanca, two from each of BIN, CB and Cáceres, and one is located in BIS. The cluster is made up of four higher education institutions, three companies/commercial associations, three central/regional administration organisations and one local administration organization.

Cluster three groups nineteen organizations with a medium involvement in innovation activities. This group does not contemplate internal or external R&D, management strategy/techniques and changes in organizations structure. The cluster contains six organizations from BIN and five from CB with three each from BIS and

from Salamanca and two from Cáceres. Six of them are connected to companies/commercial associations, four from each are regional/central administration and local administration, three are technological and training institutions and one from each are development associations and other public institutions.

Looking now at the breakdown of the organisations in different regions in the clusters, it appears that the organizations in BIN largely fall into cluster one (eight of the total of sixteen), and cluster three (six). The majority of the organizations in BIS belong to cluster one (four out of a total of eight) and three to cluster three. In CB, five of the total of twelve organizations belong to cluster one, five to cluster three while the cluster two accounting for two. In Salamanca four of the total of ten organizations belong to cluster one and the rest are equally divided between the other two clusters. In the province of Cáceres, half of the total of eight organizations belong to cluster one (the less innovative cluster) the rest are equally divided between the other two clusters more innovative.

Turning to the distribution of the different groups of actors, four of the total of five institutions of higher education belong to cluster two, the most involved in innovation. Three of the technological and training institutions are in cluster three and two of them are in cluster one, the least involved in innovation. Seven of the total of eight development associations belong to cluster one and one to cluster three. The companies/commercial associations are distributed between all the clusters: six to cluster three, three to cluster two and two to cluster one. The organisations connected with regional and central administration four from each belong to cluster one and cluster three two and three to cluster three. Six of the total of eleven organisations involved with local Administration belong to cluster one, four to cluster three and one to cluster two. The group of other institutions (constituted of Regional Association of Municipals, IAPMEI and ICEP) three quarters belong to cluster one.

Characterization of the behaviour for the entrepreneurial and institutional actors by cluster

The three groups of companies previously identified in terms of their involvement in innovation activities and the three groups of institutional behaviour previously identified can be characterized in terms of the attributes previously presented: the general characteristics of the companies/institutions/associations, the localization

factors, the characterization of relationships, innovation behaviour's and mechanisms of governance. These attributes will help to draw profiles of innovation behaviour and to analyse which environmental factors are associated with the best performance in terms of innovation.

A- General characteristics of the companies/institutions/associations

We will study the actors by analysing legal responsibility, age of localization of company within Raia Central Ibérica, if it is exporter, step of employees, employees with higher education degree, profile of the top manager and the use of ICT. The aim is to perceive which are the general characteristics associated to the best performance of the companies and of institutional actors.

Relative to the companies, for legal responsibility, the 3 clusters are mainly characterized by companies which operate one Quota Societies, following the ones that are Anonymous Societies. However, while the less innovative cluster has the greater percentage of companies with Quota Societies, cluster more innovative has the greater percentage of companies as Anonymous Societies and the medium innovative cluster has the greater percentage of companies as Cooperatives.

Relative to the institutional/associative actors, for legal responsibility, the 3 clusters are mainly characterized by public institutions, following the ones that are associations. However, while the medium innovative cluster has the greater percentage of associations, the cluster more innovative has the greater percentage of public institutions and the less innovative cluster has the greater percentage of other institutions (private or others).

Relative to the age of localization of the company in region, the biggest percentage of companies has less of 25 years in all clusters. However, the cluster less innovative exhibits more percentage of younger companies, and cluster with a medium involvement in innovation has the big percentage of older companies. The exporting companies are most involved in innovation (with 50 percent of cluster more innovative involved in exporting in 2002 and 48 per cent of cluster with a medium involvement in innovation activities, compared with 31 per cent of cluster less innovative).

There are also differences in size in terms of numbers of employees. For the companies, while the two less innovative groups have less than 20 employees (about 45 per cent of cluster one and 51 per cent of cluster two), only 26 per cent of companies

within the most innovative group have less than 20 employees. For the institutional/associative actors the most innovative cluster (an average) has the lesser number of the employees, while the cluster not involved in innovation has the greater number of the employees. It is also the more innovative cluster (of companies and of institutions) that has more employees with higher education degree and less employees with the basic education (second cycle). In opposition the less innovative cluster that has more employees with basic education degree.

Some differences are also apparent as regards the characteristics of the top manager. Top managers with higher education predominate in more innovative cluster (of companies and of institutions). For the companies accounting for over half the firms (55 per cent as against 46 per cent in less innovative cluster two and 48 per cent in medium innovative cluster). In the latter two clusters, about one third of the top managers stopped their education before the twelfth grade. For the institutional/associative actors all had a higher education degree in the more innovative cluster and in cluster less innovative only one manager did not have this level of education. In medium innovative cluster which showed a reasonable level of involvement in innovation, 85 per cent of the directors have higher education.

The cluster (of companies) more innovative that present more computers in the company (an average of 16) while in less innovative clusters, these figures are eight respectively from each. All the companies in cluster more innovative have access to the Internet and computerize their data unlike the other clusters where less than 90 per cent of companies have Internet access and not all keep data in computerized form. Also 61 per cent of cluster more innovative companies have a web page, against 48 per cent in cluster with a medium involvement in innovation activities and 42 per cent in cluster less innovative. Moreover, cluster with a high involvement in innovation activities makes more use of the new information technologies for electronic commerce and in relationships with customers. All the institutional/associative actors studied had access to the Internet and all of those classified to the more innovative clusters have a web site whereas only three quarters of cluster less innovative have a web site. The two more innovative clusters have the biggest percentage of organizations using computerized data and communicating with their users and associates with new ICT.

B- Factors of localization

Some significant differences emerge as regards the attitude of the companies to the features of the region.[5] On average, cluster more innovative values the grouping concerned with human resources more, followed by the availability of inputs and the environment of the region; cluster with a medium involvement in innovation activities values personal factors more followed the enterprise relations and the cluster less innovative is most concerned about market proximity.

Only the companies of medium innovative cluster intend to change the localisation of their company and just 5 per cent of total of companies of this cluster. The companies of cluster more innovative those present more purpose to open another establishment; however their preference it is with out Raia Central Ibérica.

C- *The characterization of relationships*

Relative to the social capital with origin in RCI, about 79 per cent of companies of cluster more innovative and of less innovative cluster, have the total (100 per cent) of social capital own region. For the cluster with a medium involvement in innovation activities 82 per cent of companies have the total (100 per cent) of social capital within RCI.

The more important geographic market in all clusters is the company's own region. The suppliers are localised in the region for 45 per cent of companies in cluster less innovative, compared with 36 per cent in cluster more innovative and 44 per cent in cluster with a medium involvement in innovation activities. However, the more

[5] Through factorial analysis, the localisation variables were reduced into the following seven groups. These were the environment of the region (including image/prestige of the region; surrounding propitious to innovation; surrounding propitious for contacts /visibilities, and information intensiveness of the environment); human resources (including availability of sufficient labour; availability of skilled labour; proximity of centres of teaching and research, and mobility of staff between companies of the same industrial sector); personal factors (including residence in the region; knowledge of home environment; origin, and existence of property in the place); market and accessibility to the market (including accessibility of the region to the rest of the EU, and accessibility of the region to the rest of the country); supply of inputs (including availability of inputs materials and accessibility); proximity of market (including proximity of the potential customers; absence of companies in the same branch; existence of companies of the same branch, and creation of new markets), and enterprise relations (including existence of supplying companies; existence of companies customers; existence of other companies of the proprietor; existence of support service companies, and access to subcontractors). The KMO was calculated to see if it was reasonable to carry out a factorial analysis (see Hill and Hill, 2002). The value here was 0.875 which is good enough to make a factorial analysis. After the factorial analysis, averages were compared.

innovative clusters operate with suppliers from other parts of the EU and other countries (about 40 per cent of companies in cluster more innovative have suppliers elsewhere in the EU and 14 per cent go further a field; in cluster with a medium involvement in innovation activities the corresponding figures are 36 per cent and 5 per cent respectively).

The cooperation is a vehicle to promote territorial innovation and competitiveness. The cooperation networks reduce the intrinsic uncertainties in the process of innovation. They facilitate the production and transmission of knowledge and promote territorial dynamics of innovation. As regards the cooperation to access information and resources to help in the general functioning of the company, 75 per cent of the companies in the most innovative cluster, had established formal or informal cooperation agreements with other external entities. In cluster with a medium involvement in innovation activities, 58 per cent had these types of agreements while only 37 per cent of the companies in cluster two, cooperate externally in this way to access information and other resources.

Of the actors previously identified that might potentially cooperate with companies in their innovation efforts, cluster more innovative has greater cooperation with the suppliers and with enterprise/commercial associations (more than 50 per cent of the companies) and institutions of R&D and higher education (42 per cent), while cooperation with the customers, development associations, central and local administration, and other institutions are found in about 20 per cent of the companies. Cluster with a medium involvement in innovation activities presents some differences. Suppliers are the main cooperation partners (44 per cent of companies) followed by customers (37 per cent), and other companies (33 per cent), while cooperation with R&D and higher education institutions and enterprise/trade associations is evident in only around 20 per cent of the companies.

The cooperation with several actors is established mainly at the level of the region for the two groups, except for the suppliers where the national level is more important for in both of the clusters. Institutes of higher education assume equal importance at the national and regional level for cluster more innovative (compared to cluster with a medium involvement in innovation activities, where the regional level predominates). Thus, the medium innovative cluster entrepreneurs have a little more pronounced territorial dimension in their cooperation activities than those of cluster more innovative.

The importance of subcontracting does not differ much between the clusters. 48 per cent of companies in the most innovative cluster have subcontracting arrangements compared with 44 per cent in the medium innovative cluster and 39 per cent in cluster less innovative.

Relative to the institutional/associative actors, a great majority of the institutions in the previously defined clusters, especially those most involved in innovation, have established cooperative agreements - 80 per cent (cluster more innovative), 63 per cent (cluster with a medium innovation), but only 28 per cent in cluster less innovative.

In general, more than half of the institutional/associative actors in RCI had established cooperative agreements with other actors to help in their innovation effort. Cluster more innovative cooperated with all the other actors except with development associations and the most important cooperation was with higher education institutions and with public central administration. Cluster less innovative had little cooperation with the R&D, development associations and with public administration. Cluster having average involvement in innovation, cooperated with companies (50 per cent), with company, commercial associations (50 per cent) and have little cooperative arrangements with consultants.

Cooperation was described as essentially formal although informal cooperation had the highest values in medium innovative cluster (47 per cent); only about 30 per cent of the organisations in the other two groups had established informal agreements.

It appears from these results that the system of innovation in RCI does not favour network cooperation. In some way, this will translate into a weak regional innovation dynamic and will result in competitiveness problems.

D- Innovation behaviour's

We will study the behaviour of actors by analysing the sources of innovation, the financial support and other obstacles, the future attitude toward innovation and the local effect of collective and individual learning.

Relative to the main sources of information for the sample companies were found to be internal sources and market sources (mainly from suppliers and clients). Less than 33 per cent of the companies consider institutional sources as an important source of information for innovation showing the absence of potentially important links between knowledge producers and company sector. However, this situation is not only found in

the RCI. According to Conceição and Ávila (2001), institutional sources (among others) are little used by the Portuguese companies with more than 70 per cent of the companies studied claiming not to have used them. Thus, external information sources for the development of innovations essentially result from the relationship of the company with its customers and suppliers, and are often of a tacit, less codified nature.

There are some differences in information sources between the more innovative clusters one and three. All sources of information, except customers, are more important to cluster more innovative than to cluster with a medium involvement in innovation. In cluster more innovative, the main and more important source of innovation is the company, while the customers are the main source of information in cluster with a medium innovation. Still, relative to the institutional sources, these have a middle or high importance for 33 per cent of the cluster more innovative companies compared with 21 per cent of cluster with medium involvement in innovation. Moreover, cluster more innovative values the other sources more than cluster with medium innovation, including proceedings from scientific and professional conferences, meetings and publications (where the information has one more codified character), and information from consulting companies[6].

Relative to the institutional/associative actors, the most innovative cluster values all the potential information sources, with the most important as identified as internal sources of information. Cluster two places little value on the different information sources except internal ideas, those coming from other companies, especially from users/partners and conferences, which are more valued here than in cluster three.

In terms of financial support for innovations, the results showed that the great majority of the companies (about 80 per cent) did not receive financial support for innovation activities from local or central administration independently of the type of innovative behaviour they represent, although central administration was more supportive than the local level, especially towards the more innovative clusters. Including EU initiatives, the percentage of companies that benefited from EU support for innovation was 37 per cent, and 50 per cent respectively for the two clusters more innovative.

The institutional/associative actors independently of the group they represent had received national and EU support. Cluster less innovative benefited the least from

[6] Factorial analysis with a KMO of 0.799 was used to reduce the sources of information into four groups classified as internal; market; institutional and other sources.

assistance provided by local and central public administrations, although this was counterbalanced with the receipt of EU funds. Cluster more innovative benefited from assistance from local and central administration more than cluster three and still benefited from EU funds.

It is also important to analyze other difficulties (other obstacles to innovation) that companies had found and to see if these allow distinguish between the innovative profiles.

After using factorial analysis to group the possible obstacles[7], it was found that cluster with medium involvement in innovation attributes greater importance to external economic and financial barriers (such as risks, costs, lack of sources of financing and lack of breadth in the market) and cluster with high involvement in innovation activities to the internal obstacles within the company (lack of information on markets, on technology, organizational structure, lack of qualified staff, weak mobility of the workers, lack of cooperation, as well as the impact of regulations, lack of acceptability of innovation to the customers and their low requirements for innovation). More detailed analysis showed that extreme risks, high costs and lack of sources of financing are not relevant for one per cent more of the cluster three (more innovative) companies than in cluster one (medium innovative). This suggests that the most innovative companies do not ignore external obstacles but are more sensitive to internal constraints than cluster one companies, especially those concerning organizational structure, lack of qualified personnel, cooperation and mobility of workers. Cluster more innovative (three) is more conscious of difficulties with respect to intangible resources, cooperation and also mobility of workers between companies of the region than cluster with a medium involvement in innovation activities (one). These factors are increasingly seen as important in promoting territorial innovation and competitiveness in a world with an increasingly knowledge based economy and marked by internationalization and globalization.

For the institutional/associative actors the main factors hindering cluster with high innovation are regulations and norms, the narrowness of the market and the lack of receptivity of users/associates. The main difficulties faced by less innovative cluster are the lack of adequate sources of financing and relatively inflexible organizational

[7] Factorial analysis was also used here to reduce and regroup the variables. The KMO was 0.897 when the obstacles were regrouped into internal obstacles and external obstacles to innovation.

structure whereas the medium innovative cluster was impeded by heavy costs and the lack of financing sources.

In terms of the future attitude toward innovation relative to the clusters defined previously, the groups most involved in innovation in the short term are those that express greater intention to innovate in the near future. Process innovations have the highest values in cluster more innovative.

The local dynamics of collective learning will influence the development of innovation in a region. This will be affected by whether there is a feeling that such collective learning exists in the region. Also important will be the extent of the diffusion of know how, sharing of experiences, cooperation between agents, diffusion of innovations, whether the promotion of the services is organized at a regional level and whether the qualified human resources and trainees are drawn from the region.

There was some difference between clusters in the responses to questions about the effect of collective learning and diffusion of know how. 76 per cent of less innovative cluster entrepreneurs did not acknowledge the existence of a learning effect or did not answer compared with lower proportions in cluster one (52 per cent) and cluster more innovative (51 per cent). The less innovative cluster depends more on national suppliers for human resources training carried out in the region. More companies in the medium innovative cluster depend on the region for training human resources and the most innovative cluster is the one giving most attention to the trainees with provenience in Raia Central Ibérica. 61 per cent of more innovative cluster regards the mobility of employees between companies within the region as a source of learning compared with 82 per cent in cluster one and 69 per cent in cluster two. Similar results emerge for the mobility of employees between companies in the same sector. However, cluster more innovative is the one that cooperates more with local suppliers and with customers to get the resources and information needed to innovate.

Relative to the institutional/associative actors, more than 56 per cent of the actors agreed that collective learning exists, irrespective of the cluster to which they belonged. For the most innovative cluster 76 per cent of actors agreed that collective learning exist within the region. However, only 25 per cent of the public institutions, in particular those at central level, agreed that this effect exists. In relation to the territorial scale of promotion of services, cluster more innovative has the lowest percentage of actors that operate at a regional level, and its members tend to focus on providing services both nationally and to other countries. Much of the training is carried out in the region and

even the trainers are drawn primarily from the region. In terms of rotation inside the organisation and the mobility of workers to other organisations in the region, there are distinct situations in the three clusters. Cluster less innovative is the one that lists fewest organizations in which the employees rotate internally (38 per cent) and cluster with a medium innovation has the most rotation of employees (69 per cent of organizations). Again, it is cluster with medium involvement in innovation activities where there is greater mobility of workers to other organisations in the region (37 per cent) and this helped in innovation activities. In contrast, only a minor percentage of organisations in cluster more innovative have such mobility.

E- Mechanisms of Governance

Relative to the governance mechanism, we will analyse the entrepreneur satisfaction in concerns to the sub-regions governance systems and their most important problems.

In average, the great part of entrepreneurs don't are satisfied with the local governance systems except in terms of landscape and geography, in terms of environment and traffic congestion and in terms of security that assumes the best averages (good averages). The mobility and transparency of information circulation and the supply of work force with necessary qualification are the elements that present minor averages in terms of satisfaction.

In what concerns the clusters previously definite, in general the two clusters more innovative are the most averages in terms of satisfaction and they are those that more believe that region attracted young persons and entrepreneurs.

The most important problems pointed for the 3 clusters of companies are the lack of economic capacity of region, the lack of governs support, the lack of qualify of human resources and the old population age. To cluster with a medium involvement in innovation activities, the most important problem is the lack of governs support and to cluster more innovative is the economic capacity of region.

For the institutional/associative actors the governance mechanism presents a middle/ high satisfaction. In terms of landscape and geography, in terms of environment and traffic congestion, in terms of values and culture systems and popular traditions and in terms of security that assumes the best averages (good averages). Relative to the clusters previously definite, in general the cluster more innovative present the most

averages in terms of satisfaction and they are those that more believe that region attracted young persons and entrepreneurs.

5- *Remarks*

The profiles drawn for companies and for institutions using quantitative methods suggest inferences about the conditions associated with the best innovative performance. The conditions in the cluster most involved in innovation include more employees with higher education, greater access to new ICTs and their use of electronic commerce, more relationships with users, consumers and associates, more qualified top managers, the highest use of diverse sources of information, extensive cooperation in both formal or informal relationships, with companies preferring to cooperate with R&D and higher education institutions and the institutions cooperating more with companies. Future attitudes toward innovation and the individual learning effect also influenced the most innovative profile.

The different actors (companies and institutions/associations) in BIS had the least innovative profile which potentially could bring disastrous consequences in terms of innovation and competitiveness. However, these also valued collective learning more highly, justifying its reduced participation in innovation activities in terms of the difficulties of forming joint innovation strategies. The different actors in BIN and CB present an intermediate situation; the companies are largely found in the two clusters more involved in innovation but the institutional and associative actors showed behaviour similar to those in BIS. Salamanca presents the most favourable situation in relation to both the institutions and to the companies. The opposite appears to be the case in Cáceres. Thus Cáceres and BIS are the two regions that present the least favourable situation as regards innovation.

Moreover, the development associations, the technical training institutions and training schools, Agricultural Professional School and IEFP, appear to have an insignificant role in the development of the territorial dynamics of innovation. The public administrative organisations have a modest role in promoting innovation activities and higher education institutions are the most dynamic group as far as this is concerned.

It appears necessary to foster the regional politics of innovation and trans border innovation policies to promote innovation and competitiveness within RCI. In particular, it seems necessary to promote the territorial and trans-territorial process of innovation in this region by improving the functioning of the regional system of innovation, implementing a cross border system of innovation and constructing a culture of the innovation in the region. A number of other measures are also important. These include improving the interaction, cooperation and relationships between R&D and higher education, institutions, technological centres and companies intra and inter sub-regions of RCI and also in taking a border perspective. In addition, the availability of information and services supporting innovation need to be enhanced, encouraging the use of the new ICTs in particular. Technological research and technology transfer through participation of the companies needs to be promoted as well as the creation of joint ventures. From a longer term perspective, it is important to stimulate creativity and the enterprising spirit from childhood, taking a new approach to this in terms of education and training.

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Appendix .1: ANOVA Applied to the 3 clusters of companies relative to the involvement in innovation

ANOVA

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
R&D inside the company	4,219	2	,123	166	34,229	,000
Acquisition of external services - R&D	3,159	2	,111	166	28,571	,000
Acquisition of new technologies	1,178	2	,190	166	6,195	,003
Acquisition of information technologies	2,614	2	,200	166	13,080	,000
Acquisition of other external knowledge	3,752	2	,162	166	23,182	,000
Training of human resources	2,013	2	,219	166	9,178	,000
Introduction of innovation into markets	6,156	2	,149	166	41,226	,000
Management strategy /techniques	6,326	2	,123	166	51,564	,000
Changes in organizational structure	6,780	2	,148	166	45,877	,000
Marketing innovation	5,247	2	,170	166	30,882	,000
Company introduced innovation	17,731	2	,029	166	617,891	,000
Product innovation	11,841	2	,112	166	106,081	,000
Process innovation	3,438	2	,146	166	23,604	,000
Organizational innovation	1,600	2	,121	166	13,176	,000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

Appendix 2: ANOVA Applied to the 3 clusters of institutions and associations relative to the involvement in innovation

ANOVA

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
R&D inside the organisation	2,341	2	,111	52	21,156	,000
Acquisition of external services - R&D	3,465	2	,036	52	96,412	,000
Acquisition of new technologies	4,083	2	,100	52	40,698	,000
Acquisition of information technologies	2,053	2	,171	52	12,029	,000
Acquisition of other external knowledge	2,686	2	,146	52	18,349	,000
Training of human resources	2,793	2	,111	52	25,212	,000
Management strategy /techniques	3,166	2	,096	52	32,827	,000
Changes in organizational structure	2,106	2	,152	52	13,866	,000
Marketing innovation	2,384	2	,158	52	15,096	,000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.