



Innovation for Development

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Innovative profiles and regional actors in the Algarve and Andalusia: An exploratory approach

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Introduction

Regional Development strategies currently have an important focus on innovation issues. This aspect is illustrated by numerous regional innovations strategies that were conducted in recent years in European Regions. European programs such as the Innovative Actions of European Regional Development Fund (ERDF) had an important contribute in defining and consolidating the mechanisms to promote innovation. In the creation of these strategies the concept of Regional Innovation System (RIS) was often used as a reference to structure its components. When a region is trying to consolidate its innovative performance one of the important activities is to benchmark what similar territories have done successfully.

The following article was based in the work carried out in the context of TECHNOPOLIS, project co-financed by INTERREG III B *Méditerranée Occidentale*. This project was developed by a partnership constituted by the Municipality of Lagos (PT), Municipality of Tavira (PT), PTA - Technological Park of Andalusia (ES), Società Sviluppumbria (IT), Science and Technological Pole of Sicily (IT) and Sidi Tabet Technopole (TN). The central aim of the project was the consolidation of networks between the technopoles of the participant regions, with the exchange of best-practices and experiences, creating important linkages between the innovation actors of Mediterranean area.

The study "Regional Diagnosis for Innovation and Technological Profile in Medocc Regions" has the general objectives of analyzing the innovative activities in the participant regions, understanding the role of interface infrastructures in the creation and attraction of new technology-based companies and identifying main themes for cooperation between science and enterprises in the regions involved. The specific objectives were to identify key-areas of scientific and innovative development in each one of the participating regions and between them; compare the regions through a set of relevant statistical indicators for innovation in a common analytical matrix and identify main innovation actors in each territory.

This paper will discuss the interest in applying the RIS concept to regions so different like the Algarve or Andalusia. Both regions assume a peripheral characteristic in relation to Portugal and Spain and the EU, are important tourist destinations, and have conducted strategies to incentive development through innovation. A general overview of the regions and the analysis of some specific issues essential to the creation of a RIS, like the innovative profile, the identification of regional governance and research, higher education and technology transfer actors is done. Two recent innovation planning initiatives (PRIAlgarve and PIMA) will be referred.

The Interest in Focusing Regional Innovation Systems

The critical impact of technology and innovation on growth is clearly showed in the economic theory since the emergence of *growth accounting theories*, Solow (1956, 1957), Denison (1967) Abramovitz (1962). More recently the *new growth theory*, Romer (1986, 1990), Lucas (1988); stress the importance of factors related with a deeper understanding of the 'residual'. Innovation remains an unclear concept and has been an area under discussion in transdisciplinary approaches but it is seen as the key factor to growth and competitiveness and gaining importance within the current political agenda, OECD (1990, 2005), European Commission (2004, 2007).

The chain-linked model of Kline and Rosenberg (1986) underlined that innovation is not a casual phenomena and that some measures can increase its appearance. This notion is the basis of the innovation system approach. The innovation system reflects the understanding of a large number of components having an influence on all innovating process, which interact, learn, depend on and change their external environment. This approach facilitates the analysis of the economic, institutional, organizational, social and political factors related to innovation. The Innovation Systems view is well synthesized in Edquist (2005). The Innovation System (IS) is presented as the determinants of innovation processes, all important economic, social, political, organizational, institutional and other factors that influence the development, diffusion and the use of innovations. The constituents of IS are the components and the relations among those components. The components are organizations (formal structures that are consciously created and have explicit purpose – the players or actors) and institutions (set of common habits, norms, routines, established practices, rules or laws that regulate the relations and interactions between individuals, groups, and organizations – the rules of the game). The activities of the IS are the factors that influence the development, diffusion and the use of innovations and are the determinants of the function of the IS (pursue of innovation processes, *i.e.* to develop, diffuse and use innovations). Freeman (1995), Lundvall (1992) and Nelson (1993) were the developers of the National Innovation System approach. The growing meaning of smaller territorial contexts gave relevance to regional scale. Doloreaux and Dione (2007) refer that the studies of innovation systems stress the meaning of the region and its particular resources, such as learning capability, corporate attitudes or existent infrastructures, for the support of innovation between enterprises and territories, are factors of development. Porter (2003) shows that competitive advantages have a relevant local character, coming from the concentration of high-specialized knowledge and expertise and from the existence of institutions, competitors, partnerships and consumers, The last edition of Oslo Manual, OECD (2005), underlines an identical view. The RIS concept emphasizes the character of the region as a territory of association between technology, market, productive capital, culture and representations. The region is not only the framework to resource allocation but the environment producer of endogenous resources and specific dynamics. The region is a satisfactory scale to put into practice developmental policies for the promotion of a knowledge-based economy. To exemplify this interest we can refer to the multiplication of innovation strategies and planning in the European regions. Several studies contributed to identify similar characteristics of localization of productive systems based in the use of technologies to clearly understand a

RIS, Doloreux and Bitard (2005), Asheim and Gertler (2005). These studies allow the analytical framework to understand the concept, showing how the spatial concentration of companies and organizations induce innovation through interactions and collective learning.

Methodological Notes

The regional scale appears to be a relevant on analyzing the innovative processes. In this context is interesting to understand some main dimensions of the regional innovation systems. In the next section the regions of Algarve and Andalusia will be compared. The interest in comparing both regions arises from the geographical proximity and some similarities regarding for example the importance of tourism, but separated (of course by the Guadiana river and) by other factors like dimension, critical mass and or productive structure.



Figure 8 - The Algarve and Andalusia Map
Source - Own elaboration

The main dimensions analyzed are illustrated in figure 9 and refer to six important issues.

- Generic Features of the Region – the proximity dimensions of the region regarding decision-making centres, the density of enterprises and the productive structure are important grounds to innovative activities;
- Innovative profile – the Educational level, the Research and Development inputs (employment and expenses) and outputs (patents and creation of new technology-based enterprises).
- Innovation Planning – the relevance and coordination of mechanisms that regional actors designed and putted in action to consolidate a common strategy in terms of development based on innovation.

- Regional Governance – the existence of a regional structure that coordinates/promotes innovative activities are usually stressed as a central issue to the maturity of a RIS.
- Research and Development and Higher Education Poles – both activities are central to two of the main drivers of innovation, knowledge creation and learning capabilities.
- Interface Organizations – the world of Research and Enterprises has an important gap. Organizations, like knowledge transfer offices or science and technology parks that try to make bridges between both realities are crucial to take inventions to market and materialize innovations.

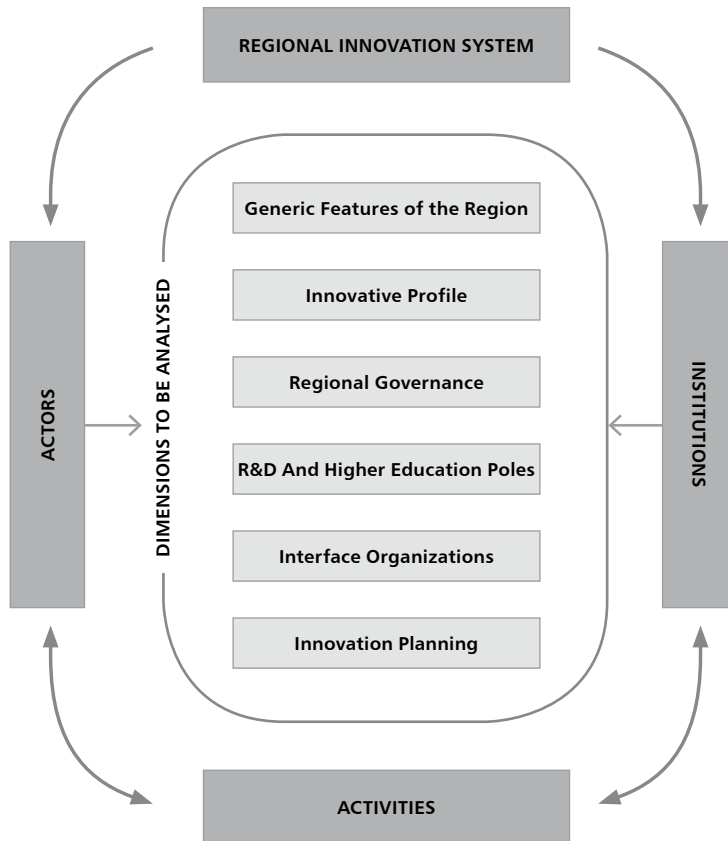


Figure 9 - Analytical Dimensions
 Source - Own elaboration

The considerations of these six important dimensions give us a snapshot of the reality of each one of the regions and show some aspects linked with the actors, institutions and actors that characterize the Regional Innovation System.

The Approach to Regional Innovation Systems in Algarve and Andalusia

Synthetic Presentation of the Algarve

The Algarve is a Portuguese region located in the south of the country, limited in the north by the Alentejo region and in the east by the Spanish region of Andalusia, specifically, the province of Huelva. In the south and west, the Algarve is bathed by the Atlantic Ocean. Here the Atlantic is softened by the influence of the Mediterranean. The region is constituted by the district of Faro (the region capital) divided in sixteen municipalities. It corresponds to around five percent of the Portuguese national territory.

The geography confers the Algarve a peripheral characteristic in the Portuguese and the European context. This characteristic brought some difficulties to the promotion of the development. Nevertheless, the last three decades witnessed a major structural transformation. The region, considered one of the poorest with low levels of life quality, massive emigration; economy based in traditional agriculture, fisheries and manufactures of these activities, was transformed in an attractive region with the highest population growth rates of the last decade (1991-2001) in Portugal. Currently the Algarve has around 410.000 inhabitants. In terms of economic development, the region left the group of "convergence" regions on the framework 2007-13 structural funds. The phasing-out status of the Algarve brought significant cuts in the financial aids but underlined the strong growth of the past decade. The Algarve, compared with the other Portuguese regions (the NUTS II level – characterized by the presence of a governance structure - CCDR), is the runner-up in terms of GDP per capita and in terms of purchasing power, coming only behind Lisbon. Four of the municipalities of the Algarve, Albufeira, Faro, Loulé and Portimão are in the list of the best fifteen regarding purchasing power in Portugal.

The development of the Algarve reflects the growth of a vibrant tourism sector, increased by the establishment of the International Airport in Faro, which impacted in other important sectors like construction or real-estate. On the other hand, the over-specialization in tourism-linked activities created high opportunity costs to investing in other sectors, which brought the fall of non-tourism activities. The massification of tourism in some areas, incremented by the fast development and construction, created a chaotic organization of the urban areas, in particular those in the coast with tourism vocation. Besides the importance of sun and beach product, the Algarve has an interesting portfolio of other products, with relevance to Golf, which was distinguished several times as the best Golf destination of the World, by the international associations in the sector. Other relevant product is the nautical tourism, with several important competitions being carried on and well-equipped marinas and tourism ports.

The rural Algarve suffered a process of abandonment (human desertification, ageing issues, very low levels of income and no access to collective equipments and services), contrasting with the very dense occupation of the coast. In fact, "two Algarves" can be considered. Almost 2/3 of the Algarve population lives in 20% of the regional territory, a linear metropolitan area, from Tavira to Lagos.

The Algarve as around 64.456 enterprises (18.697 societies) and the most relevant sectors in the region are tourism, construction and commerce, concerning the employment it creates and the percentage within regional production, INE (2006). Nevertheless the economic activity

transcends these sectors, where traditional activities like agriculture, fisheries or industry assume notorious importance. Besides these activities, others are becoming gradually of more interest to entrepreneurs, such as biotechnology (in particular, the green biotech and the blue biotech) and agro-food industries.

Innovative Profile

In the Algarve, the last two years have been important in the implementation of regional planning processes (Regional Development Strategy 2007-13, PROTAlgarve – Territorial Plan, Operational Program Algarve 21 and the Regional Innovation Plan). All these documents converge in giving innovation a central role in reducing the mono-production of the tourism that characterizes the development of the region.

The major problem regarding innovation in the Algarve is the very low level of education. Only 13,9% of the individuals between 25-64 years old have an high education degree (compared to the 22,4% of European average). In terms of the low educated people, the Algarve faces a very concerning situation (69,2% face to 29,1% European average). This reality causes important limitations in terms of the main driver of innovation, the learning process, restraining the entrepreneurial capacities, risk aversion and appetite to cooperate. Analyzing the behaviour of the companies, a small capacity to innovate is recorded. The indicators available at regional level show the predominance of incremental process innovation. The inputs of innovation, R&D personal or expenses are quite low. Recent data by Pinto (2006) showed that the expenses in R&D represent approximately 0,26% of the regional GDP, extremely far from the 3% percent goal of the Lisbon Agenda. There is another problem regarding R&D, apart from the insufficient scale that limits the creation of innovation, which has to do with who executes it. In the Algarve, R&D expenses are majority concentrated within the University (82,7%,). Enterprises represent only 8,8%. The financing of R&D is mainly coming from public funding (the national average shows that the private sector only represents 31,5% of the total investment), a situation contrasting with the OECD average, where the private sector accounts for about 60%. This factor is a limitation, as it is known that private R&D has a stronger impact in innovation when related with applied science. Projects of applied science are more likely to generate innovation outputs, such as patents or technology-based start-ups and spin-offs, two indicators where the Algarve is in a very weak position. Only larger enterprises (a minority) show slightly more innovative behaviour. Adding, to those indicators, the economic structure, where some company owners are too much focused in short-term profits, are risk adverse and very reluctant in adapting to change, a situation that will lead the Algarve to a continuous loss of competitiveness might be created, as referred by the CCDR (2006: 16). There is a growing attention to economic and social actors, to promote an adequate environment to innovation. One of the problems underlined is the inexistence of knowledge-based enterprises that stimulate the demand and supply of innovation creating technological markets. Another problem is the lack of relations between the main regional actors; in particular the relation between industry and academy is still inconsistent. This gap is a major restriction to knowledge and technology transfer. To overcome the problem, the university and some associations are developing several initiatives to stimulate this linkage, for

example, the creation of an interface organization like CRIA (Regional Centre for the Innovation of the Algarve). The excessive Portuguese bureaucracy is one of the most cited limitations to innovation, as it strangulates the decision-making process.

In Portugal, the funding of innovation is still limited, with the traditional banking sector being risk adverse and focusing the loans on the credit to consumption or housing. Solutions related to micro-credit or loans for productive investment are needed for the Algarve. There is a lack of risk capital (in particular seed capital adequate to entrepreneurial activities) and actors in general do not trust the mechanisms of risk capital solutions (for example, the Finicia program). Other limitation is the inexistence of interesting financing support from business angels.

The identification of sectors with the capacity to induce a sustainable regional growth, with a diversified economic base, was made in the process of creating a regional innovation plan, UAlg (2007). These refer to sectors with an important economic expression, like tourism, agro-food, sea - fisheries and aquaculture, and sectors where the region has specific potential based on natural resources or on R&D carried out by the University (renewable energies, life sciences, ICT, multimedia and intelligent systems). Tourism (the Algarve is responsible for 2/3 of tourism incomes in Portugal) and sea (the region has accounts a significant percentage of Portuguese fisherman (28%) and aquaculture farms (71% licensed units, 80% of area, 55% of production in quantity and 68% in value, INE (2006), have both strong scientific and economic dynamics. For their success, the other sectors are dependent on the complementarities to be created in the future.

There are important limitations regarding Science and Technology infrastructures; there are no science and technological poles in the Algarve and no science and technology incubators. This problem is currently being partially addressed by the development of science facilities, e.g., the Algarve Science and Technology Park (project lead by the University in the scientific expertise domains), the Technopole in Tavira (lead by Câmara Municipal de Tavira related with Renewable Energies) and the Technopole in Lagos (lead by the Câmara Municipal de Lagos).

Innovation Planning

The Regional Innovation Plan was designed to contribute towards the building of answers adjusted to the ambition/strategic design of the Algarve and the conception of a strategy to create a Regional Innovation System. The process of the PRIAlgarve – Algarve's Regional Innovation Plan, was based on the analysis and critical review of a set of documents, with prominence in the Ettirse project (1999-2001), INOVA Algarve programme (2002-2003) and the Regional Development Strategy 2007-2013. The plan defined six key-sectors: Tourism (central sector of regional economy), Agro-food sector (crucial to diversification of the economic base), ICT (consolidate the information society), Sea (Algarve's strategic resource), renewable energies (latent regional competitive advantage) and Life Sciences (an investment for the future).

The PRIAlgarve seeks to establish a strategic commitment between vectors of intervention in the innovation processes and the generation of critical mass infrastructure, as well as to finance the conditions for the creation and the development of innovative enterprises, the incubation and launching of start-ups and incentives to internationalization; scientific employment and the training of advanced competences relevant for enterprise modernization and regional specialization. The

establishment of networks for regional, interregional and international cooperation between Universities and above all regarding University-Industry are also worth to mention.

This context envisions four programs:

- Innovation Support Structures and Environment (main projects: the creation of the Algarve Science and Technology Park and a Regional Risk Capital Fund);
- Regional Innovation and Enterprise Initiative (main projects: program to support new technology based companies, technological modernization of existing companies, Regional Innovation Forum, strategic services to support the activity of companies the industrial zones of the Algarve);
- New Regional Abilities (main projects: insertion of Masters and Doctors in regional companies; fellowships for science and researchers);
- Cooperation for the Development of Regional R&TD (main projects: promotion of trans-border laboratories)

It is expected that the execution of these projects occur through public-private partnerships developed in the region, granting the access to funds from the CSF 2007-2013, from Regional Operational Program and Thematic National Programs and also from European Programs, like the 7th Research Framework Program or the Competitiveness and Innovation Framework Program.

Regional Governance

The CCDR Algarve (*Comissão de Coordenação e Desenvolvimento Regional do Algarve* – Regional Development and Coordination Commission) created by the *Decreto-Lei* number 134/2007 is a service of the direct administration of the State, in the context of the Ministry for the Environment, Spatial Planning and Regional Development, with financial and administrative autonomy, with the mission of executing environmental policies, spatial and urban planning, regional development, in its specific geographic area, promoting coordinated actions of the scattered services in regional context and technically supporting the municipalities and their associations.

The CCDR presented the Operational Program Algarve 21, for the period 2007-13, which intends to strengthen the Algarve as a dynamic, competitive region in the context of Knowledge Society. To achieve this ambition is important to prosecute priorities and objectives that lead to:

- Qualification, innovation and diversification of the economy;
- Human resources valorisation and creation of competences;
- Promotion of a balanced and competitive territorial model;
- Consolidation of a sustainable environmental system.

The OP is inserted in QREN – National Strategic Reference Framework with a budget of ERDF – European Regional Development Fund of 175 million euros oriented to the investment in three main axes:

- Competitiveness, innovation and knowledge;
- Protection and Environmental qualification;
- Territorial valorisation and urban development.

Research and Development and Higher Education Poles

As a thirty years old institution, the University of Algarve has now achieved its majority, deservedly recognized on account both of the growth of its physical structures and of the maturity evidenced in its teaching, administrative and research structures.

With its headquarters in Faro, the University enjoys spacious facilities: two Campi (Penha and Gambelas) and two teaching sites (Portimão), which all provide excellent conditions for the entire academic community. Ocean Sciences, Earth Sciences, Business Studies and Humanities at the University of Algarve enjoy a privileged environment for developing and widening the horizons of the builders of the Future.

As for specific skills, the University of Algarve is equipped with modern laboratories, used for research and experimentation in the most varied areas of knowledge, committed to research and development. A proof of this is the extensive list of Centres, Laboratories and Research Associations distributed by various areas, such as Ocean Sciences, Marine and Environment, Biomedical Sciences, Environmental Chemistry, Chemistry of Natural Products, Biochemistry, Biotechnology, Chemistry of Matter and Catalysis or Horticultural Sciences, which whether subsidized or not, develop a variety of activities and project the image of a university of high standards.

Among such R&D units some can be stressed, *e.g.*, the Centre for Ocean Sciences of the Algarve (CCMAR), the Centre for Marine and Environmental Research (CIMA), the Centre for the Development of Sciences and Techniques of Vegetable Production (CDCTPV), along with other research areas like Astrophysics and Space Physics, History and Archaeology, Tourism and Regional Economics, Econometrics, Chemistry, Electronics and Telecommunications, Signal Processing and Sub aquatic Acoustics, Experimental Particle Physics or Marine Geosciences, that are supported by the University.

Interface Organizations

The Regional Innovation Centre (CRIA) was born in 2003 from a partnership of University of Algarve (Research), CCDR Algarve (Regional Authority for Planning and Coordination) and ANJE Algarve and NERA (enterprise associations), as an answer to identified problems in the region: gap between research and enterprises and adverse environment to innovation. The mission of CRIA was the promotion, transfer and commercial approach to technology and knowledge in the academy, consolidating the linkage University-Enterprise. The three first initiatives of CRIA were: a Innovation Fair – a Public presentation of 75 innovative projects of the University to regional enterprises; a Tech-based Idea Contest – which resulted in 12 winning projects awarded Business Plans by well-known consultancy enterprises and the creation of GAPI (Industrial Property Rights Office) in the University. The activities of GAPI focus on patents and utility Models. Currently there are ongoing around 200 processes of trademarks, 10 patents and 30 logo registration processes.

CRIA is increasing the technology and knowledge transfer generated in the university. For this purpose, a section of CRIA called OTIC – Office for Technology and Innovation Transfer - was created. OTIC developed the following activities: characterization of R&D capabilities and

existent networks; inventory of competences, services, equipments and laboratories of the university; presentation of services to enterprises; launching of new laboratories and studies on regional innovation.

The support to tech-based entrepreneurship was funded by the CRIATech project. The main activities developed were the support to implementation of the winning ideas from the first idea contest, support to proposals for incentive programs, detection of financing opportunities and support to proposals for entrepreneurship contests. In this context, several new enterprises were supported, mainly in the field of marine sciences. The interface university-enterprise (U-E) is being reinforced with some consortium U-E projects. An R&D nucleus in enterprises (NITEC) was developed within Inesting (in collaboration with the Faculty of Economics).

CRIA participates in the regional FINICIA Platform. This is an initiative promoted by the Portuguese institute of support to small and medium sized corporations – IAPMEI – that has developed regional platforms to select entrepreneurial projects that are likely to receive financial support. This platform is composed of regional relevance institutions, with responsibilities in the field of supporting entrepreneurship and start-up creation. This is an important instrument to increase the social capital among the involved organisms.

CRIA is also proactive in participating in networks related with innovation, industrial property, science and technology parks and technology transfer. At national scale, GAPI, OTIC and Tecparques networks can be referred, and at international level, the Proton, ASTP and IASP networks. An important protocol was established with University of Texas in Austin to start collaboration to benchmark and train CRIA personnel with the expertise of IC2 of the last two decades. CRIA is also concerned with the need for incubation and science & technology areas. For this purpose, several projects are being carried out: the Algarve's Science and Technology Park (STP), the Sines CIBT (Technology-based Incubation Centre) and Incubation areas within the *campi*.

In 2007 and 2008, CRIA prepared a set of important initiatives. The first was the Algarve's Regional Innovation Plan. A second main initiative was the launching of the Regional Innovation Forum, *i.e.*, regular meetings with the main actors for regional innovation. A new Technology-Based Idea Contest was launched in 2007, originating fifteen new start-ups. Furthermore, a major event was prepared to approximate enterprises with applied research projects - INOVA 2007.

Synthetic Presentation of Andalusia

Andalusia is a Spanish region considered a natural crossroad between the Mediterranean countries and the Americas, and between Europe and Africa. Andalusia has a population of 7.3 million inhabitants (18% of Spain's population). It is localized in the extreme south of the country. The north of Andalusia is characterized by the *Sierra Morena* and in the west the Guadiana River separates the province of Huelva from Portugal. In the south, the Atlantic Ocean bathes the coast of Huelva and Cadiz, and the Mediterranean Sea in Cadiz, Malaga, Granada and Almería. The east is limited by Levante. With 87.268 km² (17% of Spain), Andalusia is the second more extense *Comunidad Autónoma* of Spain with an area similar to that of Portugal. The Guadalquivir River has created a fertile valley that configures the region and is important for the economic activities in the adjacent territories. Half the territory of Andalusia is mountain

and a third is above the 600 metres sea level (46 peaks are above 1.000 metres - Mulhacen and Veleta the 3.400 metres - Sierra Nevada). The region is well served by motorways and highways (more than 24.000 km), railways and high-velocity trains (Sevilla-Córdoba-Madrid – since 1992 – and the recent Malaga-Cordoba-Madrid). The air transportation is guaranteed by international airports in Malaga, Almeria, Sevilla, Jerez, Granada and Córdoba. The sea ports assume a strategic role, in particular in Algeciras – one of the main ports in the world for maritime transportation. Other ports like Huelva, Cádiz, Málaga and Almería are important in terms of transport routs. There are several sportive and fluvial ports in Seville.

Besides agriculture and tourism, the main regional economic sectors are chemical industry, auxiliary car industry, electronics, telecommunications, aerospace and agro-food. In terms of labour force, the agricultural sector has experienced a decline, while the industrial and services sectors have increased in importance. In recent years, the GDP growth rate in Andalusia has been very intense, almost three times the average values in Portugal or Italy. Currently the region is above the 75% of GDPpc level that defines the Convergence regions but remains in a worst situation than the majority of Spain. The employment has grown in a very fast pace, more than 600.000 new jobs transformed the region in the *Comunidad Autónoma* with the highest employment growth (22,5%) and among the 268 EU27 regions the best-performer. In the Euro Zone, only Germany, France and Italy (country level) have created more jobs that Andalusia itself. Andalusia created more jobs (2004-2008) than the United Kingdom. Nevertheless the growth in employment and activity rates and the diminishing of unemployment, relevant regional problems remains. The quality of the work created was also target of criticism, especially in the intensive agriculture provinces like Almeria. Another problem to solve is the intense illegal immigration that uses the region as the gateway to the European Dream.

The dynamics of Andalusia is expressed in more than five hundred thousand enterprises (511.728 in 2007), (Andalusian Ministry of Innovation, Science and Enterprise, 2007a), a growth of 42,37% in the number of enterprises since 1999. Larger enterprises (more than 50 workers) had a more intense increase. The productivity grew (14,6%) and the competitiveness was influenced by the exportations of the region growing 160%, more than world average (134%), or other open economies like Germany (113%), USA (77%) or Japan (46%). The supply side growth is based on a diversified economy, where six of the ten highest growth sectors are industries since 2000, and the services other than construction. The demand side reflects the high investment rates in the regional economy (around a third) and the internationalization of the local enterprises and Foreign Direct Investment. Other important issues are the growth of women employment and of education level. Andalusia's economy has as one of key characteristics - its variety. As referred by IRE (N/D), the traditional image of Andalusia linked to agriculture and in recent years to tourism, is changing to several industrial sectors, such as:

- Chemical industry - the most important sub-sector, basic chemistry, is concentrated in Huelva (petroleum derivatives, organic chemistry and derivatives of iron pyrite), Cadiz (petrochemicals) and, to a lesser extent, Seville;
- Automobile industry - vehicle manufacturing process and automobile components suppliers for different European car manufacturers are well-established in the region (Renault in Sevilla, General Motors and Ford in Cádiz).
- Computer industry - there are three computer manufacturers in the region together

with nearly 50 software development companies, about 130 distribution companies and various computer-related services, for example, consultants, data processing centres and maintenance;

- Information and communication technologies - the region hosts a number of communications companies, specialized in the production of telephone and communications network equipment, however, most local companies are dependent on multinational companies of the sector;
- Aeronautics industry - Andalusia's aeronautics industry dates back to the 1930s. Nowadays, there are a few factories (EADS-CASA, AIRBUS and GAMESA) and companies providing structure assemblies, sheet metal working, composites and the production of small runs.
- Agro-food industry - the agricultural tradition is deep-rooted in Andalusia for centuries. The main agro-food activities are baking, oils and alcohol; combined with vegetable canning and meat industries, which accounts for 70% of the turnover in this sector.

As referred by Porras Gómez (2007: 3-4), in Andalusia, the attraction of Foreign Direct Investment (FDI) through multinationals has a special importance regarding the technological weaknesses of the region, since multinationals usually invest a greater proportion in R&D and have a spill-over effect. In fact, much of the technological development in Andalusia and Spain, in the second half of the 20th century, is due to the FDI. Since its admission to the European Union, a time series show that Spain has experienced a great increase in the attraction of Foreign Direct Investment (FDI), and Andalusia has attracted an important share of that FDI. Nevertheless, multinationals mainly invest in relatively low technological sectors to take advantage of the lower salaries, like Agro-food (international purchases of Andalusian companies like Koipe), Beverages (especially in the sherry sector, with international companies like Allied Domecq, and the beer sector, through the purchase of Cruzcampo Beers by Heineken), mining and the iron-steel industry, due to the historical importance of mineral deposits in Andalusia (multinationals like Boliden).

Innovative Profile

Based in the data of the *Consejería de Innovación, Ciencia y Empresa*, (Andalusian Ministry of Innovation, Science and Enterprise, 2007b), with respect to innovation efforts, the research budget was, in Andalusia for 2005, around 1.051.028 million euros (0,84% of regional GDP) against 1,13% of national average. The absolute growth of the indicator is does not seem very relevant (in 1993 it was 0,64% of the Regional GDP), it represents an huge effort when the regional GDP grew from 49.018,31 million euros to 126.283,84). In Andalusia, a 32,3% of R&D expenditure is financed by private organizations and 67,7% of the expenses are related to public investment. This situation reflects the excessive importance that public actors still have in the Science, Technology and Innovation system. Even when compared with the whole Spain, the situation is relatively worse once the private expenses represent, in this case, 53,9%. The education has gone through an important quality and quantity improvement, as the major regional cities have universities and currently there are ten public universities, with about 240 thousand students. In relation to the number of researchers, in 2005 it ascended to 18.803 representing around 5,47% of the active population. In the whole Spanish territory this figure

is more expressive (8,37‰). The percentage of full time equivalent researchers in Andalusia-Spain ratio is stable (with a small) growth, evidencing that the region is able to cope with the technological intensification and growth of scientific jobs in Spain, as an average. In relation to scientific production, Abascal (2006), Andalusia has shown important growth, from 3.629 to 4.632 total documents in ISI. In terms of contracts between enterprises and universities, it has grown from a value around 200 in 1990 to more than 1600 contracts in 2004. One of the main innovation outputs, the number of patents, has registered an increase from a total around 150 in the nineties to 340 patents in 2004. This situation expresses a more adequate situation in terms of inputs than outputs. The same author, analyzing the number of years to converge, showed that Spain will catch-up with EU15 in 6 years, France in 9 and Germany in 9, in relation to researchers and publications, but in terms of patents (EPO and USPO) it will need, respectively, 71-69 years to converge to EU15 average, 78-40 years to France and 131-101 to Germany. Andalusia is currently under the process of updating and developing its innovation system. On the basis of different initiatives carried out in the last few years, the regional government has put together a strategy to promote a framework for public and private R&D and to find ways of improving the innovation and technology transfer system. Andalusia evidences interesting quality and capacity of research potential, increasing the creation of patents and the companies are starting to invest in R&DI due to the growing competitiveness of the productive sector. In relation to financing innovation, different instruments were being developed since 1999, in particular the creation of Invercaria –a public company, 100% owned by the Andalusian Ministry of Innovation, Science and Enterprise, with the objective to promote and develop instruments to assure financing of enterprises in Andalusia. Andalusia shows an interesting existence of the most important types of actors to create a Regional Innovation System, as it has an impressive internal market and critical mass to support a wide variety of initiatives.

Innovation Planning

The Innovation and Modernization Scheme for Andalusia (*Plan de Innovación y Modernización de Andalucía / PIMA*) is an instrument of strategic planning that defines the framework, the strategies, the objectives and the actions to impel the transformation of the social and economic culture of the region. It was assured by the Andalusian Government, with a budget that overcomes the 6.000 million euros.

PIMA was created as a consequence of the commitment of the Andalusian regional government to promote increasing development of social and economic welfare in the region. This document – of political strategies of innovation and modernization for Andalusia – comprises both a project to build the Andalusia of the future depicted by social welfare, equal opportunities, cohesion, sustainable development and intercultural nature, and a Specific Plan of Action of the Regional Ministry of Innovation, Science and Enterprise for the present legislature.

The Innovation and Modernization Scheme for Andalusia should be regarded as:

- A guide to transverse (or horizontal) strategic orientation to development governmental policies and actions, with innovation, creativity, transparency and participation as key factors of success;

- A basic tool for coordinating the available resources of support to innovation in Andalusia, towards a leadership position in the society and to an international and global projection of knowledge;
- A planification instrument for the Regional Ministry of Innovation, Science and Enterprise, that is coherent and complete but not closed, and facilitating the integration of aims, strategic lines and actions to be developed during the present legislature.

Regional Governance

The Andalusian Autonomous Government (*Junta de Andalucía*) is a huge organization, comprising 14 departments, 7 independent bodies, and around 210.000 public employees, covering a whole range of competencies. In terms of innovation, the creation of the *Consejería de Innovación, Ciencia y Empresa*, reflects the political strategy of defining a unique structure which affects the main actors in the innovation and knowledge development. Innovation has a crucial value for the economic and social model in Andalusia. For the first time in Europe, a government has included all the competences concerning to the universities, the technological development, the information society, the entrepreneurial development, the energy and the entrepreneur culture in a political and administrative single entity. The competences of the *Consejería de Innovación, Ciencia y Empresa*, are:

- Higher education in Andalusia, in all the extent, saving the university autonomy;
- Coordinate and incentive to scientific and technical research, innovation and technology transfer;
- Technological development in enterprises, specifically the incentive to private R&D;
- Innovation policies related with ICT;
- Information systems and telecommunications related with information society in Andalusia;
- Social economy, in particular cooperatives;
- Industrial, energy, mining activities, economic cooperation and incentive to activities in those areas;
- Initiatives related with entrepreneurship.

Research and Development and Higher Education Poles

Andalusia has a relevant network of public universities, with important research centres in all domains of scientific knowledge. The priority fields of research, established by the Research, Development and Innovation Plan of Andalusia (PAIDI), reflect the strategic priorities of the Andalusian R&D system. The areas of regional expertise, according to Porras Gómez (2007: 10-11), are: Aeronautical, Space, Biotechnology, Agro-industrial and Food, Exact and Experimental Sciences, Health, Social, Economic and Legal Sciences, Humanistic and Artistic Creation, Technologies of Production, Nanosciences, Nanotechnologies and Materials, Natural Resources, Energy and Environment, Information and Communication Technologies, Social Integration, Immigration, Globalization and Cooperation, Violence and Social Behaviour, Historical and Artistic Patrimony, Territorial Integration, Transport and Intermobility, and Tourism.

- 1.University of Almería
- 2.University of Cádiz
- 3.University of Córdoba
- 4.University of Granada
- 5.University of Huelva
- 6.University of Jaén
- 7.University of Málaga
- 8.University of Seville
- 9.University Pablo de Olavide (Seville)
- 10.Universidad Internacional de Andalucía (UNIA)

Interface Organizations

In Andalusia all universities have technology transfer offices called OTRIs (*Oficinas de Transferencia de Resultados de la Investigación*). OTRIs are focused on the promotion of the relations between the university departments and the research groups and the business world. All OTRIs belong to a national network of transfer offices in universities and public research centres, coordinated by the Spanish Universities Rector's Office. The role of OTRI is, in each university, to determine the actual R&D demand of companies and address it to the appropriate departments and research groups, to identify the transferable results of research groups, disseminate the results among the enterprises and facilitate the transfer. Other important aspect is the promotion and negotiation of R&D or technological support, and guidance contracts or patent licensing agreements between university and companies. The OTRIs have then to manage the contracts and support the university administrative services. OTRIs also play an important role in supporting project proposals to European or national R&D projects, promoting the cooperation and the networking.

The Agencia de Innovación y Desarrollo de Andalusia (IDEA) contributes to the economic development of the region by supporting business, entrepreneurs and the regional government on the promotion of entrepreneurial behaviors, innovation and cooperation in the Scientific-Technological-Entrepreneurial system, and by improving the competitiveness of the productive structure. The Agency for Innovation and Development of Andalusia has been appointed as the instrumental executor for the policies of promotion and for economic and social development, as the regional development agency of the Andalusian Government, under the aegis of its *Consejería de Innovación, Ciencia y Empresa*. The agency provides advanced services, infrastructures and equipment, advises companies and manages incentives, in order to ensure that innovation becomes one important driver of the regional development, and that it catches-up with the levels of the most advanced regions in Europe.

IDEA is encouraging the increase the technological level of the enterprises by:

- promotion and creation of collaborative networks in order to drive and encourage innovative processes among the regional actors;
- technology advice on research results protection, technology transfer in the business field and technology watch;

- incentive and encouragement of RTD&I in productive sectors;
- technology-based start-ups and spin-offs;
- incentive and encouragement of information society into SME;
- incentive and encouragement of cooperation and collaboration among different partnerships and institutions from different countries to encourage R&D level.

In recent years, the Government of Andalusia has made major efforts to provide the infrastructures, innovative means and technology to increase the competitiveness of its economy, and to favour convergence with other main European regions. The FDI Atlas (N/D) refers that the Andalusian Network of Technological Parks has recently been constituted, in an effort to build synergies from the cooperation and collaboration among the various agents involved.

Amongst the main existent technological parks in Andalusia, the following must be highlighted:

- Parque Tecnológico de Andalucía (Andalusian Technology Park) PTA (Málaga).
- Parque Tecnológico de Ciencias de la Salud (Health Science Technology Park) (Granada).
- Parque Tecnológico y Aeronáutico (Technology and Aeronautical Park) AEROPOLIS (Sevilla).
- Cartuja '93 (Sevilla).
- Parque de Actividades Medioambientales de Aznalcóllar (Aznalcóllar Environmental Activities Park) (Sevilla).
- Tecnoparque Bahía de Cádiz (Bay of Cadiz Technology Park) (Cadiz).
- Parque Científico y Tecnológico del Aceite y el Olivar (Oil and Olive Science and Technology Park), Geolit (Jaen).
- CIT de la Piedra Natural (Natural Stone CIT) (Almería).
- CIT del Plástico Industrial en Martos (Martos CIT of Industrial Plastic) (Jaén).
- CIT Adesva (Agroo-food CIT) (Huelva).
- Technology Parks and Centres of Innovation and Technology projected:
- Rabanales 21 (Córdoba).
- Parque de Innovación y Tecnología de Almería (Almería Innovation and Technology Park) (Almería).
- CIT de la Madera y del Mueble de Lucena (Lucena Wood and furniture CIT) (Córdoba).
- CIT del Textil (Textile CIT) (Córdoba).

The Centres of Innovation and Technology (CITs) are sites of innovation and technological development, promoted by the *Junta de Andalucía*, to improve the competitive capacities of key sectors of the Andalusian economy, to help with the technological requirements of the businesses, to promote cooperation between these and to facilitate the transfer of research.

Conclusion

The regional scale is currently a broadly-used concept for theoretical and empirical analysis when the innovation is in the spotlight. Nevertheless the Regional Innovation System approach still requires a robust framework as a concept or as a practice.

There are several dimensions relevant when trying to understand a specific RIS. The ones

proposed in this paper can serve as guidelines to a better comprehension of the specificities of each regional profile. It can be interesting in future research trying to understand in depth the differences between regions, in particular what concerns the institutional arrangements that restrict and promote the innovative performance.

Analytical Aspects of RIS		Performance of Regions	
		Algarve	Andalusia
Generic Features of the Region	Critical Mass	-	++
	Transportation Networks	+	+
	Economic Diversity	--	+
	Potential Areas with High Added Value	++	++
Innovative Profile	Educational Level	-	-
	<i>Innovative Inputs</i>	-	+
	<i>Innovative Outputs</i>	+	-
	Innovation Actors	-	+
	Innovation Institutions	-	+
Innovation Planning		+	+
Regional Governance		-	++
R&D and Higher Education Poles		+	++
Interface Organizations		-	+

[Classification: -- (bad); - (poor); + (acceptable); ++ very good]

Table 16 - Qualitative of Relevant Aspects for the RIS
Source - Own elaboration

The table 16 synthesises the performance of the Algarve and Andalusia for each one of the dimensions.

The comparison carried out between the Algarve and Andalusia underlines the discrepancies between these neighbouring regions originating, in our opinion, at least three different branches of reflection. The first is that even when we compare European regions in the same level of analysis (in this case NUTS II) we can find major differences in terms of dimension. Andalusia is a huge region while the Algarve is a small one. This situation, more population, more enterprises creates a relevant market, attracting more FDI and a sort of relevant organizations. This is the problem of critical mass.

The second branch is linked with the capacity to create, attract and retain qualified people to work in the region. If this creative people can live in a region they will attract more innovation inputs and increase the transformation in successful outputs. Qualified people will attract more investment, will do more research, develop more successful enterprises, will create more partnerships, and will be enrolled in society at a deeper level. A competitive region depends in the learning capability. The lack of possibilities in careers and qualified employment opportunities

in firms and public organisms is originating a decrease of qualified jobs in the Algarve and a relevant brain drain. This is the problem of Education.

The third and final branch is related with the governance. Territories to flourish need to create modes of governance that facilitate share between its components. In this way is crucial to have the actors and the institutions that promote an innovative environment. The Algarve is deficient in terms of innovative actors but is even worse when we understand the level of cooperation between the existent ones.

Several challenges... And solutions?

For branch 1 we could say that the challenge is to create networks and partnerships that permit the diminishing of the problems related with critical mass. For branch 2 we recommend a massive investment in Education, not only in qualifying people but retaining this people (for example, with scientific fellowships and specific support for start-ups creation). For branch 3 it is important to inform and cooperate. Actors should trust each other. An increase of social capital is really necessary in the Algarve. Enterprises cannot continue to doubt public bodies and vice-versa. The density of relations needs to be upgraded.

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ANNEX I

Region		PT15	ES61	ES	PT	EU27	
		Algarve	Andalusia	España	Portugal	EU27	
Population	Total population (1000 inh.), 2004	408	7612	42692	10502	489671	
	Population density (inh./km ²), 2004	81,9	86,9	84,4	114,2	116,0	
	Population growth (average annual % change), 1995-2004	1,7	0,8	0,9	0,5	0,3	
Economy	GDP/head in PPS (Index, EU27=100), 2004	77,1	77,6	100,7	74,8	100,0	
	GDP/person employed, in Euro (Index, EU27=100), 2004	59,4	85,9	91,7	57,8	100,0	
	GDP growth (average annual % change), 1995-2004	3,4	3,8	3,7	2,6	2,3	
	Employment by sector (% of total employment), 2005	Agriculture	6,7	9,2	5,3	11,8	6,2
		Industry	20,7	25,8	29,7	30,6	27,7
		Services	72,6	65,0	65,0	57,6	66,1
	R&D expenditure (% of GDP), 2004	0,2	0,8	1,1	0,7	1,8	
R&D expenditure in the business enterprise sector (% of GDP), 2004	0,0	0,3	0,6	0,3	1,2		
Labour market	Employment rate (%), 2005	Ages 15-64	68,0	55,4	63,3	67,5	63,3
		Female 15-64	59,9	40,7	51,2	61,7	55,9
		Ages 55-64	54,2	34,9	43,1	50,5	42,2
	Unemployment rate (%), 2005	Total	6,2	13,8	9,2	7,6	9,0
		Female	7,7	19,4	12,2	8,7	9,8
		Young (15-24)	15,7	24,5	19,7	16,1	18,8
		Long-term unemployment (% of total unemployment)	32,7	25,3	24,5	48,2	46,0
Age structure	% of the population aged, 2004	< 15	14,7	16,9	14,5	15,7	16,3
		15 - 64	66,7	68,5	68,6	67,4	67,3
		65 +	18,7	14,6	16,9	16,8	16,4
Education	Educational attainment of persons aged 25-64 (% of total), 2005	Low	69,2	59,6	51,2	73,5	29,1
		Medium	16,9	17,8	20,6	13,6	48,6
		High	13,9	22,6	28,2	12,8	22,4
Economic Lisbon Indicators (average of re-scaled values relative to the EU27 mean), 2004-2005		0,45	0,35	0,53	0,42	0,51	

Table A.1 - Statistical Socio-Economic Indicators

Source - European Commission (2007)

In table A.1 we can see some interesting figures comparing Algarve, Andalusia, the Portuguese and Spanish national averages and the European Union average (with twenty seven member states).