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### Understanding the ways and the dynamics of collaborative innovation processes: the case of the maritime cluster of the Algarve region (Portugal)

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## Understanding the ways and the dynamics of collaborative innovation processes: the case of the maritime cluster of the Algarve region (Portugal)

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The Algarve region has always showed a close relationship with the sea as a result of its excellent natural conditions, historical and cultural reasons, and notorious know-how related with traditional maritime activities, such as fisheries and fish processing, and naval industry; more recently, nautical activities, such as tourism and recreational boating, have been gaining increased importance. The region is also well infrastructured in terms of public R&D institutions which are important cornerstones of the regional and national innovation systems. Through surveys carried out over a population of firms related to fisheries, aquaculture, fish processing and trade, nautical tourism, naval construction, and repair and shipping, we intend to: (1) characterize the innovation processes adopted by the Algarve's firms of the maritime economy and evaluate some of the main outputs generated by R&D activities promoted by the regional innovation centers; (2) analyze the potential externalities linked to the production and dissemination of information from knowledge spillovers and knowledge networks; and (3) assess the strategic interest associated with the use of knowledge-intensive service activities regarding their role as sources and/or facilitators of innovation in customer organizations, or as carriers of innovation, when they help in transferring knowledge between or within organizations.

**Keywords:** maritime cluster; innovation; knowledge-intensive service activities

### 1. Introduction

The main purpose of this paper is to assess what are the most relevant behaviors in use by the actors of the maritime cluster of the Algarve region regarding the adoption of collaborative innovation processes. To do so, we will test the following propositions:

- (1) The insufficient degree of consolidation and the incipient role still played by networks formed by agglomeration or geographical polarization of companies and business organizations, public institutions and regulation bodies, and other stakeholders that interact with them;
- (2) the persistence of an apparent misalignment of priorities and behavioral logics between “those who produce knowledge” and their “potential customers”;

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- (3) the growing critical relevance assumed by the processes of management of knowledge and innovation, as well as the important role often played by activities based on knowledge-intensive services in a context of increasingly globalized competition.

It is assumed that innovation is not an isolated process of firms, it is rather the result of a collaborative process, which is complex, interactive, and systemic in nature, comprising the capture, creation, and diffusion of knowledge through an array of multiple and distinctive actors. In these, dynamics often stand out the role of knowledge-intensive service activities (KISA) either functioning as sources of innovation, when participating in the genesis of innovation in client organizations, or as facilitators of innovation, when supporting the development of the innovation process in firms, or as vehicles of innovation, when they help in the knowledge transfer between and within organizations, companies, or enterprise networks.

In the view expressed by Unidade de Coordenação do Plano Tecnológico (UCPT, 2005), globalization and technological change have created a new set of knowledge-intensive activities. In addition to the knowledge infrastructure of university–industry–government relations, an overlay of communications and negotiations among these institutional partners has become increasingly important for the dynamics of the overall system. Knowledge organization and knowledge-based reconstructions can be transformed into a third coordination mechanism of social change in addition to the economics of the market and government interventions (Etzkowitz, 2002; Goktepe, 2003; Leydesdorff & Etzkowitz, 2001, 2003). The political economy is thus reshaped into a knowledge-based economy containing this more complex dynamics because of the evolutionary advantages of the combinations. The systemic analysis of innovation builds the foundation for competitive advantage in an economy increasingly based on knowledge and learning, and has the ambition to understand the determinants of innovation at national, regional, and local levels, and could also extend across borders (Natário, Reigado, & Neto, 2005).

According to Porter (1998a), the technology strategy is a firm's approach to the development and use of technology. Although it encompasses the role of formal R&D organizations, it must also be broader because of the pervasive impact of technology on the value chain. Because of the power of technological change to influence industry structure and competitive advantage, a firm's technology strategy becomes an essential ingredient in its overall competitive strategy. Innovation is one of the principal ways of attacking well-entrenched competitors.

The interactive process perspective of organizational innovation has gained popularity in recent years for investigating the nature of the innovation process, examining how and why innovations emerge, develop, grow, and end. This perspective describes innovation as a complex process (not static), produced by interactions between structural influences and the actions of individuals, which occur simultaneously. The term "interactive process" has been used to describe the activities within and between companies (Edwards, 2000). Giget (1997) refers that the innovative process is not deterministic and does not follow a pre-established formula; instead, it is socially constructed by the actors involved or interested in the generation of innovation and, therefore, must be understood as a series of interactions and exchanges between researchers, users, technicians, scientists, governments, and companies, which are the innovation network. To fulfill its objectives, the present article is divided in seven different sections. After the introductory section, where we explain the purpose of this paper and the set of

propositions that we aim to test, Section 2 is about the scope of the study, i.e. the functional region Algarve and the notion of maritime clusters compared to the “land-based” clusters. Section 3 comprises the theoretical part, mostly concerning the role of networking and KISA as enablers and supporters of the innovation processes carried out in clusters. In Section 4, after a synthetic descriptive characterization of the main economic sectors of the Algarve’s maritime cluster, we briefly evaluate some of the dynamics and idiosyncrasies arising from the architectural model presented for that cluster. In Section 5, we present the methodological choices made for the empirical part of this study, whose main findings are displayed in Section 6. Finally, in Section 7, we draw the main conclusions connected to the set of propositions presented at the beginning.

## 2. The scope of the study

The scope of the current paper is the set of economic activities linked to the sea functioning as a cluster inside a delimited functional region – the Algarve. The traditional analysis of location and clustering emphasizes the relative abundance of resources “trapped” in a functional region (Ohlin apud Karlsson, 2008). This approach is a resource-based theory of location and clustering (and trade). The critical resources have the character of durable capacities which consists, on the one hand, of natural resources and, on the other hand, of the supply of infrastructure in the form of facilities and networks, R&D organizations, existing production capacities with specific techniques, and the supply of different immobile labor categories.

The Algarve region, with a coastline of approximately 220 km, has always presented with the sea a particular affinity, as a result of its excellent natural conditions, historical reasons, as well as cultural aspects and notorious know-how related with traditional maritime activities: the famous Nautical School of Sagres created by Prince Henry, where the navigation pilots who initiated Portugal’s Age of Discoveries received instruction, became the core of the Portuguese maritime expansion during the first half of the XV century and the most advanced center for studies and research worldwide; historically, fisheries and fish processing industry (the tuna capture in the Algarve coast goes back before the Roman occupation) have always been crucial economic activities with a strong tradition; more recently, nautical activities, such as tourism and recreational boating, have been gaining increasing importance. The Algarve region can also be considered well equipped in terms of number and quality of reference institutions devoted to science and marine, and maritime technologies regionally located, which are important cornerstones of the regional and national innovation system in this particular field. However, the strongly specialized development assumed in the Algarve in recent decades has led major regional traditional sectors, such as coastal fishing, canning industry, shipbuilding, and naval repair, among others, to a situation of general decline that is worsening over time (partly as a result of these sectors’ inability in adapting to new operating logics of the market), along with a deeply asymmetrical territorial occupation.

As explained by Sociedade de Avaliação Estratégica e Risco (SaeR, 2009), among the scientific community, there is almost universal agreement on the advantage of the use of a cluster approach, embodied through the concept of the “Hypercluster of the Sea”, which encompasses a complex of activities ranging from Tourism and Leisure to Logistics and Maritime Transport, Fisheries and Aquaculture, Naval Construction and Repair, Related and Supporting Services, to Research and Development. This way of approaching the issues from the sea, being systemic, requires a global vision and a holistic and interactive performance in the search for strategic solutions to increase the

efficient use and value added generated by the sustainable exploitation of the resources of the sea.

The first possible differentiation of a “cluster of the sea” as opposed to a “cluster of economic activities mainly based on land,” though little discussed among the various authors considered in the literature review conducted for this working paper, if any, may reside in the maritime cluster definition provided under the project “Europe of the Sea”, sponsored by the Conference of Peripheral Maritime Regions of Europe, described as a network of firms, research, development and innovation units, and training organizations (universities, specialized schools, etc.), sometimes supported by national or local authorities, which co-operate with the aim of technology innovation and of increasing maritime industry’s performance. The level and character of competition within maritime clusters is highly dependent upon the existence of formal networks of economic, social, and environmental actors that constitute an aggregation of interactive, mutually interdependent economic actors connected to the sea, as expressed by Salvador (2010). Successful maritime clusters heavily rely upon the triple helix of university-industry-government relations. According to Goktepe (2003), the synergy of the three helices that compound this model of network innovation is the most efficient way to disseminate and use knowledge and enhance learning. These aspects of a maritime cluster enhance dynamics such as cooperative competition (co-opetition), innovation pressures and an overlay of communications and negotiations among the cluster actors that become increasingly important for the dynamics of the overall system. The importance for maritime clusters of cooperation processes, formal and informal networks in areas such as innovation, marketing and lobbying activities, as well as recruitment and training skills, is a feature that runs transversally to the four European examples of maritime clusters here analyzed. There is a high level of interdependence among sea-related activities which go beyond simple geographic co-location, establishing important linkages and relationships within and across different sectors and actors. Cluster organizations and forums that facilitate the networked collaborations are also frequently highlighted as instrumental in maritime clusters.

It is thus clear that if some differentiation exists between terrestrial and maritime clusters, the same is related to the absolutely critical role that knowledge and innovation hold in the latter as determinants for the introduction of new products, new production processes and new organizational practices, creating new business opportunities and inducing entrepreneurship, aspects that are essential to the emergency of competitive advantages for the firms and the maritime regions where they operate. In this context, the consolidation of a suitable critical mass, the creation of a specialized labor pool market based on an appropriate system of education and training, and the interdependence relations established between these multiple and sophisticated actors towards the effectiveness of joint activities are decisive for the genesis and success of those dynamics, in addition to the role often played by local environmental conditions, which require an appropriate spatial planning for different uses and users, and the sustainable management of natural resources. Monteiro, de Noronha, and Neto (2013) say that

Within this framework, the geographic concentration of activities, the intersectoral and intrasectoral linkages and the assembling of local innovation networks, based upon strong cooperation ties between public and private actors, function as strong cluster enablers, allowing maritime firms to benefit from the technological externalities of agglomeration (e.g. better access to strategic information via knowledge sharing, risk sharing, lower transaction costs, scale economies, etc.) and proximity effects (pre-emptive access to knowledge, specialised technical, legal and organizational skills, human and financial resources and

strategic technologies; knowledge spillovers and localized collective learning effects; physical infrastructures, access to new markets, among others. (p. 4100)

### 3. The importance of networking and knowledge-intensive business services

The organization of economic activities into a cluster is advocated by several authors (Porter, Markusen, and Gordon and McCan) as the territorial configuration more suited to stimulate the processes of learning and knowledge creation. According to Porter (1998b), clusters are a form of spatial organization consisting of geographic concentrations of companies and institutions interlinked in a particular area, and that includes in its organization a series of industries and other entities linked to each other.

As expressed by Wegner, Costenaro, Schmitt, and Wittmann (2004), today it is recognized that enterprise networks and clusters are viable alternatives and often necessary for the survival of small businesses, because isolation makes it impossible for these companies keeping pace with the changes and demands of technological upgrading and management, as well as on adapting to market trends and on generating economies of scale necessary for competition, while collaboration makes it possible to achieve these requirements at substantially lower cost. International experience shows that such mechanisms (networks and clusters) can even elevate the status of small business to become the engine of the economy, rather than simply offering them a marginal condition and of little relevance.

Asheim and Cooke (1999) contend that there exist two main types of innovation networks. Besides the endogenous networks that appear on the basis of local industrial clusters of small- and medium-sized enterprises with traditions and expertise of mutually beneficial exchange of information as well as interactive learning in the process of joint innovation activity (e.g. Baden-Württemberg in Southern Germany, and Tuscany and Emilia-Romagna in Italy), they also refer the existence of exogenous innovation networks, mainly observed as technoparks in technopolises. The latter appear when large companies single out R&D into a separate functional unit and place it in a territory that is best for the emergence of non-commercial interdependencies (e.g. SophiaAntipolis and Ile-de-France in France), or when an innovation network is set up administratively as a planned action to establish and deepen cooperation between research institutes and enterprises (e.g. technoparks located in the United States and United Kingdom).

On the perspective presented at Enterprise and Industry Directorate-General (2007), innovation is increasingly characterized as an open process in which many different actors – companies, customers, investors, universities, and other organizations – cooperate in a complex ways. Ideas move across institutional boundaries more frequently. According to De Noronha Vaz, Cesário, and Fernandes (2006), the transition from a closed regional environment to an open interregional system demands an evolution of economic activity from simple forms of activity branches into complex technological regimes. In such a dynamic system, technological learning, entrepreneurial strategies, coordination systems and institutions, and overall regional conditions are factors that determine firm attitudes to innovation. The traditional linear model of innovation with clearly assigned roles for basic research at the university, and applied research in a company R&D center, is no longer relevant. Innovation can benefit from geographic proximity which facilitates the flows of tacit knowledge and the unplanned interactions that are critical parts of the innovation process. Porter assumes that proximity (understood as the placement of companies, customers, and suppliers) amplifies all the existing pressures to innovate and improve economic performance. This localized learning that

companies may benefit consists essentially of technological spillovers, originated from dominant or innovative companies, to the followers (Markusen, 1996; Maskell, 2001). It is now believed that diffusion and spillovers are the mechanisms that link R&D with growth, not simply levels of R&D investment (OECD, 2007).

To Neto (1999), the strategies for networking and affirmation of the functional territories modify the organization and spatial and economic interrelationships of sectors and their organizations, as well as the economical specialization of the territories, by this means reshaping the comparative and competitive inter-territorial advantages, while Andersson, Serger, Sörvik, and Hansson (2004) mention that these connections and interrelations between actors are one of the main driving forces and determinants of success for clusters. The life cycle of industrial clusters has been focused in a large number of research studies. One common finding is the stages from emergence, growth, sustaining, and declining. In the sustaining phase, the cluster is typically characterized by focused competences, open networks, synergies, and use of external knowledge (Menzel and Fornahl apud Holte & Moen, 2010). In the declining phase, reduction of demand is often combined with strong focus on a narrow trajectory, closed networks, and reduced ability to change and adapt to external developments.

Hales (2001) has emphasized that one should distinguish between “knowledge-intensive” firms and KISA. While the first rely heavily on qualified professionals (input), the latter are defined in terms of competence supply (output), activities that can be carried out by external specialized KIBS (Knowledge-Intensive Business Service) firms or in-house by employees of the firms using KISA at hand. As defined by OECD (2006), KISA refers to the activities originated by the production and integration of knowledge-intensive services crucial for the innovation process of the firm. Typical examples of KISA include R&D services, management consulting, IT services, human resource management services, legal services, accounting, financing, and marketing services. Activities oriented towards the use and integration of knowledge are instrumental for building and maintaining a firm’s innovation capability. In practice, KISA in a firm are achieved by the use of in-house, or the combination of in-house and external, expertise. The capacity of the firm to perform these KISA more effectively may indeed be what differentiates a firm from its competitors.

Miles et al. apud Muller and Doloreux (2007, p. 18) defined KIBS as ‘services that involve economic activities which are intended to result in the creation, accumulation or dissemination of knowledge’ and identified three major characteristics of KIBS:

- (1) They rely heavily upon professional knowledge;
- (2) they *either* are themselves primary sources of information and knowledge *or* use knowledge to produce intermediate services for their clients’ production processes; and
- (3) they are of competitive importance and supplied primarily to business.

#### **4. The growing relevance of the maritime economy**

Justifying the importance of the sea for the Portuguese economy is (almost) redundant: reasons of geographical, historical, geostrategic, economic and social nature are at the core of that assumption. Portuguese connection to the sea has gained prominence during the Age of Discovery, which decisively marked the beginning of the globalization process. With about 1.6 million km<sup>2</sup>, the Exclusive Economic Zone (EEZ) of Portugal is the largest in the EU, representing 3.5% of the North Atlantic surface, and one of the

largest in the world. It is also possible that Portuguese jurisdiction might be extended to other maritime zones (it only concerns the seabed and marine subsoil rights and not to any fishing rights), which could more than double the current area of its EEZ. If the extension until the 350 miles, proposed by the Portuguese Government in April 2010, is accepted by the International Commission on the Limits of the Continental Shelf of the United Nations, Portugal could obtain a territorial acquisition of nearly 2,150,000 km<sup>2</sup> (therefore, holding a sea area under its jurisdiction which is more than 40 times its land area, above India's land area and corresponding to more than 80% of the land area of the 27 EU member states), thereby strengthening its ranking position among the world's largest countries on sovereign territory.

Fisheries and fish processing industry (the tuna capture in the Algarve coast goes back before the Roman occupation) have always been crucial economic activities with a strong tradition (at the beginning of the twentieth century, there were until 17 bluefin tuna traps released throughout Algarve's nearshore; the first factory built in Portugal for the conservation of fish, essentially tuna, was the "Casa Parodi", located in Vila Real de Santo António and inaugurated in 1879, and in the first half of the past 60 decade, there were 60 active factories across the Algarve).

Algarve has excellent natural conditions for the development of aquiculture production. Since 2008, the region has showed a very interesting capacity to attract significant investments namely on offshore production systems (mostly longlines for bivalve mollusks like mussels, oysters and scallops, and bluefin tuna traps, but also fish cages for gilthead bream and sea bass, among others). The estimated production for new offshore aquacultures investments co-funded by the European Fisheries Fund during the Programming Period 2007–2013, recently concluded or ongoing in the Algarve region, reaches more than 14,000 tons in an area of 416 hectares and represents a total expenditure of more than 19 million euros.

One major positive externality of nautical tourism, particularly concerning the segments related with yachts and nautical sports, is the potential mitigation of tourism seasonality in the region, benefiting among other aspects from the quality and exquisite location of the infrastructures available and the tempered Mediterranean climate. The Algarve Marinas reach in August occupancy rates consistently above 80%, but, perhaps more important, is the fact that annually these rates rarely fall below 70% in a region where classified accommodation establishments presented in 2007 an Seasonal Amplitude Index of 3.58 (Perna, Custódio, Gouveia, & Oliveira, 2008).

The Cruise Port of Portimao started operations in 1996. For those ships coming from the Atlantic, Portimao is the last cruise port before entering the Mediterranean, hence its strategic importance while being just a night of navigation from the Port of Lisbon. In 2013, the Cruise Port of Portimao continued its sustainable growth (for the third consecutive year) having received 35,000 passengers, an increase of about 44% with respect to 2009, corresponding to 55 ship stops.

In Monteiro (2012), an architectural design for the case of the Maritime cluster of the Algarve region is proposed (Figure 1).

The proposed model has underlying the main features of an industrial cluster comprising various maritime sectors of economic activity, whose linkages (forward and backward) work within a given regional space (sub-national). At this level, the effects of geographical proximity outstand on the dynamics of interaction between the various actors. This cluster should integrate transregional and/or transnational networks with other similar clusters, as a way to gain scale and benefit from synergies and virtuous complementarities.

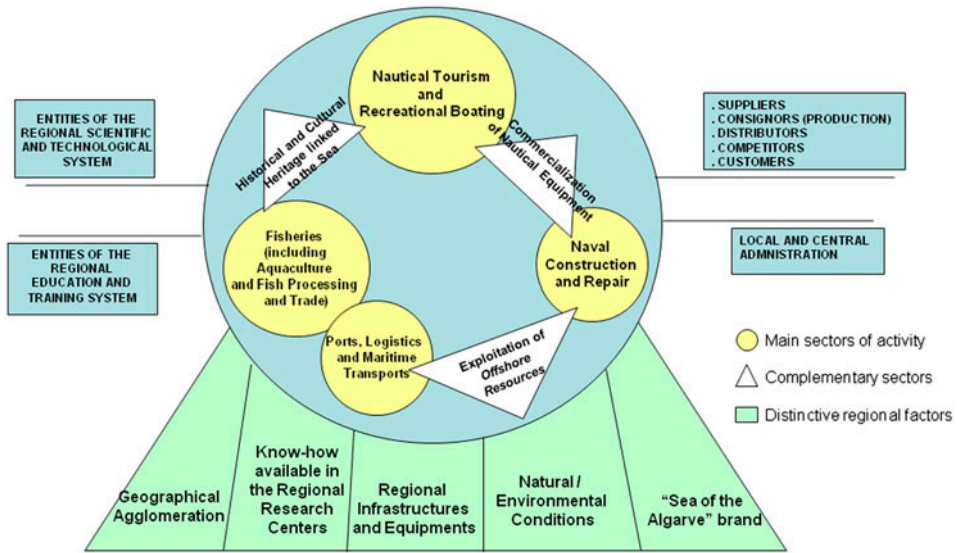


Figure 1. The maritime cluster of the Algarve region.

Note: The size of the symbols representing the sectors (main and complementary) is proportional to their relevance in terms of cluster.

The maritime cluster of the Algarve is mostly driven by a set of micro-, small-, and medium-sized enterprises, operating in specialized segments of demand. In this cluster, there are two main driving sectors:

- (1) Fisheries (including aquaculture and fish processing) due to its pivotal role because it is the one with the larger exposure to interconnections with other maritime sectors located intra- and extra-cluster. This situation is similar to what has been observed at national level, since according to Salvador, Ferreira, and Simões (2010) on relation to the commercial exchanges only involving maritime sectors, it appears that the most relevant are the ones observed in the fisheries sector (once again including aquaculture and fish processing industry), being those verified in the naval construction and repair sector practically insignificant. These evidences differ from what happens, for example, in the Dutch maritime cluster, where Wijnolst et al. apud Salvador et al. (2010) observed that two sectors – maritime equipment and marine services – are suppliers of all others and also that trade relations between the sectors of shipping, shipbuilding and ports are the most important within the Dutch maritime cluster. In this context, shipbuilding occupies a central position because it supplies all sort of vessels to the various maritime sectors.
- (2) Nautical tourism because it functions as a central link of this composite of maritime activities, not only due to the importance that already imports (and a high potential for future growth), but also by the added value that it can bring into the maritime business as a link to the vast range of economic activities that constitute coastal tourism. We should notice that tourism is by far the most important economic sector in the Algarve. It is estimated that tourism represents 45% of Algarve's Gross Domestic Product (GDP), according to World Travel &

Tourism Council (WTTC, 2003), reaching up to 66% if we take into account related activities such as construction and real estate, and about 60% of the total employment.

The “proximity” element (and the geographical concentration) along with the existence of natural resources and adequate infrastructures and equipment are key-elements for the notoriety of the brand concept “sea of the Algarve” as a functional maritime-based cluster. Externalities arise from this “complex ecosystem” where innovation-dependent highly specialized producers and capable locally based specialized suppliers of goods and services evolve together with educational and research institutions, financial institutions and other private and government bodies, guaranteeing adequate conditions for the creation of an integrative knowledge milieu and an innovative environment quite favorable for the territorial agglomeration of interdependent firms.

If we take into account the seven key dimensions proposed by Andersson et al. (2004), namely: (i) Geographical concentration; (ii) Specialization; (iii) Multiple actors; (iv) Competition and co-operation; (v) Critical mass; (vi) The cluster life cycle; and (vii) Innovation, and transpose them to the case of the maritime cluster of the Algarve, thus allowing us to evaluate its current position into the stages of cluster development, Monteiro (2012) mentions that the fourth, referred to cluster dynamics and linkages, is the one where the cluster shows a worst performance. Despite its insertion in a delineated geographical space and the existence of a system for training and research (universities, R&D centers, schools, etc.) regionally located, it isn’t noticeable in a clear and compelling way, the presence of strong interactions between firms and supportive institutions through a collective integrated strategy that favors crosscutting action, rather than isolated action logics.

To achieve success, the maritime cluster of the Algarve region requires an hybrid process of development combining top-down initiatives (undertaken by the government to stimulate and facilitate the emergence and consolidation of the cluster) with bottom-up initiatives promoted by private firms and/or corporative organizations of the various sectors identified, along with the involvement of specialized suppliers, service providers

Table 1. Economic importance of the maritime cluster of the Algarve region (revenue values and % GDP).

Algarve	Value (Euros)	% GDP
GDP (year 2009)	7,241,150,000	
<i>Maritime economic sectors</i>		
Fisheries, corresponding to landings of fish, live, fresh or chilled, in regional ports and includes finfishes, crustaceans and molluscs	52,632,000	
Aquaculture	21,335,000	
Fish processing industry	4,385,000	
Nautical tourism and recreational boating (only includes practitioner’s accommodation, moorings and other services such as repairs in yards located in marinas and recreational ports, surf and recreational diving)	99,500,000	
Commercial ports	5,000,000	
Naval construction and repair	9,500,000	
Marine works	4,500,000	
Total	196,852,000	2.72

and associated institutions from the regional system of innovation and the financial system and also civil society.

According to the data presented below (Table 1), the set of economic activities that constitute the maritime cluster of the Algarve represents approximately 2.7% of the Algarve's GDP.

## 5. Methodology

The methodology used in the empirical part of the study is based on survey research done by Monteiro (2012) over a population of firms which are active in Algarve region in the economic sectors of fisheries, aquaculture, fish processing and trade, nautical tourism and recreational boating, naval repair and shipbuilding, and shipping. The intention is to diagnose what are the companies' main drivers for innovation and also to explore some of the idiosyncratic aspects that characterize the innovation processes adopted by them.

The research themes under scrutiny were the following:

- (1) Characteristics of the innovation and innovation processes adopted by local firms, including the participation in partnerships and networks;
- (2) context costs related to the development of innovation;
- (3) sources of KISA used;
- (4) impact of KISA on internal innovation processes and their outputs.

The population in question was distributed as follow (Table 2).

About 70% of the respondents are micro enterprises, devoting themselves solely to the production and based on the Algarve; the majority are companies limited by shares with registered capital of domestic origin, and approximately 60% of them have over 10 years old and only rely on permanent staff.

For the survey design, we adopted the model recommended by the OECD Working Party on Innovation and Technology Policy, implemented through the work developed

Table 2. Characteristics of the sample.

Sectors and sub-sectors	Selected sample		Respondents		
	Frequency		Frequency		Response rate
	Absolute	Relative (%)	Absolute	Relative (%)	
Fisheries	13	21.3	6	20.7	46.2
Aquaculture	17	27.9	8	27.6	47.1
Fish processing and trade	12	19.7	6	20.7	50.0
Naval repair and shipbuilding	5	8.2	3	10.3	60.0
Nautical tourism and recreational boating	12	19.7	5	17.2	41.7
Shipping*	2	3.3	1	3.4	50.0
Total	61	100.0	29	100.0	47.5

\*For convenience and in order to increase its significance, because the company in question operates mainly on the carriage of tourists during summer for the barrier islands of Ria Formosa, it was found suitable to aggregate the data from the only shipping company that has responded to this survey in the whole of nautical tourism and recreational boating.

within the project STEP – “Studies in Technology, Innovation and Economic Policy”. This model, based upon KISA, refers to the production and integration of services carried out by companies or public actors in the context of industrial production or services, in combination with the outputs of those manufacturing processes or simply as individualized services. It appears that KISA carried out by firms are an important input to innovation. As well as being a direct input to innovation, such activities enable firms to develop knowledge-based capabilities and skills. These may be very important in the overall success of innovation. Policies designed to assist enterprises to innovate need to rest on an understanding of these processes. A better understanding of the ways in which knowledge-intensive service activities contribute to innovative activities in different industries may lead to more effective policy responses.

The data treatment consists of interpretive analysis of the results of the surveys conducted. We used the univariate statistical technique for data analysis, i.e. each variable was treated separately from the others. The results are presented through distribution of relative frequencies. The concentration of frequencies in certain categories will serve as an indication for a trend of data homogeneity surveyed, with respect to a particular attribute. When a greater concentration is observed around a certain category, we can assume it as basis for the design of a type profile. We didn't select other methods, such as the case study, based for instance on interviews, derived mainly from reasons of operational and procedural nature:

- (1) The need to collect and process information from sectors with a very diverse nature (in terms of the type of actors involved, business objectives and operative strategies, behavioral rationalities and motivations, skills, etc.) is capable of providing a high heterogeneity in the data collected, together with a high degree of subjectivity if we chose to study in “depth”, based on qualitative methods;
- (2) The target population comprises only entities with the legal status of collective entities (not individuals). Thus, the range of potential respondents (particularly in the case of the fisheries sector) was substantially reduced. Although, we can't obviously guarantee that the sample on use corresponds fully to the population likely to be integrated in this study, we make note that all the potential respondents referenced in the various information sources used were included in the sample.

## **6. Main results**

Demanding customers are increasingly pressing the companies to rapidly adopt new technologies and production processes, as well as on improving the perceived quality of their products and production processes by consumers. The sample at hand displayed a high rate of adherence to quality assurance systems of production: 65% of the firms have implemented at least one system for production quality certification and 17% already have more than one. Among the systems adopted, the highlights go to HACCP procedures (Hazard Analysis and Critical Control Points), in 53% of the cases, and self-control (32%). The adoption of ISO standards already represents 15% of all incidences.

The responses obtained on relation to the strategic priority of development to be pursued by the respondents in the short-medium term shows as top priority the increase in production (mentioned by 30% of respondents, especially 30% from the fisheries sector and 67% of the companies belonging to nautical tourism and recreational boating), followed by the need to reduce production costs, invest in diversifying and improving the quality of production (respectively with a 22, 17 and 13% share of the responses),

while the strategies associated with the strengthening of exports and directed to the promotion of internal innovation just collect 9% each, even though they are top priority for firms in the construction and ship repair sector.

The incentives to investment co-funded by EU funds, available during the programming period 2007–2013 (namely the National Strategic Reference Framework – QREN and the Fisheries Operational Program – PROMAR), together with the knowledge available at the R&D regional centers, are positively mentioned as important facilitators on relation to the adoption of innovation by approximately 20% of the intervenient, each. It is also significant that all the respondents think that the Algarve region has the potential to be a pole of competitiveness and innovation for maritime activities.

Fifty-two percent of the companies involved in this survey (particularly 47% of the firms operating in fishing activities, 33% of those related to shipbuilding and naval repair, and all the engaged in nautical tourism and recreational boating) have implemented some kind of innovation during last year, and in all cases where these innovations occurred, the same took place incrementally (there was no mention of radical innovations): 32% of the reported innovations aim at implementing a new production process, 28% relates to a new product or to a major change in an existing product, whereas 24% are related to a new or significantly improved organizational or marketing method; finally, 16% of the cases involved the introduction of a new accounting system or a new human resources management system, or profound changes at the same. Disaggregating these data, it is perceptible that in the fisheries sector, predominate innovations associated with the introduction of a new production process (41% of cases reported), while for all the firms connected to naval construction and repair prevailed those related to the implementation of a new accounting or human resource management system, or that introduce major changes to the same, whereas 43% of the respondents from the nautical tourism and recreational boating sector highlighted the launch of a new product or a profound change introduced to an existing one.

This shows some dynamism among the sampled firms on conducting investments in the area of innovation, which is a proof of their growing concern on this matter raises among them and simultaneously shows a relatively adequate level of expertise available. Regional firms denote some degree of concern regarding the allocation of effort and R&D investment towards new and/or optimization of products and processes by the firms involved in this inquiry.

It is significant that 57% of all respondents (59% of the companies in the fisheries sector, 33% of the respondents operating in shipbuilding and naval repair and 67% of those belonging to the nautical tourism and recreational boating sector) have already been or intend to be involved in the near future in partnerships with other regional entities towards: the development of innovation (32% of all cases reported); purchases from suppliers (20%); shipment of production (16%) and promotion campaigns aiming to increment exports/marketing (12% each), and only 8% for joint operations related to the preparation and packaging of production to market.

Regarding innovation partnerships, in 83.3% of the cases mentioned, they aimed simultaneously the pursuit of scientific research and experimentation/demonstration, and only 16.7% are dedicated to scientific research exclusively. Concerning the type of partners involved, the Research Centers/Universities lead with 45.5% of quota, while in 27.3% of cases, those partners were companies specializing in R&D services; 18.2% of the sampled firms, which have already been involved in partnerships for innovation, have identified suppliers as partners (none of the respondents mentioned the customers or distributors and only 9% referred the competitors). For the intervenient related to fishing

and naval construction and repair, the most important entities in such partnerships were research centers/universities, whereas for the ones from the nautical tourism and recreational boating sector in addition to the above are also important for the suppliers.

Whenever these innovation partnerships took place, in 43% of the cases surveyed, the initiative for its establishment came from the firm interviewed. Also in 50% of the cases reported, the respondent served as a supplier of goods/services within the partnership, in 16.7% of the cases was the main promoter (“leader” of the partnership), whereas in 33.3% of cases played both roles.

By type, the partnerships for innovation highlighted refer to: knowledge share (30% of cases), strategic development (also 30%), technology and market (20% each).

Concerning the objectives pursued by these partnerships for innovation, 45.5% of the cases listed aim at developing new products (mostly picked as first choice among fishery companies, with a 75% quota) and the development of new technologies/equipment, with a response share of 18.2% (seen as the most relevant objective for all the respondents from the naval construction and repair sector involved in these partnerships), an identical score as the obtained by the processes involving the improvement of environmental performance and production quality (this latter option is referred to as the main purpose by 100% of the companies doing business within the marine tourism and recreational boating sector).

Globally and in relation to the geographical scope of the partnerships at hand, 31% of the respondents named regional partners, whereas 38 and 23% of them mentioned, respectively, entities from other EU countries and from other regions of Portugal (there was no mention to partners from outside the EU). Individualizing by areas of activity and degree of importance in terms of their participation, we can extract from the present investigation that for fishery companies, the main partners are regionally based (a 50% share of the total responses), dividing this significance with those from other regions of the country in case of respondents belonging to the area of nautical tourism and recreational boating; on the other hand, respondents coming from the naval construction and repair only mentioned national partners as the most important.

For 71% of the firms that have participated in cooperation partnerships for innovation, the degree of satisfaction with the results achieved is below the initial expectations.

The observations reported above show that the role of involvement in networks and partnerships seems to be sufficiently internalized by the surveyed firms, but not always those partnerships were able to achieve the level of desirable success.

In what concerns to the use of KISA by the firms enquired regarding the development and introduction of innovations, the most commonly used services were, in 58.8% of cases, internal to the firms, because they assume to have the skills and competencies to take sole responsibility for the same. On the other hand, the partnerships involving entities of the national and regional innovation system or competitors are responsible, respectively, for 20.6 and 14.7% of those innovation processes. The outsourcing of KISA only represents 5.9% of the reported cases.

Also significant is the fact that 83% of the sample (82% of the companies belonging to the fisheries sector, 67% of the intervenient operating in naval construction and repair, and all the respondents from nautical tourism and recreational boating) have done some kind of investment in the area of KISA in the last three years: 28.6% of those investments were made in Information and Communication Technologies (ICT) (e.g. acquisition of software and hardware, networking, internet, e-Commerce, etc.), followed by education and training skills (19%); 16.7% of the companies promoted investments

in R&D; 14.3% have mentioned consultancy in finance/accounting/legal/fiscal/management/market research, whereas the investments for the purpose of launching new products consubstantiate 11.9% of the events reported and only 9.5% are related to technical consultancy/engineering or architecture. In the fisheries sector prevailed the investments in ICT, with a response quota of 43%, while among the intervenient from the naval construction and repair sector, besides the investments done in ICT, were also important the ones related to education/training skills (50% of nominations, each). The operators working in nautical tourism and recreational boating highlighted, besides ICT, the investments made in varied technical consultancy and also those aimed to support the launch of new products into market.

The knowledge available internally to the firms (in their employees) is pointed out by 50% of the respondents as the main source of new ideas in the innovation process, more than the double of what is induced by competitors, suppliers and customers (23.5%) or by specialized consulting firms (20.6%). In this case, there was no mention to public R&D institutions (universities/research centers/associated laboratories) or arising from the participation in fairs/exhibitions, conferences/seminars. Disaggregating these data, we can observe that only among firms related to shipbuilding and naval repair, the main source of new ideas did not originate inside the company, but mostly comes from the relationship with their suppliers/customers/competitors.

24.6% of the enquired have identified the high economic risk as the main obstacle to the adoption of innovation processes, while 23.1% mentioned the high costs and 20% of firms appointed the lack of targeted financial support. In turn, the lack of interest from customers for new products or production processes (with 27.8% of mentions), the deficit of skilled human resources, the insufficient information available about market trends and the internal organizational constraints, each selected by 16.7% of the respondents, are the factors taken as less restrictive. While among the sectors of fisheries and marine tourism and recreational boating, the economic risk and high costs associated with the innovation processes are mostly identified as the main constraints (for 65% of respondents in the first case and 100% in the second); in the case of naval construction and repair, all the respondents highlight the lack of specific financial support as the main handicap.

We can say that the respondents show some ability to forecast and evaluate the environment as well as in identifying opportunities and threats concerning their current activity. They have also already demonstrate some ability to define coherent strategies and to establish innovation priorities, but there are still some strong context constraints subsisting, capable of undermining those efforts.

Concerning the financing of investments in innovation, 37.5% of the enquired are able to fund their own projects using only equity capital; banking institutions are responsible for 25% of the overall funding, while the EU co-funded support programmes represent a share of 23.2%; finally, only 14.2% of those funding needs are met by venture capital firms and private investors (e.g. business angels).

## 7. Conclusions

On relation to the set of propositions established at the beginning of this paper, the observations made so far allow us to conclude:

- (1) The incipient role still played by networks formed by agglomeration or geographical polarization of firms and sectoral organizations, and public

institutions and services with which they interact, is not as noticeable as one would assume from the outset: however, there is still much work to do in terms of the effective consolidation and formalization of these networks. Although 14% of companies surveyed point out the deficit in collaborative networks as one of the main regional weaknesses, it was found that 57% of them have been or think coming to be in the near future, involved in partnerships with other regional actors, mainly targeting: the development of innovation (named by 32% of respondents); purchases from suppliers (20%) and shipping of production (16%). It seems paradoxical that despite 12.7% of the sample having mentioned production costs as a major handicap to their activity and 40 and 26.7%, respectively, having pointed out the lack of a critical mass of production and the excessive associated costs as major limiting factors for exports, the partnerships aimed for exports, for the joint implementation of promotional and marketing campaigns and for the preparation/packaging of production to market, that could contribute to ameliorate substantially the constraints named above, are still not expressive. From the above discussion, it is evident that the urgent need is to work out mechanisms linked to stimulation of networking and raise awareness among operators for the capital gains associated with the sharing of resources and services as a means to achieve critical mass and generate economies of scale.

In terms of the innovation processes adopted, in general, we can say that the respondents are not only sensitized to the need, but they have already internalized as a current practice, the continued improvement of its operations, i.e. we are dealing with incremental innovators (52% of firms said they had implemented some kind of innovation during the past year and 83% had made some sort of investment in the area of KISA in the last three years). It stands, however, a set of findings that in this subject too (innovation), there is yet little involvement of the sampled firms with the other economic operators in the sector: only 18.2% of companies surveyed who stated they had been involved in cooperation projects aimed at promoting innovation, admit having as privileged partners the suppliers, none of the respondents mentioned the customers or distributors and only 9% the competitors; more, only 31% of these partnerships have involved other regional actors. As regards the use of KISA in innovation support, only in 14.7% of the reported cases, the respondents opted for sharing possible alternatives with other companies.

- (2) There is still a low effectiveness and efficiency in the way the systems (or resources) of innovation meet the needs of businesses and their organizations or even are able to induce a demand that values the latent capacities of the maritime business. This apparent gap between the knowledge capital existing at regional level and the business actors is reflected in the survey data collected: although 10% of respondents suggest knowledge regionally available, namely in the University of the Algarve and R&D centers, as the main strength of the region, when they are asked about the sources of new ideas within the innovation process none of the respondents named the above entities and in what concerns the development of partnerships for innovation only 18% of the enquired have mentioned them. A possible explanation derives from the constraints to the University Enterprise mobility as a result of the inertia made possible by the research career. Based on the work undertaken in the context of this paper, we can revalidate what is stated in Universidade do Algarve (UALG, 2007), i.e. that processed elements point to a generally poor balance on the levels of fertilization of the

business and regional economic activity by the existent R&D resources, namely as a result of the mismatches between supply and demand for innovation, and the difficulties in structuring R&D projects that are mutually beneficial both for research centers and firms. In the latter mentioned study, it was observed that the relationship “public funding/revenue from service provision” reveal that only one in seven projects held by the University of the Algarve had origin in the provision of services to companies and other entities seeking R&D outsourcing. These findings allow us to conclude that the regional R&D system, and the university in particular – despite its regional presence, the fact that it enjoys an almost total absence of competition in the geographic area of its implementation and from the outset having established science and technology related to the sea, along with research in the marine resources field, one of the main pillars of its formative and investigational offer – does not play the desired role that it should have in the Triple Helix of the maritime cluster of the Algarve. It becomes imperative to fight against this underutilization of the knowledge potential installed, otherwise this function could be occupied in the near future by other more dynamic players with a more utilitarian view of the relevance that the knowledge produced in the academies have for the processes of innovation and of its added value to the strengthen of the business competitiveness.

- (3) The proposition dealing with the growing critical relevance assumed by the processes of management of knowledge and innovation, as well as the role of KISA in a context of increasingly globalized and competitive performance services, it is an assumption with full legitimacy. More than half of the companies surveyed have implemented some kind of innovation during the past year, and in 100% of those cases, the same was incremental/gradual (there was no mention of radical innovation), in 17% of the sample, we verified the implementation, during the last year, of a new production process, 15% of the respondents introduced a new product or a major shift in an already existing product, while 12% have implemented a new or made significant improvements in organizational or marketing methods. Also significant is the fact that 83% of companies surveyed have performed some sort of investment in the area of KISA in the last three years. Nevertheless, it is observed that there is still an under-use of KISA in supporting product innovation, i.e. the companies of the sea economy in the Algarve are not yet fully made aware of their critical importance. Most of the reported cases in the survey about the use of KISA refer to advisory operations related to management of internal processes: 24% in ICT (e.g. acquisition of software and hardware, networking, internet, e-commerce, etc.), 16% in training/skills and 12% in consultancy in the fields of accounting/legal/fiscal/management and market research and financial advisory. Only 14% refer to R&D activities.

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