A TECHNOLOGICAL INNOVATION PLAN FOR ENTERPRISES IN THE AZORES∗

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ABSTRACT
The nine Azores islands, located in the middle of the Atlantic Ocean between Europe and North America, offer many areas of natural beauty. This autonomous region of Portugal is often described as the Region of Magic Nature, unique in Europe. The Region’s commitment to preserve and maintain the environment is evident from the presence of dozens of nature reserves and areas of protected landscape, parks and forests.

It is within this framework that the INOTEC-Empresa – the Technological Innovation Plan for Enterprises in the Autonomous Region of the Azores (RAA) - was developed in 2006-2007, at the request of the Regional Government, with the main aim of promoting innovation within small and medium enterprises. The methodological approach used in the development of the INOTEC – Empresa Plan was designed to obtain a comprehensive view of regional actors and included a document review, participation of the various actors through interviews, a collection of statements from RAA – Região Autónoma dos Açores, entrepreneurs, academics, public leaders and other key players, together with an analysis of their views and a survey of the innovation dynamics of the most relevant Azorean enterprises. The INOTEC-Empresa – the Technological Innovation Plan for Enterprises - comprises seven programmes aimed at promoting innovation in the Region. This paper focuses on the Programmes for Qualification of Human Resources and the Development of Scientific and Technological Capacities for Innovation. Some socio-economic data and the metrics selected to assess and benchmark the implementation of the Plan will also be discussed.

1. INTRODUCTION
The Azores Region has the status of one of the “outermost regions” of EU. The GNP per capita for RAA in 2003 (expressed in parity of buying power, 11,7 X1000 Euro/Inhabitant) is around 64% of the EU average and 88% of national average. The rate of development of RAA, since 2000, has approached the EU average, which means that Azores is no longer considered to be one of the less developed regions of the EU (RAA, 2007a). In terms of significance for the regional economy, the agro-food and agro-forestry industries, in parallel with fisheries, perform a central role as one would expect in an isolated insular territory.

The Technological Innovation Plan for Enterprises in the Autonomous Region of the Azores (RAA), hereafter called INOTEC - Empresa Plan, was developed over the period 2006/2007 at the request of the Regional Government, with the main aim of promoting innovation within small and medium enterprises. The strategic vision defined within INOTEC – Empresa Plan was ambitious (Simão, 2007):

To develop the Azores Autonomous Region (RAA) into one whose competitively is above the national average, while at the same time the most attractive and with the best quality of life in Portugal, for its residents and visitors.

With this vision in mind, the INOTEC - Empresa Plan aims (op. cit.),

[...] to formulate the policies and programmes to be developed within the forthcoming European Structural Funds Framework Programme for Portugal and specifically for the RAA, over the period 2007-2013 (RAA, 2007a; b) [to define] its strategic and specific objectives, the methods and tools for its realisation, suggesting performance metrics to monitor and assess its implementation and the use of corrective measures.

This paper is organized as follows: in the next section, the methodological approach used to devise the **INOTEC – Empresa** Plan is presented. The third section outlines an overview of the Plan. The subsequent sections focus on the Programmes for **Qualification of Human Resources** and the Development of **Scientific and Technological Capacities for Innovation**. The sixth and last section introduces and discusses the metrics selected to assess and benchmark the implementation of the Plan.

## 2. METHODOLOGICAL APPROACH

The methodology used in the development of the **INOTEC – Empresa** Plan was designed to obtain a comprehensive view of the regional actors, stakeholders and factors which could have an impact on innovation and competitiveness of RAA. It included a document review, participation of the various actors through interviews, a collection of statements from Region’s entrepreneurs and other key players, together with an analysis of their views and a survey of the innovation dynamics of the most relevant Azorean enterprises. Each element of this research methodology is detailed in following paragraphs.

### i) Documentary research

The sources consulted included printed documents and the Regional Government Portal (RAA) which is kept continuously updated; it enabled the monitoring of developments in the Region which might have had impact on the **INOTEC – Empresa** Plan. The Portal includes the Plans and Budgets for the RAA (2005-2007); Mid-term guidelines (2005-2008); the Socio-Economic situation 2004-2006; Sustainability perspectives in RAA (RAA. SRAM, 2006); several documents with data on Employment. Obviously the study of these documents was informed by national policy documents, such as the recently published (at the time) European Structural Funds Framework Programme for Portugal (for the period 2007-2013) (QREN); documents produced by Central Government regarding the implementation of the revised Lisbon Strategy, the XVIIth Government Programme (2005-2009) (Portugal. PCM, 2005), the National Technological Plan (2005-2009) (Portugal. CNEL) and the 7th European Framework European Research Programme (2007-2013), particularly in what concerns the lines to support SME and those related with the building and strengthening of Knowledge Regions in Europe.

Statistical data was obtained from the National Statistics Office (Portugal. INE) and from those other sources which are part of the National Statistics System in the Ministry of Education, the Ministry of Science, Technology and Higher Education and the Ministry of Employment and Social Security. Data on the development of the Information Society was also obtained from the Observatory for the Knowledge Society (OSIC) in Portugal, which is under the umbrella of the Agency for the Knowledge Society, UMIC. This data is available through the publication *A Sociedade de Informação em Portugal* (Portugal. OSIC, 2007).

### ii) Participatory research

As Creswell and Clark (2007:23) describe it, whenever research seeks to address political concerns, then the participatory approach is the most appropriate. This includes obtaining the collaboration of the individuals that would be affected by the proposals being developed. In the case of **INOTEC – Empresa** Plan, there was an exchange of views within a Strategic Council specifically created for the Plan; this was convened three times, during the project’s duration (March and June 2006; March 2007). All members at the first of these meetings were invited to present their views on their specific areas of expertise in the broad context of the Plan, namely education and professional training, availability of scientific and technological infrastructures, enterprise competitiveness and new areas for entrepreneurship in the region.

### iii) Survey analysis

Designed to reveal the state of innovation dynamics in the RAA economy, a questionnaire was circulated, with the cooperation of the three existing Chambers of Commerce, to some of the most important enterprises in the region. This questionnaire included closed and open questions on several issues, namely:

- Enterprise characterization and its structure; its markets, how actively they search for information relevant to innovation and competitiveness, the effect of public policies;
- The use and exploitation of information and communication technologies;
- Issues of certification on quality and environment sustainability;
- Entrepreneurship affiliation;
- The most relevant factors that could contribute to an increase in their competitiveness;
The data collection, which lasted from June to December 2006, benefited from the support of Direcção Regional de Comércio, Indústria e Energia (Regional Department for Commerce, Industry and Energy), as well as from the Regional Chambers of Commerce.

3. THE PLAN INOTEC – EMPRESA (PLANO TECNOLÓGICO E DE INOVAÇÃO EMPRESARIAL INOTEC-EMPRESA)
The INOTEC-Empresa Plan (Simão, 2007) was approved by the Strategic Council during its March 2007 meeting and will be published at the end of the first 2008 Semester. The first part the Plan was influenced by the European Structural Funds Framework Programme for Portugal (2007-2013) (QREN), in particular by those for the RAA – the PRO-EMPREGO (European Social Funds) (RAA, 2007b) and the PRO-CONVERGÊNCIA (European Regional Development Funds) (RAA, 2007a); it discusses how the RAA should position itself to benefit from the opportunities offered by these and by the 7th European Framework Research Programme, especially in what concerns Programmes for SME’s and the building and strengthening of Knowledge Regions in Europe. The second part gives an overview of the Azores Autonomous Region, showing the results of a SWOT analysis and provides the main conclusion drawn from the survey on innovation dynamics of enterprises in the region. This analysis expands on and complements the conclusions of the 4th CIS – Community Innovation Survey (Portugal. MCTES…, 2007) and their impact on RAA enterprises. The programmes of action constitute the third part. There are six chapters:
Chap. 5 introduces a strategic vision for the RAA competitiveness, where special attention is paid to public policies and entrepreneurship strategies.
Chap. 6 deals with the development of an integrated infrastructure to support Innovation in RAA – particular attention is paid to the role of public/private partnerships and some strategic guidelines are provided for the implementation of INOTEC-Empresa. The creation of a network of Innovation Intermediaries is considered as one of the core elements of this infrastructure.
Chap. 7 addresses the crucial issue of human resources qualification for innovation and the availability of scientific and technological resources for business innovation. These will be dealt with in more detail in subsequent sections.
Chap. 8 discusses the issues related with the implementation of innovation incentives schemes in the RAA, within the European Structural Funds Framework Programme period (2007-2013) (QREN) and proposes the creation of a Regional Innovation Agency – as a public/private entity – which would perform a “brains trust” role; its main objectives would be to support the development of newly formed knowledge-based enterprises.
Chap. 9 introduces some examples of innovative exploitation of natural resources including those arising as a consequence of the RAA’s geo-strategic location, for example space communications.
Chap. 10 characterises the future direction for the decentralised “Technology and Competitiveness Park” (Polo de Tecnologia e Competitividade) within the RAA and makes proposals to improve the collaboration of AIP-CE (Industrial Association of Portugal – Entrepreneurship Confederation), one of the National Confederations, with the Chambers of Commerce in Azores. In the following section, this paper concentrates on the Programmes for Qualification of Human Resources, in what concerns creation of opportunities for lifelong learning opportunities and the Development of Scientific and Technological Capacities for Innovation.

4. PROGRAMMES FOR QUALIFICATION OF HUMAN RESOURCES AND THE DEVELOPMENT OF SCIENTIFIC AND TECHNOLOGICAL CAPACITIES FOR INNOVATION

4.1 Programme for Qualification of Human Resources
Observing the current (at the time of INOTEC-Empresa Plan development) educational attainment of human capital in RAA, the obvious proposal for the Programme for Qualification of Human Resources was to promote its enhancement through an integrated programme of training and re-qualification for potential candidates already in the workplace, aiming to increase the percentage of population with 3, 4 and 5 EU level qualifications. To achieve this, it is recognised that there is a need to raise aspirations and improve access to attractive learning facilities. These measures will increase the self-motivation of managerial staff to improve their qualification levels and to allow the workforce to take advantage of re-qualification opportunities. The latter can be a severe problem in Portugal, where organisations are reluctant to give time off for further education and where the pursuit of higher qualifications is not always appreciated by the older generation.
Various initiatives were outlined with the aim of attracting non-traditional students to study for higher qualifications. These include the promotion of *Open Days* for prospective students; the offering of *Taster Courses* and of preparatory courses, specially designed to ensure the success of non-traditional candidates wishing to access HE. The overcoming of barriers felt by these students will also include the implementation of student-centred teaching and learning methodologies as well as assessment approaches and improving the flexibility of the teaching timetable. Because of the archipelagic nature of the region, emphasis on the use of e-learning technologies and of blended learning approaches to course delivery was strongly recommended. As one of the mechanisms to promote a student-centred approach, it was also recommended to introduce Personal Study Plans (PSP), where competences acquired by individuals in all areas, including the use of Information and Communication Technologies will be registered.

Taking into account the present state of development of educational levels in RAA, the INOTEC-Empresa Plan strongly recommend wider use of the CET courses (Cursos de Especialização Tecnológica), in particular those which are already taught at the Technological School ENTA (Escola de Novas Tecnologias dos Açores) (ENTA). These are post secondary, non-university training level IV EU qualifications, addressing the specific needs of the intermediary level workforce. Apart from their flexibility, CET's undertaken under the auspices of an agreement, or protocol, with at least one Higher Education Institution (HEI), guarantee access to HE. These protocols, agreed between the provider of CET and HEI for defined programmes of study, establish the conditions for recognition of training for advanced entry, within those HE programmes, without the need to sit the National HE Access examination, according to the Decree-Law nº 88/2006, of 23rd May, (article n.3) (Portugal. MCTES, 2006) which constitutes the CET regulatory framework in Portugal. INOTEC-Empresa Plan recommends that there should be a strengthening of the link between the CET's provide by ENTA and the University of Azores. Furthermore, there should be an increase in CET’s offered in the area of Information and Communication Technologies with an initial common structure followed by specialization and a stronger involvement of regional enterprises, chambers of commerce and local government in several aspects of course organization. This approach would also require an agreed definition of the programme of studies’ contents and the creation of practical work experience opportunities. It is also recommended that ENTA, which is now mainly active on S. Miguel island and in the capital city Ponta Delgada, should strengthen its activity through the creation of autonomous centres in the other islands, acting in a coordinating role to optimise the sharing of human and material resources. Above all, INOTEC-Empresa recommends that there should be an active campaign at Regional level to increase entrepreneurs’ involvement and to promote awareness of the benefits to be found in developing flexible ways to allow suitable candidates to attend CET’s courses.

### 4.2 Programme for Development of Scientific and Technological Capacities for Innovation

One of the recommendations of the INOTEC-Empresa Plan is that an effort should be made by all stakeholders to produce the reliable data needed for monitoring and benchmarking the impact of innovation policies. However, it is obvious that the current productive capacity is limited by a relatively weak technological base; this is responsible for the difficulties experienced by Azorean enterprises to move up to a higher level of competitiveness. This weakness can be monitored by several indicators, such as (data for 2003) (Correia & Mota, 2007):

i) R&D staff as % of active population: 0,32% in RAA, compared with 0.47% in Portugal average (*op. cit*, Graph B.2.1);

ii) R&D effort, expressed as percentage of working time spent on research, spread over the following types of institutions - Higher Education, enterprises, State and private sectors - is significantly higher in RAA in Higher Education (ca. 60,1%) than the same indicator for Portugal mainland (43,5%) and the one for Portugal's other Autonomous region (Madeira; 32,8%) (*op. cit*, graph B.2.3);

iii) the main part of the total expenditure on R&D in Azores, although increasing since the 1990s, was allocated to the University of Azores; its spend was mainly concentrated in the areas of Biology, Technologies, Maritime resources and Geosciences; this expenditure represents only 0,5% of GNP in Azores, compared with the average for Portugal which is 0,78% of the GNP. It is a value that is far from the target of 1% established by the National Technological Plan for the year 2010 which is 1% (Portugal. CNEL).

iv) the expenditure in R&D needs an urgent review to correct the imbalance between the University (62,7%), the State (18,2%), Enterprises (5,1%) and Private sector (14%) (*op. cit*, graph B.3.3).
The Lisbon Strategy, which aims to develop Europe into the most competitive and dynamic knowledge-based economy in the world by 2010, incorporates a policy goal that requires R&D expenditure in the European economies to reach 3 percent of GDP by 2010 (Comissão...,2002). R&D intensity is extensively used by scholars and policy makers as a benchmark for measuring the innovativeness of a firm, an industry, a region or a country. Nevertheless, the European Innovation Scoreboard shows that almost half of European innovators do not conduct intramural or in-house R&D. (Innometrics, 2008). Such non-R&D innovation includes the purchase of advanced machinery and/or computer hardware; usually, these are specifically to implement new or significantly improved products or processes. The purchase of rights to use patents and non-patented inventions, licenses, know-how, trademarks and software is also necessary. Internal or external training for keeping personnel up-to-date is an important expense for the innovative firm. Generally speaking, non-R&D innovators are concentrated in the low technology manufacturing and service sectors. The distribution of these non-R&D innovators is also skewed towards small and medium sized firms. It is in such circumstances that INOTEC- Empresa Plan deals with the development of an integrated infrastructure to support Innovation in RAA. The creation of a network of Innovation Intermediaries (Howells, 2006) is considered to be one of the core elements of this infrastructure.

Development of the Information Society in RAA
Some of the most relevant data characterising the Information Society in RAA, are:
   i) In 2006, the broadband penetration in households was 24% in Portugal and in RAA it reached 27%;
   ii) The percentage of households with PC in 2005 and 2006 in the RAA were 41% and 45%, respectively; these values can be compared with similar values for the average of Portugal which were 42% and 45%, respectively. And when one considers Internet connection, the RAA (in 2006) has a higher value – 38% - when compared with the average for Portugal (35%) (op.cit.: graph C.1.2.2)

Taking into consideration the archipelagic nature of the RAA and the central role of a networked infrastructure for innovation and learning in the region, INOTEC- Empresa Plan strongly recommends that the RAA reach and eventually overtakes the target established by the Portuguese Government, within the Renewed Lisbon Strategy, by the year 2010. This would mean at least 50% of households being connected to Internet by broadband (Portugal. CNEL).

5. METRICS FOR BENCHMARKING
The strategic vision defined by the INOTEC-Empresa Plan is in accord with the Regional Government GNP growth forecast of above 5% per year for the period of 2007-2013. Innovation in enterprises is at the core of this challenge. RAA must converge into a knowledge-based region and take full advantage of the digital economy.
In order to stimulate the dynamic process of this innovation policy, benchmarking emerges as a powerful technique for measuring the success of policies and their outcomes, across industries, sectors, products and services. It is in this context that the development of an Innovation Scoreboard for the European regions (IRS) has been incorporated into the INOTEC – Empresa Plan. Only through benchmarking is it is possible to monitor and assess the impact of innovation policies at the regional level. This monitoring activity should be based on metrics discussed and accepted by all stakeholders – namely, Regional government, enterprises, Chambers of Commerce, and academia. The INOTEC- Empresa Plan is therefore based on an analysis of:
   i) the point of departure for the region;
   ii) the targets for 2010 established by Portugal, within the scope Technological Plan (TP) for Portugal (Portugal.CNEL), which integrate the response of Portugal to the European Union, regarding the implementation of the Renewed Lisbon Strategy and will be in accord with Regional Benchmarking exercises in other European regions (e.g. Region Lazio Innovation Scoreboard) (RIS). The proposed benchmarking methodology adapts the Innovation Scoreboard to the local requirements and introduces a set of regional indicators and targets. In this paper only Tables 1 & 2, referring to those groups of indicators relevant for the RAA Knowledge Creation Programmes, are presented:
   - Knowledge creation – qualified human resources
   - Knowledge creation – science and technology
For each indicator there are specific associated targets:
- Target for 2010, for Portugal, obtained from the TP
- EU-25 average (the most updated value available)
- EU-15 average (the most updated value available)
- Target for 2015, RAA – ten years of the implementation of the INOTEC- Empresa and European Structural Funds Framework Programme.

Although it was not possible to summarize all the indicators defined in the *European Innovation Scoreboard* for the RAA, in the context of the *INOTEC-Empresa* Plan a detailed compilation of several indicators was completed (Correia and Mota, 2007) and provisionally accepted. They will be refined and expanded as necessary.

### TABLE I - Knowledge creation – Qualified Human Resources
Sources: Portugal, CNEL; Correia & Mota, 2007

<table>
<thead>
<tr>
<th>STRATEGIC OBJECTIVE</th>
<th>POPULATION INDICATORS</th>
<th>2010 PT TARGET</th>
<th>PT</th>
<th>EU25</th>
<th>EU15</th>
<th>RAA &quot;currently&quot;</th>
<th>RAA TARGET 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S&amp;T graduates in 1000 inhabitants (20-29 years of age)</td>
<td>12</td>
<td>12.6 (2006)</td>
<td>13.2 (2005)</td>
<td>-</td>
<td>-</td>
<td>13</td>
</tr>
<tr>
<td>Promote lifelong learning</td>
<td>Lifelong Learning (per 100 inhabitants of the age group 25-64)</td>
<td>12.5</td>
<td>4.6 (2005)</td>
<td>11 (2005)</td>
<td>-</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Percentage of households with broadband access to Internet</td>
<td>50</td>
<td>34 (2006)</td>
<td>77.3 (2005)</td>
<td>-</td>
<td>27 (2006) C.1.2.2</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Students per PC</td>
<td>5</td>
<td>10.3 (2005)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>
Table 2 - Knowledge creation – Science and Technology
Sources: Portugal, CNEL; Correia & Mota, 2007

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<thead>
<tr>
<th>STRATEGIC OBJECTIVE</th>
<th>R&amp;D Indicators</th>
<th>2010 PT TARGET</th>
<th>PORTUGAL PT</th>
<th>EU25</th>
<th>EU15</th>
<th>RAA &quot;currently&quot;</th>
<th>RAA TARGET 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Researchers per 1000 workers</td>
<td>5,3</td>
<td>3,4 (2005)</td>
<td>5,8 (2002)</td>
<td>-</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Strengthen the scientific and technological capabilities</td>
<td>New PhD in S&amp;T per 1.000 inhabitants (in the age group 25-45)</td>
<td>0,45</td>
<td>0,3 (2003)</td>
<td>0,49 (2003)</td>
<td>-</td>
<td>0,6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R&amp;D effort expressed as per 1000 of working population</td>
<td>7,5</td>
<td>4,7 (2003)</td>
<td>-</td>
<td>10,5 (2003)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Public expenditure in R&amp;D (% of GNP)</td>
<td>1</td>
<td>0,5 (2005)</td>
<td>0,65 (2005)</td>
<td>0,70 (2003)</td>
<td>1,5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enterprise expenditure in R&amp;D (% of GNP)</td>
<td>0,8</td>
<td>0,26 (2003)</td>
<td>1,26 (2003)</td>
<td>1,30 (2003)</td>
<td>1,5</td>
<td></td>
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</table>

Using this approach, some 2015 targets for RAA were established. These are ambitious and above the national average established for Portugal in 2010 (Portugal. CNEL) Proper implementation of the INOTEC-Empresa Plan should make it possible for the RAA to achieve, in 2015, an increase in performance of at least 10% on Portugal’s 2010 figures, but only a culture of Entrepreneurship in the RAA can make this a reality.

REFERENCES
(URL accessed on 11th April 2008)
URL: http://ec.europa.eu/research/era/pdf/com3percent_en.pdf
ENTTA. Escola de Novas Tecnologias dos Açores
URL: http://www.enta.pt/ENTA/index.php


