

## ON THE SOCIAL RETURN OF R&D PROJECTS AND SUPPORT PROGRAMMES

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### ABSTRACT

This work is a part of an ongoing research focusing on the social impact of R&D projects and support programmes from the perspectives of the public and private sectors. The research project is based on interviews conducted as part of a case study methodology involving a marine-sector private company and the Technological Center in Vigo. The results indicate that the criteria chosen as being the most important for the evaluation of social return of R&D were the number of jobs created at the company, the environmental impact and the working conditions. Also included in the analysis were the criteria used in the process of evaluating applications for funding. From the analysis it becomes notorious that social return is not a priority in this evaluation process, with assigned weights for the related criteria ranging between 0 and -22%. The only exception was the Transnational Program of cooperation Atlantic Space where the weights of the variable related to the social character of the project sum about 50 %. The mostly used criteria are the environmental impact, the incorporation of new PhD's and the presence of women investigator's in the project. Only in the Transnational Program of cooperation Atlantic Space include criteria like the transference of knowledge, diffusion of knowledge and platform growth.

### INTRODUCTION

From the point of view of the private companies, several studies show that evaluating R&D projects is a complicated task as Mohanty et al.(2005) argue. But, although these difficulties exist, these evaluations are fundamental due to the competitive environment surrounding R&D investing companies.

These evaluations are supposed to focus not only on purely financial factors, but also on the social criteria, with the aim of quantifying the of social return and ensuring that adequate levels of social return are

obtained in R&D activities financed by private corporations or public agencies.

The first fruits of this project suggest an obvious interest from the participants in these projects and programmes. However, they expose also the difficulties of obtaining information and setting a common methodology that would allow to contribute for the measurement of the efficiency of those projects and/ or programmes using a consistent form (Carvalho, 2009; Álvarez Gómez, 2009).

The lack of objective measures increases the evaluation time and may lead to the lack of R&D investment because the interest of the theme is not clearly demonstrated ( Sánchez and Pérez, 2002 ). In spite of the difficulties of the process, the definition of a methodology for the selection of R&D projects is fundamental. Different methods of evaluation have been reported, most of them based on purely financial tools, cost-benefit analysis or some kind of multi-criteria model. These last ones, allows for the inclusion of criteria like lucre, business relevance, probability of technical and commercial success, among others ( Eliat et al., 2005 ).

From the point of view of the evaluation of programmes which support R&D activities, it is appropriate to say that different methods exist as Cozzarin ,( 2006 ) or Ruegg and Feller, ( 2003 ) studies stand out.

### EVALUATION OF R&D PROJECTS AND PROGRAMMES

This section intends to demonstrate the importance of a correct evaluation of R&D projects for companies, analyzing in particular if and how companies measure the impact of R&D activities.

Mohanty et al.(2005) support the need for a compatibility between the R&D project and the company mission, underlying also that companies are supposed to foresee the obtained benefits. The authors demonstrate the importance of the selection process of R&D projects, due to the underlying risks that may generate important losses in financial results and in human resources.

Loch and Tapper (2002) identify the most important objectives to control the performance of R&D: Aligning

behavior and installing priorities, establishing a working control, stimulating, learning and getting better. Also Chiesa et al. (2009) justifies the importance of R&D performance measurement: Motivating researchers and engineers and improving their performance, controlling the progress of R&D activities regarding objectives of resources consumption, time and technical requirements, evaluating the cost-reducing contribution of R&D activities to the company, reducing the uncertainty and promoting organizational learning.

Next section presents different methods that were used in the evaluation of programmes supporting R&D activities and also in the evaluation of R&D projects at company level, focusing in particular on the possible inclusion of social criteria in these evaluations.

### Methods of evaluation at company level

Chiase et al., (2009) study aimed to discuss the problem of the measurement of the performance of R&D activities at company level. The used methodology was based on a framework identifying : ( I ) the main contextual factors and the approaches used to measure the performance of R&D activities ( II ) the main issues that would have to be taken into account when designing a performance measurement system ( for example indicators ). The proposed framework was applied in multiple case studies, resorting to interviews as research method .In order to measure the performance of R&D projects the indicators of financial type like the IRR (Internal Rate of Return) and NPV (Net Present Value) were used. In addition other indicators included the share of new products sales, number of presented complaints or customer satisfaction, registered patents, number of publications and number of new ideas per year, among other ones.

Mohanty et al, ( 2005 ) resourced to the ANP process (analytical net process) with a partial cost analysis for the selection and evaluation of R&D projects. The authors used a large range of criteria such as the strategic adjustment, the capacity, the technical viability, the financing, the risks, the organizational preparation (culture), the opportunity costs, the duration of the project, among others.

Eilat el al. ( 2008) presented a method for R&D evaluation, based on a multi-criteria model. The proposed indicators offer an evaluation of the performance of the organization taking into account the financial and commercial perspective along with the operational and strategic dimensions. Sánchez and Pérez (2002) demonstrated that ratios and the financial analysis of the project are the most common evaluation methods.

### Methods of evaluation of R&D support programmes

Ruegg and Feller ( 2003 ) describe different kinds of methodologies for the evaluation of programs such as: The analytical method and the conceptual- model of the

subjacent theory, econometric and statistical method ,survey, the case study, the analysis metric and social-nets member, historical tracking and expert's opinion.

An interesting study that tackles this theme is presented by Cozzarin (2006). The author presents 11 programmes which support R&D activities from the Government of Canada and describes a method of analysis to see the economic and social impact. A large number of methods was proposed to analyze these programmes such as: Internal Rate of Return (IRR), the Cost-Benefit Analysis (ACB), Econometric studies, and Microeconomic Analysis. The author proposes also the inclusion of a set of non-financial indicators, turning the analysis more complete and focusing it towards the concept of social return.

Another recent work of investigation conducted by Carvalho (2009), presents an analysis of different programs of public financing for Portugal in the R&D area. In order to be able to accomplish a comparison among these programmes, a set of qualitative and quantitatively indicators that can characterize the attained objectives was used. From the quantitative results of the interviews with experts the order of importance of the considered criteria was derived: Formation, conditions of employment, ambient/ energy, social return against financial return, job and finally the return on investment.

### Selection of indicators

To proceed with the empirical study a selection of indicators directly related with relevant criteria to the assessment of the social return of R&D programmes was attempt. This selection of indicators was based on the presented bibliography, on other references (Ares et al., 2008 ), ( Carvalho, 2009 ), ( Álvarez Gómez, 2009 ) and also on to the Spanish Observatory of the Invention and of Knowledge ( ICONO ) web page. The selected category of indicators are: Employment/ Working conditions/ Learning and growth/ Return social vs. financial Return /Environmental Effects /Investment taxes.

For each one of these categories, a set of indicators was proposed:

Employment: Creation of employment: increase of the total number of places of work in the company/  
Creation of employment: increase of the total number of places out of the company/  
Increase of the number of places of work for disadvantaged communities socially, women, immigrant..

Working conditions: Quality employ-ergonomics/Wage level/Level of training: increase of knowledge and capacities /Security/Degree of satisfaction of the employees/Good working environment/Maintenance and consolidation of existent places.

Learning and growth: Improvement of the competitions of the R&D personnel /Boost the culture of R&D/  
Diffusion of knowledge (scholarships, patents)/

Creation of spin-off (number of companies created from the knowledge obtained by the project and that are kept independent /Transfer of knowledge Know-Hw/Platform for the growth.

Social Return: Improvement of the social satisfaction/Resolution of problems like unemployment, delinquency, immigration/Contribution for the regional development/Contribution for national politics, regional or European/social Effect in the operation of market: transfer of companies, outsourcing, boost the spirit of the technological innovation.

Financial Return: Increase of the productivity for the company /Increase of the quota of market/Reduction of costs/Financial Stability of the company/Economic effect in the operation of market: creation of new companies, increase of the productivity/Sales of new products.

Environmental effects: Reduction of the pollution, broadcasts/Protection of the environment/Reduction of the energetic consumption/ Utilization of renewable energy sources.

Investment rate: New buildings/ Infrastructures of I+D+i/Investments in human capital (education, human skills, academic methods).

## EMPIRICAL STUDY

The empirical study presented in this research paper, is centered at the marine sector. A case study methodology will be followed, describing opinions of a private company operating in the sector (Ronautica, SA) and of the Technological Center of the Sea (CETMAR). The case study methodology was utilized previously in works such as Chiesa et al, (2009) and Carvalho, (2009) also focusing on the evaluation of R&D projects and programmes .

This interviews conducted aimed to collect opinions on the social impact and social return of R&D. The format of the interviews conducted was based on Foddy, (1995).Both organizations included in the research were involved in R&D projects financed with public funds. The main objectives of the empirical study were: (1) to determine which of the proposed indicators are assumed to be more important for project evaluation and how this indicators may be associated to the concept of social return,; (2) to assess the importance of this social return concept on the moment of project elaboration.

## Analysis of results

### *Qualitative Analysis*

The qualitative analysis of this interviews aims to collect information about R&D projects in general and to the evaluation conducted at the company or at the technological center. Some general information could be drawn from the interviews results:

1) Difficulties in getting financing: Both interviewees emphasize that there are always difficulties at the

moment of getting financing and on the electability of the expenses. This may even lead to the impossibility of conducting the project.

2) Social objectives: The company does not deal with social objectives during the project evaluation. In fact, for 95% of the company's projects, most of the objectives focus on the financial character. The environmental benefits that the company gets from the creation of new and more ecological products and environmental friendly processes are frequently collateral consequences of the project and not pre-defined objectives. The Technological Center, however, gives more attention to social objectives of the project during the project follow-up and evaluation. Neither the analyzed company nor the technological center resource to a predefined set of indicators to evaluate the impact of R&D projects.

### *Quantitative Analysis*

This quantitative analysis aims to establish a ranking of the indicators that could evaluate the social return of a publicly funded project. This ranking was based on the weights assigned by the company and by the technological center.

From the private company point of view the main indicators that could be used to evaluate social return are, in order of importance:

1° employment and in particular the most notable indicator is "creation of employment: increase of the total number of places of job in the company".

2° environmental impact and in particular the most important indicator is "utilization of renewable energy sources".

3° working conditions and in particular the most important indicators are "level of training: increase of knowledges and capacities (polyvalence)/ security/ degree of satisfaction of the employees".

From the technological center point of view the main indicators that could be used to evaluate social return are, in order of importance:

1° Employment ("creation of employment: increase of the total number of places of work in the company"). Learning and growth ("knowledge production")/ Working conditions ("polyvalence)/ Security/ Degree of satisfaction of the employees.") Environmental impact ("Reduction of the pollution, broadcasts/Protection of the environment/Reduction of the energetic consumption/ Utilization of sources of renewable energy" (all considered equally important).

2° Social return vs. the financial return.

For the social return the most notable indicators are - Resolution of problems like unemployment, relocation, delinquency, immigration/ Contribution to the regional development/ Contribution to national, regional or European politics, all valued with the same weight.

For the financial return the most important indicators are: Increase of the productivity for the company/  
Economic effect in the operation of market: creation of new companies, increase of the productivity, also valued with the same weight.

3° Investment return.

#### *Analysis of the company's R&D financial sources*

In this section the evaluation criteria included in the public calls of Support programmes in which the company R&D projects were included will be analysed. The project data were taken from the website [www.ronautica.com](http://www.ronautica.com)

Project1, under PGIDIT 2006-2010. Code: IN841C-2006/314

The objective of the call was to promote business innovation in the Autonomous Community of Galicia. Included criteria were: environmental implications, significant pollution reduction, reduction of energy consumption, importance and capacity of the Project to solve problems in the sector (maximum 14 points over 100) and creation of new jobs and significant presence women on the team (máximum 8 points over 100). In total, the assigned social value was 22%. The technical criterion was worth 50%.

Project 2, under PGIDIT 2006-2010. Code PGIDIT06CCP007.

This included public calls from sectoral programs of Natural Resources, Innovation Technologies and Services. The only criterion related to the social impact is the significant presence of women researchers in the research team with 2 points assigned out of 100. So 2% of the evaluated related to the social value. The scientific and technical criterion was the most important one weighting 70% of the overall evaluation.

Project 3, under PGIDIT 1999-2001 and 2002-2005. Code PGIDT01MAR05Y.

This call related to the Plan Marino Gallego Research to the Research Program and Technological Development. No evaluation criteria related to the social impact was found.

Project 4, under PGIDIT 1999-2001. Code PGIDT00INN33Y

This was included in a public call from the Support Program to Innovation of Plan Gallego for Research and Technological Development. Once more, this call does not include any social criteria for the evaluation.

#### *Analysis of the Technological Centre R&D financial sources*

The technological centre projects address mainly Control and Management of coastal and marine

resources, project objectives can be found at its website: [www.cetmar.org](http://www.cetmar.org)

Project 1, funding: European Union. Multinational Cooperation Programme Atlantic Area. Social indicators displayed on the call are: Extent to which the project responds to challenges common to all the territory of the Atlantic Area. Weight 7/100.

Positioning of the project in an ascending scale of four levels of intensity of cooperation: exchange of experiences, knowledge transfer, sharing of resources and problems solving, development of a transnational strategy. Weight 7/100.

Demonstration of the sustainability strategy of the project to allow to proceed with the project activity beyond the funding period, including the possible leverage effect through the involvement of new actors, sectors or regions. Weight 6 / 100.

Relevance and realism of the communication plan and its contribution to the transferability of the results of the project including the transfer of knowledge and best practices to expand the Atlantic Area (for new audiences, sectors or regions). Weight 6/100.

Relevance, realism, and tangible value of performance indicators and results and their relation to the objectives of the project. Relevance of monitoring indicators presented. Weight 6/100.

Extent to which the project demonstrates, through information, such as the issues and challenges of the project correspond to the objectives and problems common to Member States / regions of the Atlantic Area. Weight 5 / 100.

Extent to which the project promotes and facilitates the transfer of knowledge and know-how and exchange of experiences within the partnership. Weight 4 / 100.

These indicators represent a weight of 50% compared to the total. Each project is graded between 0 and 5 for each of the twenty criteria that may be found in the Candidate Handbook from the website (<http://atlanticarea.inescporto.pt/>).

Project 2, Financing: General Direction of R&D. Ministry of Economy and Industry. Plano INCITE - Eranet AMPERA (VI Marco Program). Xunta de Galicia.

The most valuable criterion in this case is the scientific and technical merit with a maximum of 70 points out of 100. Those criteria that may be included in a social category are: number of PhD, incorporation of new PhD, balanced participation of women researchers in, with a maximum of 4 points on 100. Use of Galician language with 2.5 points out of 100. This represents a total of 6.5% in social valuation.

Project 3, Funding: Ministry of the Sea .Xunta de Galicia.

Social criteria pre-defined in the order of October 20, 2008 are the criteria for test methods to improve gear selectivity of fishing and environmental impact with 8

points on 100 and follow good environmental practices with a weight of 2 points on 100. This implies that social value is 10% of the total. The most valued is the scientific-technical quality and innovation with a weight of 40% of the total.

## CONCLUSIONS AND FURTHER RESEARCH

The main aim of this paper was to establish a set of variables or indicators that can be used to assess the social return of R&D. Therefore a set of criteria or indicators to prioritize the social return more than economic or scientific were chosen. Based on these criteria, interviews were conducted to assess the possible social return generated by R&D. The interview was conducted in a marine sector company and in the technology centre of the sea. Following the interviews and according to these case studies, it seems that this company does not take into account social objectives when carrying out projects. The technology centre, however, takes already into account some social objectives when elaborating and evaluating their projects. However, both interviewees have a limited idea of what is the social return and what criteria may be used to measure, indicating a clear lack of awareness to that concept. The criteria the interviewee selected as most important for evaluating the social returns are the employment with Number of jobs created in the company, the environmental and working conditions. After analyzing the calls to the R&D support programmes, it could be concluded that a match seems to exist between the criteria that the firm and technological center consider to be related and/or assume to be important to measure the social return, and the criteria included in the R&D support programme calls. Taking this into account the possibility that a relationship may exist between the social criteria that are required in the calls and the concept of social return for companies and agencies, the following hypothesis may be proposed:

“these social criteria appearing in the calls can influence business objectives and agencies applying to the support programme. Companies frequently prepare the project by finding the lines of the call that best suits the companies’ needs and characteristics, so if the call requires environmental objectives the project will end up having environmental improvements. That is, there is a possibility that setting a greater number of social criteria for project evaluation under a specific R&D support programme, will lead to increase awareness for social return on the company goals and to the need to accomplish predefined minimum social goals.”

To test this hypothesis more interviews and in deep analyze of public R&D support programmes calls seems to be fundamental. It must be underlined that the

discussed result represent the point of view of the interviewees and may not be universally accepted. In fact, the conclusions drawn from a case study cannot be generalized (Gable, 1994). But as Benbasat et al., (1987) underline the case study methodology can generate theory from the practice.

If the weight assigned to the social criteria of each call was to be associated to the potential social return generated by the project, we can conclude that from all analyzed calls, the one with the highest potential social return is the Transnational Cooperation Programme with almost 50% of total evaluation weights assigned to social criteria. This hypothesis should also be studied further. For this more calls must be analyzed getting also data on the social impacts generated by the projects supported by these calls.

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