

Social impact on project assessment: An integrated methodology for the assessment of investment projects in Research and Development (R&D) at a society level.

Ana Fernández Fernández,^{1,2*} Jorge Cunha² and Enrique Ares Gómez¹

¹ University of Vigo, Spain

² Department of Production and Systems, University of Minho, Portugal

* Corresponding author: ana.fdez.f@gmail.com, University of Vigo, Spain

KEYWORDS

R&D investment, social benefit, survey analysis

ABSTRACT

Nowadays, organisations increasingly need to adapt to the fast evolution of markets and societies in our globalised world in order to be competitive. Therefore, it is essential to take the right decisions when it comes to invest in R&D&i projects.

The present research focuses not only on the analysis of how R&D&i projects are assessed and selected but also on new proposals to improve them, with the aim of obtaining a suitable methodology which contributes to improve the competitive advantage and to integrate criteria of social nature both in organisations and in the Public Administration. The methodology which has been used in this research includes both interviews and analysis of the data obtained through them.

INTRODUCTION

As all R&D activities begin with an idea, the most important decisions all companies have to make are those related to financing and developing new ideas and projects as well as those linked to determining whether existing projects should be set aside or continued (Henig and Katz, 1996).

Investment in R&D is an essential element if we are to increase competitiveness, especially in the case of technology-based companies (Bitman and Sharif, 2008). But when funds are limited and there are several alternative projects, it is necessary to define a methodology that enables us to balance the different aspects that must be taken into consideration in the decision-making process. In other words, the choice of investment projects is an important strategic decision for all businesses. Several studies have revealed that the use of traditional financial techniques for project-assessment purposes is not the most suitable one when it comes to analysing investment in R&D (Chan et al.,

2001). The use of these techniques consists, essentially, of the estimate of the investment's cash flows and of the application of methods to assess their viability (e.g. NPV and IRR). This procedure involves that the costs and benefits associated with investment are easily and objectively quantified and this cannot always be achieved. Particularly, in the case of R&D projects, three different types of benefits can be distinguished: strategic, measurable and intangible. For instance, if we take the example of intangible benefits, it should be noted that they are difficult to quantify but may nevertheless have a significant impact on ROI (Adler, 2000).

As emphasized by Henig and Katz (1996), the NPV of a project in basic research is virtually impossible to calculate. Companies are looking for new technologies, yet to be developed, where it is impossible to extrapolate probabilities from past experiences. Companies must make all their assessments while minimizing any information leaks to their competitors. On the other hand, there is a noticeable need for companies to include in their decision-making process specific criteria of non-financial nature (e.g. strategy, flexibility, quality, social returns). In fact, these non-financial aspects are particularly important in the new industrial environment in which firms operate, where new technological developments tend to occur more rapidly than the evolution of project-evaluation techniques (Brownell and Merchant, 1990).

In recent decades, increasing competition, reduced life cycles and globalisation of markets have highlighted the interest of measuring the importance of research and development (R&D). This issue has indeed become a major concern for R&D managers (Chiesa et al., 2009). The different contributions from the study of the technological and evolutionary aspects of the economy question the need to incorporate social criteria in the field of scientific research and engineering. These contributions allow us to establish a new concept of technological change based on the co-evolution of technology and society (Rip and Kemp, 1998).

The empirical study focused on how R&D investment projects are evaluated in the wood and furniture sector.

The methodology which has been used in this research includes both interviews and analysis of the data obtained through them.

Through this survey, attention has been given to different points of view on the chosen topic. In order to achieve this, not only companies of the above-mentioned sector, but also technology centres, the University of Vigo and trade unions, as well as an agent of programs of R&D, were interviewed, with the aim of providing a wider view of the selected subject.

LITERATURE REVIEW

In this section, a number of studies on the importance of investing in R&D and the selection and evaluation of projects were reviewed, emphasising the role of non-financial criteria in the evaluation process.

Investment in R&D is an essential element for increasing competitiveness, especially in technology-based companies (Bitman and Sharif, 2008). These authors stressed the importance of not only adopting a financial perspective but also a qualitative perspective with an appropriate model.

In other words, it is necessary to find a suitable methodology which takes into account a range of different criteria that are to be considered when selecting which projects should be developed (Henig and Katz, 1996).

The process of making the right decisions when it comes to investment should be properly modelled (Zopounidis and Doumpos, 2002). According to these authors, it is advisable to adopt multi-criteria methods which take into account a range of quantitative and qualitative factors when assessing projects. Several studies have shown that the use of traditional financial techniques in project evaluation was not the most suitable for the analysis of investment in R&D (Chan et al., 2001). Therefore, it is necessary to include various approaches (strategic, analytical and financial).

This is important for our study because it is intended to include the social focus. Chiesa et al. (2009) examine the problematic task of assessing R&D results. In particular, these authors explore the iteration between measurement objectives, dimensions of performance and contextual factors in the design of a performance measurement system for R&D.

In conclusion, it is essential to invest in R&D and to make a proper assessment of projects based on multiple criteria, due to the competitive environment in which companies coexist. Therefore, the inclusion of social criteria for evaluation of R&D investment projects is highlighted in this study. Afterwards, we will present some theories that deal with this issue.

Social approach

The different contributions from the study of technology are concerned with the need to incorporate social criteria in the field of scientific research and engineering. These contributions allow us to establish a new concept of technological change based on the co-evolution of technology and society (Rip and Kemp, 1998).

The concept of social responsibility arises in the twentieth century. Although the term comes from the 50s-60s in the U.S., it failed to develop in Europe until the 90s, when the European Commission used this concept to involve employers in an employment strategy that would generate greater social cohesion. In the European society there were increasing problems related to long-term unemployment and the resultant social exclusion.

Over time social responsibility is gaining importance and companies are trying to find a proper balance between economic profitability and social responsibility.

In order to find out what the major policies, strategies and practices that are being developed regarding corporate social responsibility (CSR) and how to evaluate them, Galician companies created the Permanent Observatory for CSR in 2010.

The growing interest in CSR has led to the establishment of new awards and recognitions, the proposed measurement indicators, the study of the perceptions of different stakeholders (managers, shareholders, employees, customers, etc.) or the inclusion of social and environmental criteria in awarding public contracts, which means that CSR is not a fad, but a new way of understanding the role of business in our society while obtaining financial, social and environmental benefits and improving the competitiveness of the company.

These criteria include social impact on R&D management. This impact begins to be seen as a potential source of profit, as it increases the degree of consumer confidence and reduces the likelihood of conflicts among the different groups affected (Carroll and Buchholtz, 2009).

In some R&D programmes designed to fund research we can find references to social aspects, for instance in Framework Programme n° 7.

From a standpoint that gives priority to social criteria rather than to economic effects, it is necessary to carry out a sector analysis and the identification of measures and actions which may enable us to determine whether social return on investment in R&D (RESIPIDI) exists. According to Ares et al. (2008), such factors can be considered to be either positive or negative effects of public investment in R&D.

Governments are trying to take more into account social progress. For instance, integration of women and disabled people in the workplace is becoming an important issue in our days. This should be taken into consideration by companies when assessing R&D projects.

The concept of social impact can be broadly defined as a combination of multiple environmental, socioeconomic and scientific factors which are often left out of traditional mechanisms for evaluating R&D (Moñux, et al, 2006).

It is necessary to analyse, discuss and synthesise to solve social problems, just in the same way as medical examinations are performed to measure health indicators and to make sure that our organs and senses work properly.

Before investing in R&D projects, companies should decide how to finance them. Funds can be both private and public. Some relevant aspects of public finance will be discussed here.

We have focused on the Galician Plan R&D& i INCITE. The main objective of this plan is to develop the research and innovative Galician potential in order to achieve positive results in social welfare and economy. To this end, the Plan should look up to the future and be based on social trends to anticipate any potential social changes that might occur. Figure 1 illustrates that the Galician innovative system consists of four agents:

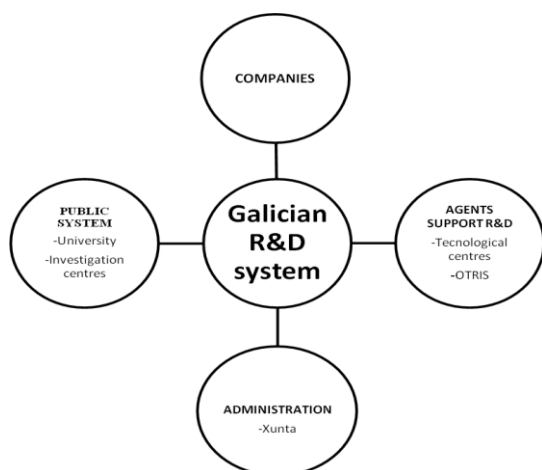


Figure1: Galician R&D system

RESEARCH METHODOLOGY

In this section the research methodology adopted in this study is described. Such methodology was based on interviews.

We defend the methodological complementarity by means of an appropriate adjustment of the different existing approaches in order to achieve a better research in which the objectives of the research themselves will be essential when deciding which method to use. Its contribution to this project is a special role assigned to qualitative research techniques. This role is applied to a large number of questions in such a way that the opinions of those interviewed are those which are the first to be considered and then lead to further reflection (Olaz 2008, 2007). On the other hand, one of the sections deals with quantitative techniques by means of

an interview, which is an essential element when selecting those common criteria which are considered relevant by respondents. That is why the methodology we have adopted is of mixed nature and is focused on the case study.

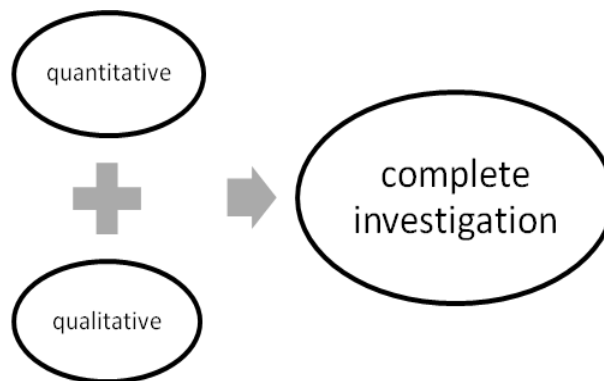


Figure 2: Methodology

Our methodology includes the selection of a few interviews which consist of both open-ended questions and closed questions.

In order to carry out this research project we chose to conduct two-part interviews: on the first hand, we can find essential questions whose aim is to deepen on the subject and which are of great interest to the interviewer, who can add more questions during the interview if appropriate. On the other hand, we have used a standard questionnaire which enables us to compare the answers provided by different respondents and to quantify the results we have obtained. We have opted for this kind of interviews because we find it is the most flexible means in terms of data and that with a highest response rate, as the interviewee agrees more and more to be controlled by the interviewer, despite the fact that it is obviously a laborious methodology which demands much time.

We have opted for individual interviews in most cases. Interviewees were always representatives of the companies or institutions most involved with R&D funding. In one case there was a group interview in which several people were involved in the organization. The first questions were closed, as we had designed them to provide the interview with a context. Nevertheless, some room for open questions was always given to interviewees so that they could express their opinions freely, what enabled us to compile extra information and views which were extremely useful for our research.

After completing the interviews, there was a stage of information processing and speech coding. Recorded conversations were transcribed to paper, a laborious but very interesting task which would permit us to analyse the information clearly and to focus on interpreting data.

We will now proceed to explain the three-part structure of the interview we used in our study. The heading

explains that the purpose of the interview is to conduct a study on the evaluation of R&D in Galicia, even though we had previously explained this to the interviewees in previous encounters. It states the duration of the interview (30 minutes) and also that the information provided will be only used for research purposes. The first part of the interview consists in collecting general data of the company in question.

- Name of the company or institution;
- Market sector, field of activity;
- Contact person and his/her position in the company;
- Year in which the company was founded;
- Turnover;
- Number of employees;
- Position in the value chain: extractive, manufacturer, wholesaler, retailer, services;
- Attributes: exporter, high performance, certified quality, audited, other.

The second part is directly related to R&D projects evaluation. Questions 1-9 deal with R&D performed by the company to learn about its situation with regard to R&D+ i: number of years they have been developing projects, collaborators, employees involved, budget, previous projects, objectives, indicators and source of funding.

Questions 10-18 are more focused on public funding, R&D plans and project-monitoring. These questions enable us to find out the views companies have concerning their current plans on project assessment, by emphasizing social issues.

Finally, the third section of the interview consists of an optional questionnaire aimed at quantitatively assessing the current indicators drawn from the latest calls for R&D proposals for grants by the Galician Government (Xunta de Galicia) and the Spanish Ministry. We decided to combine technological, social and economic standards because of their current rating and also in order to avoid monotony, but the main aim is to find out the main social criteria which are taken into account by companies when it comes to R&D projects. This questionnaire has been divided into two parts. In both cases a subjective numerical scale or Likert scale (1-5 points) has been used as appropriate to help us reach the two objectives pursued by this research.

- In the first section, we have tried to find out the assessment of current project evaluation made by those respondents who were familiar with or heavily involved in R&D funding and therefore knew the current criteria used for evaluation. In other words, our aim is to draw conclusions on whether R&D project assessment is being carried out in a satisfactory manner concerning the most recent calls which attracted the interest of the companies whose representatives collaborated with us. In the case of the companies we interviewed, most of them resort to private funding so they decided to ignore this part of the interview due to their poor knowledge of the applicable criteria.
- As for the second section, it has been designed to find out the score that the respondent would give to the different criteria to be applied when assessing R & D. This data enables us to draw conclusions regarding the criteria which are considered to be the most important parameters from all the points of view we have studied: business, research institutes, universities and unions. All respondents were in the position to complete this section of the interview as, although companies currently receive no public funding, they might wish to resort to it in the future. Therefore, all opinions were considered to be valid.

In order to select these indicators of the interview, we proceeded as follows:

- Read the latest announcements from Xunta de Galicia's programme SUMA (INCITE) - since they are the most attractive ones for many companies - so as to choose those criteria currently valued;
- Read the latest announcements from the National Plan in order to choose those criteria which are currently being evaluated;
- Review of the criteria used by RESIPIDI (Ares et al 2008);
- Review of the criteria suggested by previous studies (Alvarez, 2009; and Carvalho 2009);
- Review of the bibliography discussed in the study.

In all cases we selected the criteria which, in our opinion, would be more suitable for our study. It follows that in the sector programmes of the Xunta's INCITE Programme, social criteria are not given much importance since the current figure is lower than 5% at a regional level and only the presence of women is considered to be a social criterion.

RESULTS

As we are dealing with R&D project assessment, we first visited AENOR (the Spanish Association for Standardization and Certification) website in order to look for certified companies in R&D Management, since they would be more likely to know the subject of research and could possibly collaborate with us. As a consequence, a company of the wood sector –and, more specifically, devoted to furniture manufacturing– was selected for our research. Moreover, we contacted the Wood Technology Centre (CIS-Madera) which is located in Ourense (Galicia). At first, the idea was to study the points of view of a company and a technology centre.

After the interviews, we processed both the data and the conclusions drawn. As the information was too scarce to draw conclusions, we decided to try to contact other companies of the same sector as well as more technology centres. Moreover, we had the opportunity of interviewing a person who was linked to R&D funding at the University of Vigo, which was extremely interesting.

Since trade unions are organizations formed by workers for the defence and promotion of their social, economic and professional interests, we found it would be suitable to contact the major trade unions in Galicia for a possible collaboration.

Thus, this research enables us to compare five different views on the subject: business, technology centres, university, unions and project managers themselves. This will allow us to reach a wider perspective of the subject than our initial proposal. In total, our collaborators were three companies of the furniture sector, two technology centres, OTRI (University of Vigo), three trade unions and INCITE (the program manager of the Xunta de Galicia).

Before conducting the interviews, information was gathered with regard to R&D in the chosen sector. Afterwards, we will discuss the highlights of all the interviews we conducted by dividing the different opinions into groups.

With regard to companies, this survey has proved that there are different criteria for project selection, although not many of them are socially-based. Instead, companies are becoming more and more aware of environmental issues. On the other hand, we have found out that some firms seem to be more interested in having into consideration social issues when it comes to assessing projects. Therefore the present research has been useful for creating social conscience.

Prime factors like the search for products and services aimed at covering unsatisfied needs, staff development, contribution to environmental improvement, employment of women on R&D, social responsibility and the creation and maintenance of employment are some of the most valued criteria to measure the social impact.

Technology centres are those that prove to be less keen on the inclusion of social criteria when assessing projects. They rather seem to be more interested in having into account scientific and economical criteria such as the multiplier effect of investment, which will indirectly imply other social criteria like employment.

Regarding the University, it criticises the fact that well-established projects are not assessed by the administration, an opinion which is shared by the manager of the programme INCITE, who collaborated with us on this research. This might be helpful to assess both the current R&D plan and its benefits and also to verify if appropriate procedures are being carried out when it comes to financing. Attention should also be given to the difficulty experienced by some associations which develop R&D projects (e.g. associations of disabled people) when trying to obtain public financing. Trade unions have mainly contributed by sharing with us their view on the current Galician R&D plan and its need for change, going for public financing in order to enable R&D to work by taking into consideration social criteria.

The most valued criteria to measure the social impact by trade unions are contribution to solving social problems (unemployment) and the creation and maintenance of employment.

CONCLUSIONS AND FURTHER RESEARCH

From this empirical study, it can be concluded that even if the interest in the scientific level is remarkable (it should be noted that we are referring to R&D projects) social repercussion criteria are also taken into account. Prime factors like the creation and maintenance of employment and the search for products and services aimed at covering unsatisfied needs are some of the most valued criteria to measure the social impact.

We think that it is advisable to continue through several stages, such as carrying out the appropriate tasks which will enable the public administration to incorporate social criteria, when assessing applications for R&D grants, so as to represent about 20% of all the criteria to be taken into account. This would mean an increase of 15%, since the current figure is lower than 5% at a regional level and only the presence of women is considered to be a social criterion.

Should public administration take into account social criteria in its announcements of grants, companies and institutions would also begin to consider those when selecting the projects in which they wish to invest.

In short, social benefits would be strengthened by adopting such measures.

REFERENCES

- Adler, R., (2000) "Strategic Investment Decision Appraisal Techniques: The Old and the New", *Business Horizons*, 2000, pp.15-22.
- Álvarez Gómez, M. Soledad (2009) "Análise e avaliação de programas de Investigação e Desenvolvimento (I&D)", Dissertação de Mestrado Integrado em Engenharia e Gestão Industrial, Universidade do Minho
- Ares Gómez, Enrique; Dominguez, A. P.; Quintela, Ares. E.; Fernández López, F. J.; Doiro Sancho, M; (2008) "*Análisis del "Retorno Social" de la financiación pública de la I+D+i*"; Observatório Industrial del Sector del Metal; elaborado pela Área de Ingeniería de los Processos de Fabricación da Universidade de Vigo.
- Bitman, W.R.; Sharif, N. (2008) "A Conceptual Framework for Ranking R&D Projects", *IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT*, VOL. 55, NO. 2, pp 267-278.
- Brownell, P. and K. A. Merchant, (1990) "The Budgetary and Performance Influences of Product Standardization and Manufacturing Process Automation." *Journal of Accounting Research*, Autumn, pp., 388-397.
- Carroll, A. B. and Buchholtz, A. (2009) *Business and Society. Ethics and Stakeholder Management*, South-Western Publishing.
- Carvalho, M (2009) "Análise do retorno económico-social do investimento público em Investigação e Desenvolvimento (I&D): aplicação na área da Energia / Ambiente", Dissertação de Mestrado em Engenharia Industrial, Universidade do Minho.
- Chiesa, V; Frattini, F; Lazzarotti, V e Manzini, V (2009) "Performance measurement in R&D: exploring the interplay between measurement objectives, dimensions of performance and contextual factors" *R&D Management*, Vol. 39, nº 5, pp. 487-519.
- Chan, F.; M. Chan; H. Lau; R. Ip, (2001) "Investment Appraisal Techniques for Advanced Manufacturing Technology (AMT): A Literature Overview", *Integrated Manufacturing Systems*, pp.35-47.
- Henig, M.; H. Katz, (1996). "R&D Project Selection: A Decision Process Approach". *Journal of Multicriteria Decision Analysis* 5: 169-177.
- Moñux, Alexandre, Gomez, Cáceres, Miguel, Velasco, (2006) *Evaluación del impacto social de proyectos de Investigación y Desarrollo tecnológico (I+D): Una aplicación en el sector de las comunicaciones industriales*
- Olaz, A. (2007) *La entrevista en profundidad: en la encrucijada del debate metodológico de lo cuantitativo frente a lo cualitativo*. IX Congreso español de sociología: Poder, cultura y civilización. Sesión 2ª. Articulación Metodológica. Teoría y práctica. Barcelona
- Olaz, A. (2008) *La Entrevista en profundidad: (justificación metodológica y guía de actuación práctica)*. Publicación Oviedo: Septem, 2008
- Rip, A. and Kemp, R. (1998) "Technological Change". In: Rayner, S. and Malone, L. *Human Choice and Climate Change. Volume II. Resources and Technology*, Batelle Press, Washington D.C.
- Zopounidis, C.; Doumpos, M. (2002) "Multi-criteria Decision Aid in Financial Decision Making: Methodologies and Literature Review". *Journal of Multi-Criteria Decision Analysis*, Vol. 11, p. 167-186.