

# Investment Projects: Evaluation Tools and Methods

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## Abstract

Given the need to study different areas of analysis during the investment decision process, it is imperative to know which tools and methods are used by companies to assess various financial and non-financial aspects. As regards tools, we find that firms use checklists of analysis for non-financial aspects, whereas they use their past experience in risk assessment, gathered from other projects. Records of past evaluation tend to be maintained in companies and those that use external advisors to evaluate projects tend to perform political analysis. As for the methods, companies use the identification of risk factors and assessment of effects and risk probabilities, the discussion and assessment of favorable and unfavorable factors to the project's execution, a coordinated analysis of financial and non-financial aspects, and the creation of lists of risk indices, attributing a qualitative weight to each item. We have also analyzed the relationship between these tools and methods and each area of analysis in project evaluation.

**Keywords:** Real Investment Projects; Evaluation Tools and Methods; Non-Financial Analysis.

## 1 Introduction

Financial theory has analyzed investment projects based on cash flows and has used NPV, IRR and Payback. In this case, investment decision making is relatively simple since only financial criteria are taken into account (Lopes and Flavell, 1998). Moutinho and Lopes (2011) show the importance of the analysis of various non-financial aspects and how some of those aspects have a greater relevance than that attributed to financial elements. As the most relevant elements, they find the strategic and technical aspects, followed by the analysis of financial and commercial aspects. The least relevant in firms' project appraisal are the social and political areas. In these analyses, there are many aspects that are not easily measured.

As non financial analysis can provide additional information to the decision making, it is important to take into account all financial and non financial areas: strategic, technical, commercial, political, social, environmental, organizational, human resource and management (Skitmore, et. al., 1989; Adler, 2000; Chen, 1995; Meredith and Mantel, 2000; Love et. al., 2002; Kendra and Taplin, 2004; Moutinho and Lopes, 2011). The incorporation of these areas of analysis can pose new problems to project appraisal. However, Moutinho (2011) presents the main tools and methods used in the analysis of all financial and non financial areas together in a project evaluation. As main tools for the evaluation of non financial aspects, he finds that companies choose the incorporation of people from several backgrounds, the free-format qualitative evaluation, the experience of evaluators/decision-makers in other projects, and the use of external advisors. About the methods used he finds that companies prefer the discussion and assessment of favourable and unfavourable factors to the project's execution, followed by the coordinated analysis of financial and non-financial aspects, the identification of risk factors, and the assessment of effects and risk probabilities. So, we propose to analyze which tools and methods companies can use to incorporate each area of analysis into their decision-making process.

This paper is organized as follows. In the next section, we present our hypotheses and the research methodology used. Then we present and discuss the results. Finally, we present our conclusions.

## 2 Research Hypotheses and Methodology

Lopes and Flavell (1998) show the most important tools for the incorporation of non-financial aspects in project evaluation: decision-makers' experience in other projects, maintaining records of past evaluations to verify the credibility of management opinion; creating a record of its own past experience and generating

checklists of analysis of all aspects; incorporating people from several backgrounds; using external advisors in project appraisal; use of a free-format qualitative evaluation; definition of alternative strategies, and; considering all risks. In addition, Nardini (1997) suggests that for non financial aspects companies can use a multi-criteria analysis of the projects. In project analysis several tools of financial evaluation are known. However, it should be addressed how the assessment is made when the projects take into account non-financial aspects. As such the following hypothesis is studied:

Hypothesis 1: The tool used to evaluate non-financial elements is associated with each dimension of evaluation.

In respect to the methods used to quantify non-financial aspects in project evaluation, Lopes and Flavell (1998) consider that these methods are dependent on personal opinions and perspectives and there should be a combination between personal analysis and personal opinion. It is necessary to employ common sense to assess and identify risk factors, assess their effects and probabilities. The decisions are justified through discussion of arguments of all aspects analysed in inter-connection. Companies can create lists of risk indices, attributing a qualitative weight to each item. The success of these processes depends on the personal experience, the feedback of past projects, the systematic and detailed analysis of expert support, and the inclusion of people from several backgrounds and its connection to decision making. Companies can also create checklists as risk warnings to decision-makers. Then, the methods used to quantify non-financial aspects can be tested by the hypothesis below:

Hypothesis 2: The method used to incorporate and quantify non-financial aspects is related to each dimension of evaluation.

### 3 Tools and Methods

This research has used the same questionnaire of Moutinho and Lopes (2011) and Moutinho (2011). There were 96 responses to the questionnaire addressed to the 1000 largest Portuguese companies (in terms of sales) in 2005, representing a response rate of 9,6%.

Regarding the first hypothesis mentioned in Section 2, Table 1 identifies the methods for evaluating non-financial aspects, used in each dimension of analysis. Companies tend to adopt checklists of analysis of non-financial aspects when considering the social and the project manager aspects in the project evaluation. The appraisal based on past experience in risk assessment, gathered by several companies tends to be used by companies engaged in environmental analysis and by those who do not consider the human resources area. Maintaining records of past evaluation tends to be used in companies engaged in political analysis. The experience of evaluators/decision-makers in other projects tends to be used by companies engaged in technical analysis and by those who consider the social analysis in project evaluation. Companies that use external advisors to evaluate projects tend to perform political analysis. Considering management's errors of judgment in risk assessment tends not to be used by companies that analyze strategic aspects.

Table 1 shows the results of multivariate analysis, by logit, between the probability of performing each form of assessment of financial and non-financial analyses and the performance of each dimensions of evaluation. Panel A analyses the free-format qualitative evaluation. Panel B analyses the checklists of analysis of non-financial aspects. Panel C analyses past experience in risk assessment, gathered from other projects. Panel D analyses the maintaining records of past evaluations. Panel E analyses the experience of evaluators/decision-makers in other projects. Panel F analyses the use of external factors. Panel G analyses the incorporation of people from several backgrounds. Panel H analyses the consideration of management's errors of judgment in non-financial evaluation. Panel I analyses the consideration of management's errors of judgment in risk assessment. Each column shows the regression for each form of assessment. In addition to the coefficient of the variable, in brackets is the standard deviation associated with it. \*\*\*, \*\* and \* show the existence of statistical significance at 1

Next, with respect to hypothesis 2 defined in Section 2, we study the methods used to incorporate and quantify non-financial aspects. These results are presented in Table 2. Companies that use the identification of risk factors and assess effects and risk probabilities are carrying out financial, social and project manager analyses. The discussion and assessment of favorable and unfavorable factors to the project's execution is used in companies engaged in human resources analysis and those that do not perform organizational analysis. A coordinated analysis of financial and non-financial aspects tends to be chosen by companies engaged in the analysis of organizational aspects. Requesting opinions from each area is common in companies engaged in human resources analysis. The creation of lists of risk indices, attributing a qualitative weight to each item tends not to be used in companies engaged in organizational analysis and those that do not consider the strategic dimension in the evaluation of projects. Dividing

Table 1: Evaluation tools by area of analysis

<i>Analyses</i>	<i>Panel A</i>	<i>Panel B</i>	<i>Panel C</i>	<i>Panel D</i>	<i>Panel E</i>	<i>Panel F</i>	<i>Panel G</i>	<i>Panel H</i>	<i>Panel I</i>
C	-0.99 (-0.72)	-5.92 (-3.32)	-0.86 (-0.55)	-2.12 (-1.20)	-5.43 (-2.84)	0.27 (0.19)	-0.52 (-0.38)	-0.82 (-0.54)	-0.75 (-0.54)
Financial	-0.58 (-0.84)		0.16 (0.18)	-0.29 (-0.29)	1.29 (1.02)	-0.54 (-0.69)	0.87 (1.10)	-0.04 (-0.03)	-0.32 (-0.35)
Strategic	1.15 (0.91)		-1.36 (-0.99)	-0.97 (-0.73)		-1.61 (-1.40)	-0.87 (-0.74)	-2.51 * (-1.75)	-2.08 (-1.55)
Technical	0.22 (0.35)	1.86 (1.34)	0.86 (1.02)	0.77 (0.66)	1.87 * (1.95)	0.23 (0.28)	-0.69 (-1.01)	0.01 (0.01)	-0.05 (-0.04)
Commercial	0.25 (0.42)	1.26 (1.44)	0.34 (0.43)	-0.21 (-0.25)	0.73 (0.77)	-0.56 (-0.82)	0.78 (1.18)		
Political	-0.64 (-1.07)	-0.56 (-0.79)	-0.47 (-0.68)	1.52 ** (1.99)	0.06 (0.09)	1.43 ** (2.21)	-0.20 (-0.32)	-0.67 (-0.82)	-0.49 (-0.57)
Social	-0.11 (-0.19)	1.52 ** (2.06)	-0.18 (-0.25)	-0.09 (-0.14)	1.04 * (1.65)	0.50 (0.81)	0.72 (1.21)	0.09 (0.09)	-0.03 (-0.03)
Environmental	0.04 (0.07)	0.42 (0.71)	1.16 *** (1.78)	0.75 (0.95)	0.56 (0.88)	0.18 (0.30)	-0.43 (-0.74)	1.16 (1.08)	0.96 (0.83)
Organizational	0.02 (0.04)	1.08 (1.38)	0.28 (0.37)	-0.40 (-0.49)	0.66 (0.87)	0.04 (0.05)	0.69 (1.07)	1.08 (1.07)	
Hyman Resources	0.25 (0.36)	0.26 (0.30)	-1.72 (-2.01) **	0.40 (0.42)	0.48 (0.53)	-0.04 (-0.05)	0.51 (0.68)	-1.63 (-1.52)	-0.92 (-0.85)
Project Manager	-0.58 (-1.2)	1.11 * (1.94)	0.55 (0.96)	0.07 (0.11)	-0.45 (-0.65)	0.55 (0.99)	-0.82 (-1.56)	-0.52 (-0.55)	-0.30 (-0.32)
McFadden R2	0.04	0.28	0.12	0.13	0.22	0.14	0.10	0.13	0.12
LR statistic	5.21	33.00	12.75	13.14	28.29	17.86	13.04	4.37	3.87
Prob. (LR stat)	0.88	0.00	0.24	0.22	0.00	0.06	0.22	0.89	0.87

factors into levels of importance for subsequent evaluation is little used by companies that conduct environmental analysis in project evaluation.

In Table 2, Panel A analyses the identification of risk factors, assessment of effects and risk probabilities. Panel B analyses the discussion and assessment of favorable and unfavorable factors to the project's execution. Panel C analyses the coordinated analysis of financial and non-financial aspects. Panel D analyses the request of opinions from each area and verification of consistency with the company's strategy. Panel E analyses the creation of lists of risk indices, attributing a qualitative weight to each item. Panel F analyses the attribution of positive and negative considerations to each factor in the qualitative analysis. Panel G analyses the separation of factors into levels of importance for subsequent evaluation. Each column shows the regression for each method. In addition to the coefficient of the variable, in brackets is the standard deviation associated with it. \*\*\*, \*\* and \* show the existence of statistical significance at 1

Table 2: Evaluation methods by area of analysis

<i>Analyses</i>	<i>Panel A</i>	<i>Panel B</i>	<i>Panel C</i>	<i>Panel D</i>	<i>Panel E</i>	<i>Panel F</i>	<i>Panel G</i>
C	-2.058 (-1.202)	-2.049 (-1.293)	-3.000 (-1.981)	-0.342 (-0.248)	-2.225 (-1.033)	-1.895 (-1.094)	-2.185 (-3.447)
Financial	1.903 ** (2.066)	1.045 (1.175)	1.253 (1.474)	0.153 (0.198)			
Strategic	-0.253 (-0.182)	2.244 (1.576)	0.415 (0.327)	-0.343 (-0.286)	-3.360 *** (-3.794)	-0.769 (-0.553)	
Technical	-0.927 (-1.260)	0.697 (0.922)	0.655 (0.912)	-1.102 (-1.613)	-1.413 (-1.367)	0.154 (0.161)	
Commercial	0.321 (0.453)	-0.652 (-0.775)	-0.443 (-0.627)	0.134 (0.201)			
Political	-0.039 (-0.055)	-0.138 (-0.171)	0.556 (0.864)	-0.424 (-0.643)		-0.496 (-0.534)	-0.928 (-0.964)
Social	1.873 *** (2.675)	0.869 (1.031)	-0.006 (-0.009)	0.137 (0.226)		-0.105 (-0.127)	1.398 (1.376)
Environmental	-0.154 (-0.235)	-0.311 (-0.463)	0.051 (0.088)	-0.067 (-0.116)	1.168 (0.990)	0.012 (0.012)	-2.267 *** (-2.665)
Organizational	-0.838 (-1.054)	-2.582 ** (-1.984)	1.623 ** (2.424)	-0.182 (-0.282)	2.276 *** (2.692)	0.763 (0.829)	
Hyman Resources	0.268 (0.317)	2.827 ** (2.118)	-0.081 (-0.111)	1.492 * (1.901)		0.692 (0.569)	
Project Manager	1.637 *** (2.797)	0.011 (0.018)	0.659 (1.211)	-0.136 (-0.259)	1.471 (1.681)	-0.250 (-0.428)	
McFadden R2	0.262796	0.209014	0.202143	0.075609	0.199910	0.049491	0.145387
LR statistic	34.23416	20.87265	26.12615	9.212466	8.921399	3.739057	5.679960
Prob. (LR stat)	0.000169	0.021999	0.003574	0.512066	0.112241	0.879866	0.128263

## 4 Conclusion

In the process of evaluating investment projects, because of the importance of combining the analysis of financial and non financial aspects, it becomes important to determine how to evaluate each aspect. In this article, we show which tools and methods are used by companies in the analysis of each individual assessment areas.

Companies use checklists of analysis of non-financial aspects, and use their past experience in risk assessment, gathered from other projects. Maintaining records of past evaluation tends to be used in companies and those that use external advisors to evaluate projects tend to perform political analysis. About the methods used, companies use the identification of risk factors and assessment of effects and risk probabilities, the discussion and assessment of favorable and unfavorable factors to the project's execution, a coordinated analysis of financial and non-financial aspects, and the creation of lists of risk indices, attributing a qualitative weight to each item.

The scope and the methodology adopted for data collection were the main problems encountered during the work. In fact, the lack of empirical work on the evaluation of non-financial aspects implies the construction of a survey, which may bring some complications, including interpretation of the universal questions. Another limitation of this study concerns the representativeness of the sample, since the findings only represent the reality of the practices of Portuguese companies if the answers for each project are representative of the universe of projects. In addition, the studies are based on questionnaires measuring beliefs or opinions and not necessarily actions or occurrences, since there is no way to verify if these match the company's actions.

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