

# Forms of use of non-financial measures: evidence from the manufacturing sector in Navarra (Spain)

*Formas de uso de los indicadores no-financieros: Evidencia empírica del sector manufacturero navarro*

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**ABSTRACT** Management accounting literature supports that the differential use of accounting based measures reflects different needs. However, literature on nonfinancial measures has practically focused on the importance/weight given to these measures in the firm performance measurement systems. We extend current knowledge by carrying this differential use of financial information over to nonfinancial information. Thus, in this paper, we argue that nonfinancial measures may also not be a monolithic category and, therefore, the phenomenon of an increase in their use could also be approached by posing the question of how nonfinancial information is used. From the analysis of thirty one cases of manufacturing firms we find that *i*) the perception of managers about the usefulness of nonfinancial information characteristics of relevance and reliability changes depending on the contextual scenarios the companies face, and *ii*) these perceptions result in the existence of two differential uses of nonfinancial measures.

**KEYWORDS** Nonfinancial performance measures; Qualities of the information; Performance measurement system; Perceived usefulness of nonfinancial information.

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**RESUMEN** La literatura en contabilidad de gestión reconoce que el distinto uso de indicadores financieros refleja necesidades diferentes. Sin embargo, la literatura sobre indicadores no financieros se ha centrado en el peso o relevancia de dichas medidas en el sistema de medida del *performance*. En este artículo argumentamos que los indicadores no financieros no constituyen una categoría uniforme y que, por tanto, su papel en los sistemas de medida del desempeño requiere ser estudiado desde una doble dimensión: cuántos indicadores y cómo se usan dichos indicadores no financieros. A través del análisis de 31 casos, concluimos que: *i*) la percepción de los *managers* sobre la importancia de las cualidades de relevancia y fiabilidad de la información no financiera dependen del contexto en el que la empresa opera, y *ii*) estas distintas percepciones se traducen en la existencia de dos formas de uso de los indicadores no financieros.

**PALABRAS CLAVE** Indicadores no financieros; Cualidades de la información; Sistemas de medida del desempeño.

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## 1. INTRODUCTION

The role of non-financial information in measuring performance has been one of the most widely studied issues in the last decade. In fact, the inclusion of non-financial measures has

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become an essential characteristic of current performance measurement systems (hereafter PMS), to the point of becoming the main criterion to distinguish traditional and non-traditional systems (Widener, 2004).

A great number of studies stress the advantage of non-financial measures over financial measures. These studies have sought the circumstances in which companies have increased the use of non-financial measures (contingency approach). As a result, the literature has focused on the importance of non-financial *vs.* financial information in firms' PMS composition in different scenarios. However, empirical evidence is mixed. There is neither unanimity on the contingent factors that prompt the use of non-financial measures, nor agreement on the effect of these contingency factors on the importance of said information (see Chenhall, 2003; Hartman, 2000; Otley & Fakiolas, 2000, and Vagneur & Peiperl, 2000, for a review and for the plausible explanations of these equivocal results).

In this paper, we propose to change the focus from «whether or not non-financial measures are used» to «how exactly these non-financial measures are used».

Some papers have pointed out the idea that non-financial measures are not uniform, but rather form multiple categories/sets, perceived as not equally useful. For instance, Ittner, Larcker & Randall (2003, 717) state «one approach to *Strategic Performance Measurement* is supplementing traditional financial measures with a diverse mix of non-financial measures that are expected to capture key strategic performance dimensions». Another example comes from Cavaluzzo & Ittner (2004, 247) where they stress the difficulties in assessing «metrics that capture desired actions and outcomes.» Reading between the lines, it could be inferred that different non-financial measures have different qualities. These studies still approach the issue of the importance of non-financial measures in the PMS by focusing on «whether or not» non-financial measures are included in PMSs, and their amount.

We integrate the idea of heterogeneity in non-financial information and we propose that contingency variables may affect the forms of use of non-financial measures while not necessarily affecting the intensity of their use. Managers' perceived usefulness of information qualities depends on the circumstances the company faces. Therefore, different contextual scenarios require non-financial measures with different predominant qualities. Going a step further, we propose a relationship between information qualities and use of non-financial information. We hypothesize that the managers' perceived usefulness of the qualities of non-financial measures depends on different circumstances, leading to different uses of non-financial information.

In light of the aforementioned, we address the following questions: What are the qualities of non-financial information managers perceive as useful? Does manager perception of the usefulness of non-financial information qualities change with contextual circumstances? Does this dissimilar perception on the usefulness of non-financial information qualities result in this information being used differently?

Our results show that, first, different contingent factors demand specific qualities of non-financial information, i.e., different contextual scenarios affect manager perception of how useful non-financial information is. Second, that the perceived usefulness of said characteristics does not explain the importance of non-financial measures included in the PMS. Third, we find evidence that the perceived usefulness of qualities indeed results in a signifi-

cantly different weight pattern among non-financial measures. We argue that this finding can be interpreted as different forms of use (or differential uses) of non-financial measures. Lastly, we identify specific features for those forms of use.

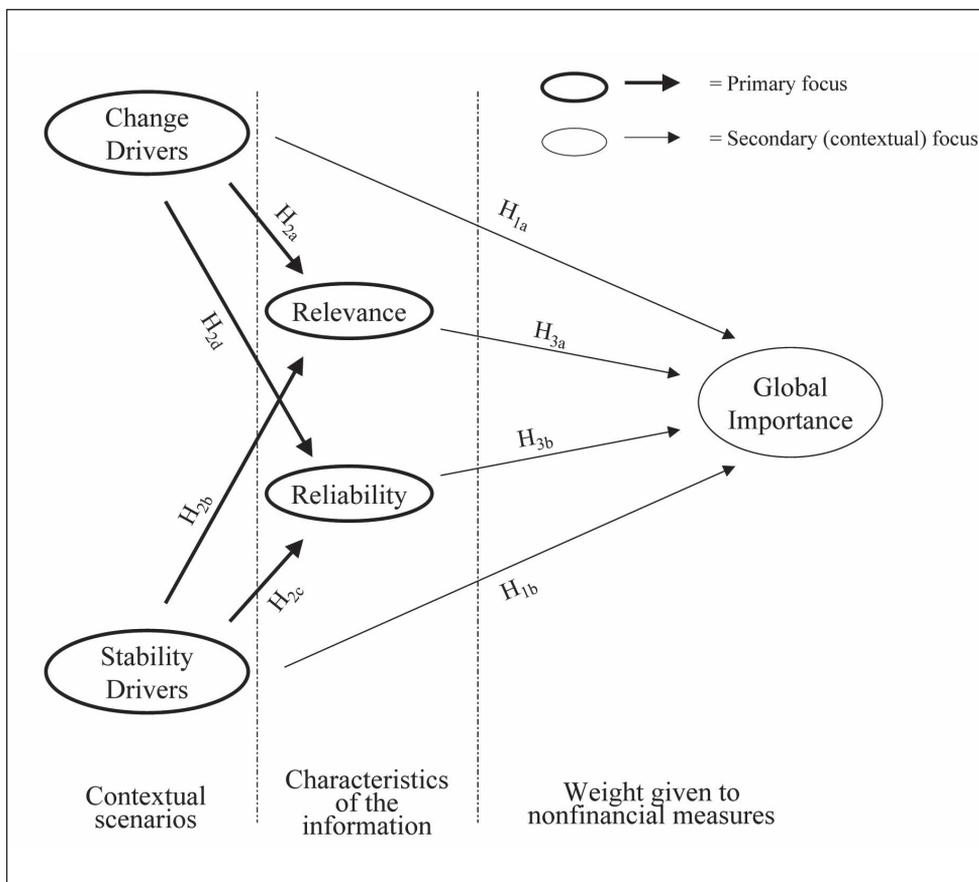
In the first section of the paper, we develop the theory and hypotheses as an extension of the work of Chenhall and Morris (1986) on the usefulness of financial information, but applied to non-financial measures. Then, we present the methodology and variable measurement to test the contingent model of the importance of non-financial measures. Discussion of the results leads to further analysis and conclusions follow.

## 2. THEORY AND HYPOTHESES

The present study starts by looking at the general scope of literature depicted in Figure 1. The model explores the relationship among three different sets of variables: 1. Contingent factors representing contextual circumstances (both external and internal to the firm); 2. The perceived usefulness of different characteristics of non-financial information, and 3. The global importance/weight given to non-financial measures in the firms' PMS.

FIGURE 1

THE MODEL: PLACEMENT OF THIS STUDY WITHIN THE GENERAL DOMAIN OF LITERATURE



Chenhall and Morris (1986) conducted a contingency study on the usefulness of management accounting information. They established a relationship between contextual variables and the perceived usefulness of four qualities of information: scope, timeliness, aggregation and integration. Specifically, they found that *i*) decentralization was associated with a preference for aggregated and integrated information, *ii*) perceived environmental uncertainty was associated with timely information and a broad scope, and finally *iii*) organizational interdependence was associated with a broad scope, and both aggregated and integrated information.

Carrying Chenhall and Morris's research over to the case of nonfinancial information requires that both qualities and contextual variables be identified.

With respect to qualities of information, the Financial Accounting Standard Committee (FASC, 2002) argues that non-financial performance measures should be judged against the same criteria as financial performance measures. To date, there are merely two different branches of literature on non-financial information qualities. On one hand, some authors have focused on the identification of specific characteristics not successfully achieved by traditional and new financial measures. (Fisher, 1992; Brancato, 1995) On the other hand, other authors have sought to document the increase in relevance from the use of non-financial information through *i*) establishing a direct link between non-financial measures and equity values (Amir & Lev, 1996; Ittner & Larcker, 1998a), and *ii*) demonstrating a link between current non-financial measures and future financial information (Ittner & Larcker, 1998b; Banker, Potter & Srinivasan, 2000; Luft & Shields, 2002). Nevertheless, the «informativeness» of non-financial measures (the ability of non-financial measures to predict financial performance) does not always result in the heightened use of those measures. (see for instances Ittner, Larker & Meyer, 2003) Therefore, a deeper understanding of the characteristics of non-financial measures and proxies is needed.

Specifically, this study focuses on the following two qualities of non-financial information: relevance and reliability. Then, we hypothesize that firms use non-financial measures because either *i*) They provide more relevant information, and/or; *ii*) They increase the reliability of firms' PMS. Relevance here (including characteristics such as scope and integration; see section 3) means the set of characteristics of information providing either a predictive value or a feedback value, or both. For reliability sake (including characteristics such as accuracy and comprehensiveness; see section 3) information must have representational faithfulness, and must be verifiable and neutral<sup>(1)</sup>.

As for the design of the right mix of financial and non-financial measures, a wide range of critical contingency variables has been identified. An increase in the weight of non-financial information is found to be directly or indirectly associated with variables such as *i*) organizational design (Dixon, Nanni & Vollmann, 1990; Banker, Potter and Schroeder, 1993); *ii*) an increased use of advanced manufacturing technology (Dixon *et al.*, 1990); *iii*) the adoption of modern management philosophies or practices (Abernethy & Lillis, 1995; Chenhall, 1997; Ittner & Larcker, 1995, 1997; Carr & Needham, 1997; Banker *et al.*, 1993; Perera, Harrison & Poole, 1997; Hoque & Alam, 1997); *iv*) the adoption of differentiation/explorative strategies (Kaplan, 1983; Miles & Snow, 1978; Govindarajan, 1988;

(1) Note that our interest lies in managers' perception on the usefulness of the explained characteristics of non-financial information. By relevance/reliability we mean the perceived usefulness of each characteristics.

Dent & Ezzamel, 1987; Chenhall & Langfield-Smith, 1998), and *v*) the increase of market uncertainty (Gordon, 1984; Govindarajan, 1984; Dixon *et al.*, 1990; Hirst, 1983). In addition, previous literature has also shown several interaction effects among these contingent factors (Chenhall, 1993, 1997; Baines & Langfield-Smith, 2003).

For purposes of this research, the contingent factors are combined in two contextual scenarios. The «change drivers» factor encompasses the set of previous variables (advanced manufacturing technology, market uncertainty, explorative strategies, etc.) that literature has considered as factors aiming to change the design of the PMS. The change is supposed to increase the global importance of non-financial measures (see section 3). Similarly, the «stability drivers» factor consists of the set of contextual circumstances (cost-based competence, high standardization levels, low uncertainty, etc.) that go along with traditional PMS, based principally on financial measures.

Once contingency factors, as well as qualities, have been identified, the following hypotheses will be formulated accordingly:

- $H_{1a}$ : There is a positive and significant association between a scenario characterized by the presence of change drivers and the global importance of non-financial measures.
- $H_{1b}$ : There is a negative and significant association between a scenario characterized by the presence of stability drivers and the global importance of non-financial measures.

Few arguments are found in the literature predicting the nature of the association between contextual scenarios and the characteristics of non-financial information. The most explicit references are Chenhall & Morris (1986, 32) and Chang, Chang and Paper (2003, 697). In these studies, the range of PMS scope (required under uncertainty scenarios) is proxied by the amount of non-financial information. They argue that heavier weight placed on non-financial measures widens the scope of the information system (Chenhall & Morris, 1986). Since scope is one of the characteristics included in the quality of relevance (see section 3), it can be hypothesized that:

- $H_{2a}$ : There is a positive, significant and direct association between a scenario characterized by the presence of change drivers and the perceived usefulness of relevance.
- $H_{2b}$ : There is no significant direct association between a scenario characterized by the presence of stability drivers and the perceived usefulness of relevance.

Besides relevance, there are other arguments in the literature that justify the use of non-financial measures. For instance, non-financial indicators are direct measures, not submitted to the cost allocation process. This process, in the new world of increasing overhead costs, reduces the reliability of accounting data. Accounting numbers are very sensitive to changes in allocation rules and can be manipulated, so their reliability has decreased (Kaplan and Norton, 1992; McKinnon and Bruns, 1992).

Additionally, while non-financial measures give information on each relevant variable of the process, accounting indicators provide information that is too aggregate. It then becomes inappropriate for tracking both the causes of the problems as well as sources of improvements. Cost variances are more like «passengers» and not «drivers». Therefore, in most cases the causes for deviations and corrective actions are not immediately revealed (Dixon *et al.*, 1990; Singleton-Green, 1993). Moreover, managers frequently prefer non-financial measures to accounting ones in order to avoid mistaken interpretations (Dixon

*et al.*, 1990; McKinnon & Bruns, 1992) and to impel the decision making process (Perea *et al.*, 1997).

All these above arguments refer to reliability in its different aspects (accuracy, traceability, clarity, comprehensiveness and instructiveness see Section 3). While there is no clear guide in previous literature to anticipate the sign of the association, we expect the following:

- $H_{2c}$ : There is a positive, significant and direct association between a scenario characterized by the presence of stability drivers and the perceived usefulness of reliability.
- $H_{2d}$ : There is no significant direct association between a scenario characterized by the presence of change drivers and the perceived usefulness of reliability.

Finally, as a higher positive characteristic is always preferable, we expect a positive relationship between the perception on usefulness and the importance of nonfinancial information in the PMS. In addition, we are interested in knowing whether the effects of the two characteristics are significantly different. Therefore, it is hypothesized that:

- $H_{3a}$ : The higher the perceived usefulness of the relevance of non-financial information, the higher the global importance of this information on the PMS.
- $H_{3b}$ : The higher the perceived usefulness of the reliability of non-financial information, the higher the global importance of this information on the PMS.

### 3. SAMPLE AND DATA COLLECTION

Information was obtained from a population of medium-to-large manufacturing firms in Navarra. The firms were selected using a directory published by the European Center for Business and Innovation in the region of Navarra<sup>(2)</sup>. The selection criterion was firm size—medium to large—measured by annual turnover (greater than €40 million). Small companies were excluded because, due to their specific characteristics, their control systems are not comparable with those of medium-to-large companies (Dávila & Foster, 2007).

The method used to collect data was both a questionnaire and a semi-structured-interview. With respect to the questionnaire, a preliminary version was reviewed by a manufacturing company manager, a consulting company senior manager and an academic<sup>(3)</sup>. All firms meeting the size criterion were first contacted by telephone in order to explain both the goals of the study and the contents of the questionnaire. Questionnaires were sent to all firms in the population and were collected by e-mail. In all cases, once the questionnaires were filled out, personal interviews were conducted.

The response rate was 58% from a population of 53 companies. No questionnaires were refused, and in eight cases answers were modified during the interviews due to misunderstanding of the questions or conflicts between answers and comments<sup>(4)</sup>. The sample (with a size of 31 companies) represents the economic configuration of the area, with 40% of the firms coming from the automobile parts manufacturing sector (3363), 30% from agricul-

(2) We used this directory because it was the most current one at the time the study was designed.

(3) The manager was selected based on authors' previous knowledge of him, which had been gained through a study on non-financial indicators conducted in the manager's company. The consultant is an expert on the topic participates in empirical seminars with one of the authors.

(4) Modified items are negligible.

ture (11) + food manufacturing (311) + fruit and vegetable canning sector (311421), 20% from the utilities sector (22) and, 10% from other economic activities<sup>(5)</sup>. Finally, approximately 50% of the firms were subsidiaries, 20% partner enterprises, and 30% autonomous enterprises.

## 4. QUANTITATIVE ANALYSIS

### 4.1. METHODOLOGY: VARIABLE MEASUREMENT

#### 4.1.1. *Contingent factors: change drivers, stability drivers and organizational structure*

The contingent factors affecting the qualities of non-financial measures considered here are those identified by contingency literature both on qualities of financial information, and on the use of non-financial measures. These factors include organizational design, advanced manufacturing technology, modern management philosophies and accounting practices, adoption of different strategies, and the level of market uncertainty. Previous literature (Chenhall, 1993, 1997; Baines & Langfiel-Smith, 2003) has shown interactive effects among those contingent factors. These interactions support the aim of identifying the dimensions around which contingent factors may be grouped. As a result, contingent variables used later are designed using a factor analysis on two sets of items (see Cavaluzzo & Ittner, 2004 among others).

In the first set of questions (items 1 to 7) managers were asked about the emphasis placed on seven different goals of management to identify the strategy and level of uncertainty. Some strategic goals reflect high market uncertainty that demands new management philosophies, e.g., maintaining high ratios in delivery schedule, product characteristic variation and product quality improvements. These goals reveal firms' commitment to high levels of flexibility as well as adoption of customer-focused strategies (Perera *et al.*, 1997). In contrast, other goals such as low costs or high standardization levels can be understood as a sign of market stability and the prevalence of traditional strategies.

The second set of questions includes seven items (8 to 14) that Chenhall (1993) selected, establishing the extent companies apply advanced management philosophies and practices. In Chenhall's study, all items were loaded onto a single factor (indicating application of advanced management philosophies and practices). However, in this study, when combined with the previous set (1 to 7), one item was included in a different factor<sup>(6)</sup>. All items used a five-point Likert scale anchored on «very little,» score of one, to a «great extent,» score of five.

The factor analysis conducted on the two joint sets of items revealed the existence of two main factors that explain the 60.4% of the total variance (see Table 1).

Factor 1 is a combination of ten items<sup>(7)</sup>. Each item is a variable that affects market uncertainty as well as the adoption of new management philosophies and practices. Traditionally, it has been argued that items included in this factor require the introduction of non-

(5) 2002 NAICS code.

(6) One possible explanation for this difference is that this item (Programs to improve the quality and reliable delivery of materials and components provided by suppliers) has more than one interpretation.

(7) Nevertheless, one of these items received a 0.28526 loading (probably because managers found it redundant). For this reason the item was omitted in the posterior analysis.

financial performance measures. Based on this belief, this factor was coined as «change drivers».

**TABLE 1**  
FACTOR ANALYSIS OF THE CONTINGENT VARIABLES

	<i><b>FACTOR 1*</b></i>	<i><b>FACTOR 2*</b></i>
	<i>Change-drivers</i>	<i>Stability-drivers</i>
Eigen Values	5,83	2,62
% variance explicate	41,16	18,8
% accumulate	41,16	60,4
Cronbach's alpha	0,905	0,763
<i>Items</i>	<i>Loadings</i>	<i>loadings</i>
Low cost		0.79870
Product characteristics variation	0.66864	
High standardization levels		0.72496
Ability to change the production program**	0.28526	
Delivery schedule maintenance	0.71449	
High quality	0.68225	
Ability to adapt the capacity to different volumes of production.		0.65352
Coordination with suppliers		0.78726
Programs to reduce waste or non-value added activities	0.83239	
Programs to reduce time delays	0.80841	
Involvement of employees in quality improvement programs	0.67557	
Involvement of functional personnel in strategy formulation	0.86270	
Developing close contact between manufacturing and customers	0.87717	
Programs to coordinate quality improvements between parts of the organization	0.86411	

\* Factor 1 («Change-Drivers») and Factor 2 («Stability-Drivers») have been built using the factor score coefficients. Since the principal component extraction method is used, factor scores are exact (see Marija, 1990).

\*\* Omitted in posterior analysis.

Factor 2 contains four items (see Table 1), all of them variables reflecting market stability, traditional practices of management, and adoption of defender (Miles & Snow, 1978)/competence in cost (Porter, 1985) strategies. Therefore, according to the literature, Factor 2 was named «stability drivers,» meaning a set of contingent variables aiming to maintain the composition and characteristics of traditional PMS.

Lastly, there is general agreement in the literature on the role played by the company's structure in the introduction of non-financial measures. As organizations migrate from vertical to more horizontal structures, the necessity to turn to financial indicators lessens (Dixon *et al.*, 1990). Therefore, a single item instrument is used to control the effect of organizational structure, proxied by the number of hierarchical levels.

#### 4.1.2. Qualities of non-financial performance measures: relevance and reliability.

In this section we aim to identify the main characteristics of non-financial information that affect its perceived usefulness. Managers were then faced with a set of twelve items. They were asked to evaluate, using a five-point Likert scale, the reasons for introducing and maintaining non-financial measures in their PMS. Such reasons were formulated as a summary of the principal arguments provided by the literature (Kaplan, 1983; Kaplan & Norton, 1992, 1993; Dixon *et al.*, 1990; McKinnon & Bruns, 1992; Fisher, 1992; Singleton-Green, 1993; Emmanuel & Otley, 1995; Brancato, 1995; Dhavale, 1996; Perera *et al.*, 1997). The full instrument, containing twelve items such as economic soundness, timeliness, instructiveness, future-oriented, etc., is provided in Appendix A.

A factor analysis revealed two dimensions, which altogether explain the 64% of the total variance (see Table 2). The reasons grouped in each factor are consistent with findings in previous literature.

TABLE 2  
FACTOR ANALYSIS OF THE QUALITIES OF NON-FINANCIAL PERFORMANCE MEASURES

	<i>FACTOR 1*</i> (Reliability-reasons)	<i>FACTOR 2*</i> (Relevance-reasons)
Eigen Values	4,14	3,53
% variance explicate	34,5	29,4
% accumulate	34,5	63,9
Cronbach's alpha	0,864	0,846
<i>Items</i>	<i>Loadings</i>	<i>loadings</i>
Economic Soundness	0.76618	
Accuracy	0.59632	
Traceability or analytical power	0.74850	
Opportunity or timeliness	0.81459	
Comprehensiveness or Clarity	0.76621	
Instructiveness	0.89265	
Process-oriented		0.76318
Future-oriented		0.88046
Organizational effects-reflected		0.93014
Performance improvements-oriented		0.61807
Adaptability		0.68672
New areas-oriented		0.60204

\* Factor 1 («Reliability-reasons») and Factor 2 («Relevance-reasons») have been built using the factor score coefficients. Since the principal component extraction method is used, factor scores are exact (see Marija, 1990).

Factor 1 is named «reliability» because the included characteristics contribute in making information verifiable and neutral, thus, contributing in providing a faithful representation of the firm. Factor 1 includes (according to the order of appearance in Appendix A):

1. Economic soundness; 2. Objectivity; 3. Traceability<sup>(8)</sup>; 4. Timeliness (no delay between event occurrence and reporting); 5. Clarity or understandability, and 6. Instructiveness.

Factor 2 is named «relevance», since it combines characteristics of information that provide a predictive value or feedback value, or both. This factor includes six items. Three of them, 7. Process-oriented information, 9. Organizational effects information and 11. Adaptability to precise targets, are included by Chenhall and Morris (1986) in the «integration» quality of financial information. Similarly, items 8. Future-oriented, 10. Possibilities of performance improvements and 12. New information areas, imply a broader scope of information (Chenhall & Morris, 1986; Mangaliso, 1995). Scope and integration are qualities in Chenhall and Morris' (1986) framework that increase relevance.

#### 4.1.3. *Global Importance*

To build a direct measure<sup>(9)</sup> of non-financial information importance, we used an instrument adapted from Abernethy and Lillis (1995), Perera *et al.* (1997) and Baines and Langfield-Smith (2003). In this instrument (provided in Appendix A) we asked respondents about the relevance of a set of measures, both financial and non-financial, on performance evaluation. The instrument contains 17 measures: 12 non-financial and 5 financial. Examples of the non-financial performance measures are «product defects» (relating to quality), «number of product components» (relating to complexity), and «evaluation of ability to vary product characteristics» (relating to flexibility). Examples of financial measures are «material purchase price variance», «full cost of products», and «inventory turnover ratio».

The non-financial measures' intensity is computed as the sum of their scores. This procedure results in a measure of the importance or weight rather than the quantity of financial versus non-financial measures.

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(8) While the first one is recognized as a general constraint, literature has identified items 2, 5 and 6 with an increase in reliability of the economic information (FASB, 1980; Mackinnon & Bruns 1992). However, the case of item 3 is controversial and is pending further explanation. There are no studies that explicitly relate traceability with any specific quality. One possible explanation for these items being components of the reliability factor is that non-financial measures are used not as information in itself but as a means to corroborate the information provided by financial measures. In this respect, McKinnon and Bruns (1992) argue:

«Corroborating information from a second source adds to the manager's perceived value of the information. Some redundancy is valued, and the consistency of different information adds to the confidence with which a manager uses information».

*McKinnon and Bruns (1992: 201).*

Traceability implies knowing disperse but specific information, which could be seen as opposite to aggregation. Nevertheless, it allows the company to know the root causes of the aggregated financial information. Therefore, the information provided by disperse but specific non-financial measures grants the necessary reliability so that aggregated financial measures reach the desired information. The same explanation can be applied to item 4.

(9) Several studies provide estimates of the relative weight or global importance of non-financial measures in the PMS. Even though a unique set of non-financial indicators is assumed in all cases, alternative ways of measuring this variable are proposed. The first one is by comparing the number of indicators of each type, financial and non-financial (Li, 1997), while the other is by comparing the weight of the information provided by each of them in the PMS. In this study, both were initially considered. Whereas accounting gathers and summarizes information from several economic phenomena (accounting is a model), non-financial measures may not have this property in the same degree. As a result, the direct comparison of the number of financial and non-financial indicators may not provide a good proxy for global importance.

## 4.2. RESULTS AND DISCUSSION

Following the literature (see Perera *et al.*, 1997, and Chenhall, 1993, 1997, among others)<sup>(10)</sup>, we first use the multiple Ordinary Least Square (OLS) technique to test the hypotheses depicted in Figure 1. Our aim is to preserve the estimation techniques as much as possible, so that the different results will not be attributed to econometrics, but rather to our approach. Nevertheless, due to the small size of our sample, we complement the OLS with two other *ad hoc* techniques. First, a non-parametric bootstrap technique<sup>(11)</sup> has been used to estimate 95% confidence intervals. Second, a Bayesian regression<sup>(12)</sup> has been applied to estimate parameters obtaining consistent results. Finally, we used a multivariate Wald test to check if the difference of coefficients of the same regressor, with respect to the two dependent variables, was statistically different from zero<sup>(13)</sup>. Tables 3a to 3c contain the results.

First of all, results on Table 3a confirm the significant negative association between organizational structure and the weight of nonfinancial measures ( $\beta = -9.462$ ,  $t\text{-s.} = -2.473$ ). The lower the number of hierarchical levels, the higher the weight given to non-financial information. Results also show that neither change drivers nor stability drivers explain the importance given to non-financial measures [coefficients amount to 0.413 ( $t\text{-s}$  of 0.663) and 1.148 ( $t\text{-s}$  of 1.574), respectively]. In addition, the positive coefficient for stability drivers is opposite to the sign hypothesized. Although these results do not back the hypotheses, they are consistent with other studies such as McKinnon and Bruns (1992), Albernethy and Lillis (1995), and more recently Hartmann (2000), Otley and Fakiolas (2000), Vagneur and Peiperl (2000), and Chenhall (2003). These studies report anomalies on the factors affecting the importance of non-financial measures (for a review of the literature see Langfield-Smith, 1997). For example, Morissette (1998) found no relationship between the type of performance measures used (financial/non-financial) and the uncertainty of the market, the level of management and/or the strategy adopted by the firm. Hoque and Alam (1997) found that in highly competitive environments, reliance on traditional performance measures is significantly higher than on non-traditional measures. On strategy, Goold and Quinn (1990), McKinnon and Bruns (1992), Euske, Lebas and McNair (1993), Abernethy and Lillis, (1995), and Hoque and Alam (1997) found high levels of non-financial measures in cases of cost-based competence (defendant strategies) and/or low levels in differentiation.

(10) Note that in all previous studies, the main focus is to establish a relationship between several contingency factors and the global importance of non-financial measures. As we explained in the introduction, our approach is completely different and so are our results.

(11) This technique relies on an analogy between the sample and the population from which the sample was drawn. It involves sampling the data with replacement many times over to generate an empirical estimate of the entire sampling distribution, with the precise aim of overcoming the problem of a small sample size (for further details, see Mooney & Duval, 1993). Specifically, we draw 100,000 re-samples from the data sample using the uniform distribution over (1, 31). In each re-sample, we run an OLS regression and estimate the coefficients (see Table 3). The distribution developed by giving a probability of 1/100,000 to each value for the estimated coefficient, was the bootstrap estimate of the sampling distribution of said coefficient. Lastly, the sample distribution is sorted and the  $\left(\frac{\alpha}{2}\right)$  percent (with  $\alpha = 0.05$ ) of the lower and higher tail values are discarded.

(12) This technique generates a posterior probability distribution for the estimated parameters (beta vector) from a linear regression model with Gaussian errors using Gibbs sampling (with multivariate Gaussian prior on the beta vector, and inverse Gamma prior on the conditional error variance). In the OLS analysis, we implicitly assume having a large data set. On the contrary, in the Bayes approach, we assume we have only a small sample, and seek to correct our estimate by «borrowing» information from a larger set of similar observations. In sum, it is precisely the introduction of prior information along with sample data that overcomes the limitation of the small sample size (see Bradley & Thomas, 2000).

(13) i.e. (-0.096; 0.559), and [1.112; (-0.093)] in Table 3b. See Green (1993) for a detailed explanation.

**TABLE 3.A**  
**CONTEXTUAL SCENARIOS AND GLOBAL IMPORTANCE OF NONFINANCIAL MEASURES**  
**(H1a, H1b)**

	CONSTANT	CHANGE DRIVERS	STABILITY DRIVERS	ORGANIZATIONAL STRUCTURE	R-SQUARE	ADJUSTED R SQUARE
$\beta$	94.284	0.413	1.148	-9.462	0.3	0.181
Standard error	25.852	0.663	1.574	3.826		
t-student	3.647*	0.663	0.729	-2.473*		
Bootstrapping CI 95%	(45.8679;144.7067)*	(-0.9222;1.6307)	(-2.0767;4.3992)	(-18.1057;-0.8787)*		

\* The confidence interval excludes zero which means it is statistically significant.  
\* Significant at 5%.

**TABLE 3.B**  
**CONTEXTUAL SCENARIOS AND PERCEIVED USEFULNESS OF NONFINANCIAL CHARACTERISTICS**  
**(H2a ... H2d)**

	CONSTANTE	CHANGE DRIVERS	STABILITY DRIVERS	ORGANIZATIONAL STRUCTURE	R SQUARE	R SQUARE ADJUSTED
Relevance Characteristics	$\beta (H_{2a}, H_{2b})$	3.716	0.559	-0.093	-0.455	0.803
	Standard error	2.836	0.068	0.173	0.419	
	t-student	1.310	8.183*	-0.536	-1.084	
	Bootstrapping CI 95%	(-3.3581;10.8877)	(0.3757;0.6692)*	(-0.5136;0.2697)	(-1.4838;-0.3343)	
Reliability Characteristics	$\beta (H_{2c}, H_{2d})$	8.332	-0.096	1.112	-0.352	0.49
	Standard error	4.573	0.010	0.278	1.70	
	t-student	1.822	-0.876	3.99*	-0.20	
	Bootstrapping CI 95%	(-1.4018;10.8888)	(-0.3260;0.1266)	(0.4872;1.6152)*	(-1.8188;0.1275)	
Wald's test		-4.85*	3.65*	0.14		

\* Significant at 5%.  
\*\* Significant at 10%.  
• The confidence interval excludes zero which means it is statistically significant.

**TABLE 3.C**  
**PERCEIVED USEFULNESS OF NONFINANCIAL CHARACTERISTICS OF RELEVANCE AND RELIABILITY**  
**AND GLOBAL IMPORTANCE OF NONFINANCIAL MEASURES**  
**(H3a, H3b)**

	CONSTANT	RELEVANCE	RELIABILITY	R-SQUARE	ADJUSTED R SQUARE
$\beta$	45.130	0.913	1.483	0.119	0.021
Standard error	25.209	1.077	1.074		
t-student	1.79	0.848	1.381		
Bootstrapping CI 95%	(-30.3619;120.6228)	(-1.5140;3.3409)	(-1.1688;4.1347)		

Secondly, there is a positive association ( $\beta = 0.559$ , t-s. = 8.183) between «change drivers» and the perceived usefulness of «relevance» ( $H_{2a}$ ). The same positive association exists for «stability drivers» and the characteristic of «reliability» ( $\beta = 1.112$ , t-s. = 3.99) ( $H_{2c}$ ). Empirical evidence supports both positive associations regardless the technique (see Ta-

ble 3.b). On the contrary, the coefficients of  $H_{2b}$  and  $H_{2d}$  were not significant ( $\beta = -0.093$ , t-s. = -0.536 and  $\beta = -0.096$ , t-s. = -0.876). In addition, and more importantly, the effect of each contingent factor (Factor 1 and Factor 2) on qualities is of a different magnitude. The effect of a variation of «change drivers» (and also «stability drivers») on relevance is of a different magnitude than the effect on reliability, as supported by the Wald test ( $W-t = -4.85$  for «change drivers», and  $W-t = 3.65$  for «stability»).

In terms of  $H_2$ , our results can be read as follows: each and every different contingent factor is related to the perception of the usefulness of one specific quality of non-financial information<sup>(14)</sup>.

Lastly, regarding  $H_{3a}$  and  $H_{3b}$ , while the coefficients of regressors are positive (0.913 for relevance and 1.483 for reliability), they are both non-significant (t-s = 1.077 for relevance and t-s = 1.074 for reliability). Furthermore, adjusted R-square amounts to merely 2.1%, showing a very limited explanatory power. In addition, we also checked if the characteristic of relevance (reliability) mediates the relationship between change drivers (stability drivers) and global importance. We applied a path analysis using a regression approach (Asher, 1983; Venkatraman, 1989; Parker & Kohlmeyer, 2005). This methodology checks for an intervening<sup>(15)</sup> variable in the association between two random variables. This mediation effect has been estimated using both OLS and Bayesian techniques, statistical significance being checked using the Sobel Test. Results do not support the mediation effect<sup>(16)</sup>.

In summary, with reference to the preceding: 1. There is no empirical evidence to support the relationship between contextual scenarios and global importance; 2. Different contingent factors result in a different perceived usefulness of relevance and reliability; and 3. There is no empirical evidence to support that the perceived usefulness of said characteristics affects non-financial measures' global importance differently.

## 5. QUALITATIVE ANALYSIS

### 5.1. METHODOLOGY

Managers' interviews<sup>(17)</sup> had two parts. In the first one, reasons and explanations for the answers given to the questionnaire were requested from managers<sup>(18)</sup>. Then, an unstructu-

(14) To the best of our knowledge, this is a pioneer empirical study that links contextual scenarios to qualities of non-financial information.

(15) The intervening effect is also called mediated or indirect effect because it is the part of the model that indirectly affects the outcome through the mediator. The interaction effect, also called moderator effect, measures a different idea. In our model, it is the presence of the so-called change drivers that demands more relevant information. This new need would translate then into a higher weight of non-financial measures of the PMS. To a certain extent, we could say there is a causal relationship. It is precisely in this sense that we say that the mediator variable carries (i.e., mediates) the influence of change drivers on global importance. In contrast, interaction effect means that the effect of a variable on another depends on the level of a third variable. In our study, the levels of variables are not the main concern.

(16) Results are available upon request. The lack of significance might be due to the statistical problem of multicollinearity between regressors. In connection to this, the correlation coefficient of change drivers and relevance characteristics amounts to 0.9, invalidating our estimate of confidence intervals and making the extraction of any conclusion on the significance impossible. For the case of stability drivers and reliability characteristic, since the problem is not as severe (correlation coefficient is 0.6), the non-significant results could be considered. In other words, change drivers and relevance contain similar information with respect to global importance. However, the regression of global importance on relevance outperform that of global importance on change drivers in terms of  $R^2$ .

(17) Each interview was conducted by at least two research team members.

(18) On average, this part took two thirds of the total interview time.

red talk followed. Note that the goal of this qualitative analysis was to describe and explain the phenomenon of the introduction and use of non-financial measures in the PMS.

Interviews were recorded and field notes were taken. After transcribing them, we analyzed the answers and comments by asking questions about the data together with making comparisons searching for similarities and differences between each incident, events and other instances of the phenomenon at hand. We did so in a three step procedure: open coding, axial coding, and finally, selective coding.

In the first step (open coding), we coded the interviews and field notes with a «sentence-or-paragraph» analysis. Precisely, we asked: what is the major idea brought out in this sentence or paragraph? The outcome is a first classification of concepts.

In the second step (axial coding), we adjusted the model proposed by Strauss & Corbin<sup>(19)</sup> (1990, 99) to our data to come up with the properties of the phenomenon, their dimensional range, and the classification of companies according to this range.

In the third step (selective coding), we conceptualized the phenomenon.

Finally, we used the interviews of three companies of each of the resulting groups from the classification of the second step to validate our conceptualization.

## 5.2. RESULTS AND DISCUSSION: DIFFERENTIAL USES OF NON-FINANCIAL MEASURES

The qualitative analysis first revealed that the increase in the use of non-financial measures is a universal phenomenon in the selected population. All analyzed companies recognized an increasing use of non-financial measures in the last years. In fact, traditional companies with cost-based (defendant) strategies, pursuing high standardization levels, and especially sensitive to changes in volumes of production (all aspects incorporated in stability drivers), also benefit from the use of non-financial measures.

Next, we identified the following three properties: *a)* the magnitude of the change in the PMS, *b)* the role played by information i.e. how the information is used, and *c)* the process followed for measure definition. Likewise, we identified the dimensional range of each property and we classified companies according to this range.

Examples of words used by managers to identify the first property are: adapt, evolution, adjust, alter, change, vision, approach, content, edit, etc.

The dimensional range is a change in language vs. a change in message. By a change in language we mean that non-financial measures are seen as a better way of providing information already reported by accounting-based indicators: the same essence with different attributes. By a change in message, we mean that non-financial measures are seen as source of new information because a key change in perspective has taken place: performance in the PMS no longer is associated solely with efficient processes, but also, and mainly, with value creating activities. In other words, new aspects of the economic activities are reported since, for different reasons, they became relevant for management.

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(19) Highly simplified, the model looks like this: (A) Causal conditions → (B) Phenomenon → (C) Context → (D) Intervening conditions → (E) Action → (F) Consequences.

The classification of the companies according to this property reveals that companies which make greater use of non-financial measures because of reliability play down the importance of the introduction process. They associate the use of non-financial measures with a change in the language. For instance, during an interview conducted it was argued that:

«Information is information, what difference does it make if it is given in Spanish, Catalan, Basque<sup>(20)</sup> or Russian? Our reality is that the current RPE allows us to incorporate non-financial measures into the system in the place where these non-financial measures occurred, by the employees who generate them, and using the language employees know».

Contrary to this, companies that introduce non-financial measures for relevance see the phenomenon as a consequence of a change in the message very much appreciated by managers, not a change in the language.

Examples of words used by managers to identify the second property are: complete, expand, widen, extend, and replace. The values for the dimensional range are: substitute information *vs.* complement information. The conclusion is that firms including non-financial measures for reliability reasons generally use them as «substitutes» of accounting indicators. Meanwhile, the relevance reasons seem to result in the use of non-financial measures as a complement of financial information.

One possible explanation for this dichotomy may be that the introduction of non-financial measures for reliability reasons does not imply a change in the way activities are analyzed. The system still believes that good performance comes from efficient activities and processes. In effect, non-financial measures supplant traditional cost accounting measures in some phases of the PMS. As a matter of fact, these companies appreciate non-financial measures as a consequence of a major effort in improving their management accounting systems. Specifically, managers understand this situation as a phenomenon connected to the introduction of cost accounting practices, such as ABC models.

On the contrary, companies that use non-financial measures for relevance reasons employ these measures as a means to supplement, rather than supplant, information provided by traditional financial measures. «Complementary» non-financial measures are employed in cases where the use of non-financial indicators reflects a different understanding of economic reality, and a new form of managing activities to achieve strategic goals. Therefore, it represents a real change in the nature of the information reported and not merely in its attributes.

Examples of words used by managers to identify the third property are: drafts, complexity, discussion, consensus, debates, long, short, meetings, time, etc. The values for the dimensional range are: easy *vs.* difficult consensus. We conclude that those companies who use non-financial measures for relevance reasons, are the ones having the hardest time in achieving consensus on the most adequate list of measures. Also, difficulties related to the interpretation of those measures have been reported by these managers. These problems were brushed off or not mentioned at all by managers of companies using non-financial measures for reliability reasons.

Finally, in the selective coding phase we conceptualized the phenomenon of our research. Understanding the phenomenon of an increase in use of non-financial measures implies

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(20) Catalan and Basque are regional languages spoken in Spain.

analyzing «how» non-financial measures are used. Reliability and relevance reasons are both reasons that justify the use of non-financial measures. However, the use of non-financial measures by companies due to reliability reasons is different from the use of non-financial measures by companies that introduce said measures for relevance reasons. That is, there exist different types of use of non-financial measures. Note that, this conclusion implies a change in the research question: we are no longer interested in «what companies (or strategies)» use non-financial information and «how much» they use it. Rather, our interest is now, to «why» and «how» non-financial information is used. We then postulate to change the focus from «whether or not non-financial measures are used» to «how exactly these non-financial measures are used». As an example, a manager described the phenomenon of the introduction of non-financial measures in the following terms:

«Since the introduction of a new cost system two years ago, it has become clear to us that the variances in the cost of products have been due to several measures of complexity. Variables such as the degree of coordination among departments needed to manufacture a specific product, the breadth of the product line and the number of components affecting the changes, etc., were what made our process and products slower, more complex and expensive. Therefore, we don't need to wait for the costs to evaluate the efficiency of our processes and to discuss improvement plans. Furthermore, we have learned to guess or anticipate the cost numbers before they come from the financial department. We are unlikely to get any major surprises from them».

On the contrary, the head of quality control of a major company justified the need for adopting non-financial measures with the following argument:

«Our group was concerned about measuring the quality in each phase of the process so that specifications of the products could be met. Later on, we realized what we needed was to define several non-financial measures of the attributes of our products and services to satisfy the requirements of our customers. That was the real measure of the quality level accomplished and, finally, the value generated by the firm».

## 6. CONCILIATING THE RESULTS OF QUANTITATIVE AND QUALITATIVE ANALYSES

The purpose of this section is to check whether or not the evidence from the qualitative analyses can be validated applying quantitative techniques to the data set. To do so, we *i)* interpret the qualitative results in terms of the variables defined in section 3 and develop a new hypothesis, and *ii)* check that hypothesis.

The qualitative analysis of managers' interviews revealed that traditional companies with cost-based strategies also benefit from the use of non-financial measures as a means of improving accuracy, analytical power, timeliness, clarity and instructiveness of their PMS (that is, for reasons of reliability). Conversely, non-financial measures are also used by companies adopting differentiation strategies and developing programs to increase aspects such as quality, coordination, customer satisfaction, etc. (aspects incorporated in change drivers). However, the aim now is to improve integration and to broaden the scope of their PMS, i.e., for relevance reasons.

In other words, the qualitative results suggest that it is possible that as the context changes, managers modify their perceptions, then react by changing how they use non-financial

measures, while maintaining the measures' weight. If this is so, a possible explanation for the quantitative result of Section 3 may be rooted in the «global importance» variable. As explained in Section 3, the variable was computed as the sum of the scores given to each indicator from a relation of 12 non-financial measures. While being a good proxy for the weight given to non-financial information, it can be argued that this construct does not quite capture the way managers use the measures.

Thus, considering our current focus of studying how non-financial information is used, it would be more appropriate to look for a proxy for the different «patterns of use» of non-financial measures, instead of a measure of weight or global importance. In doing so, firms using non-financial information for relevance reasons are expected to show a distribution of scores among non-financial measures that significantly differs from the distribution showed by those firms using non-financial information for reliability reasons. In addition, we also expect an association between contextual circumstances and the patterns of the distribution of scores.

In order to obtain the proxy variables for «patterns of use», a K-mean cluster analysis of the score matrix of the 12 non-financial indicators has been applied. The analysis reveals the existence of two clusters whose centers have been used as the patterns of the two «typical» uses (pattern 1 for relevance reasons and patterns 2 for reliability reasons) (see Table 4).

**TABLE 4**  
CLUSTER CENTERS RETRIEVED BY K-MEANS CLUSTER ANALYSIS  
TO THE MATRIX OF NON-FINANCIAL INDICATORS

<i>NON-FINANCIAL MEASURE</i>	<i>PATTERN 1</i>	<i>PATTERN 2</i>
I2 machine utilization	3.47	1.39
I3 Reduction in the set-up times	2.91	1.39
I5 Repairing time	2.49	2.06
I6 Product defects	2.82	2.06
I8 Number of reworked units	2.78	2.00
I10 Rate of introd. of new products	1.29	2.39
I11 Ability to vary product charact.	1.42	2.17
I12 N.º components of each product	2.05	1.89
I14 Time from order to delivery	2.02	1.78
I15 Manufacturing overtime	2.67	1.17
I16 Absenteeism	2.38	1.78
I17 Labor utiliz./efficiency statistics	3.39	1.33

To measure dissimilarity in the uses from the two typical patterns, we constructed two variables named «dissimilarity to pattern 1» and «dissimilarity to pattern 2.» The distance was computed between the distribution/vector of scores for each firm, and each of the two typical forms of use (or differential uses). Hence, the lower the distance, the closer the firm's form of use is to the typical pattern.

At this point, hypotheses were tested by replacing global importance with the two dissimilarity variables. Figure 2 represents the associations of the final model, and Table 5 contains the estimated coefficients and the statistics for the econometric techniques.

FIGURE 2  
THE FINAL MODEL

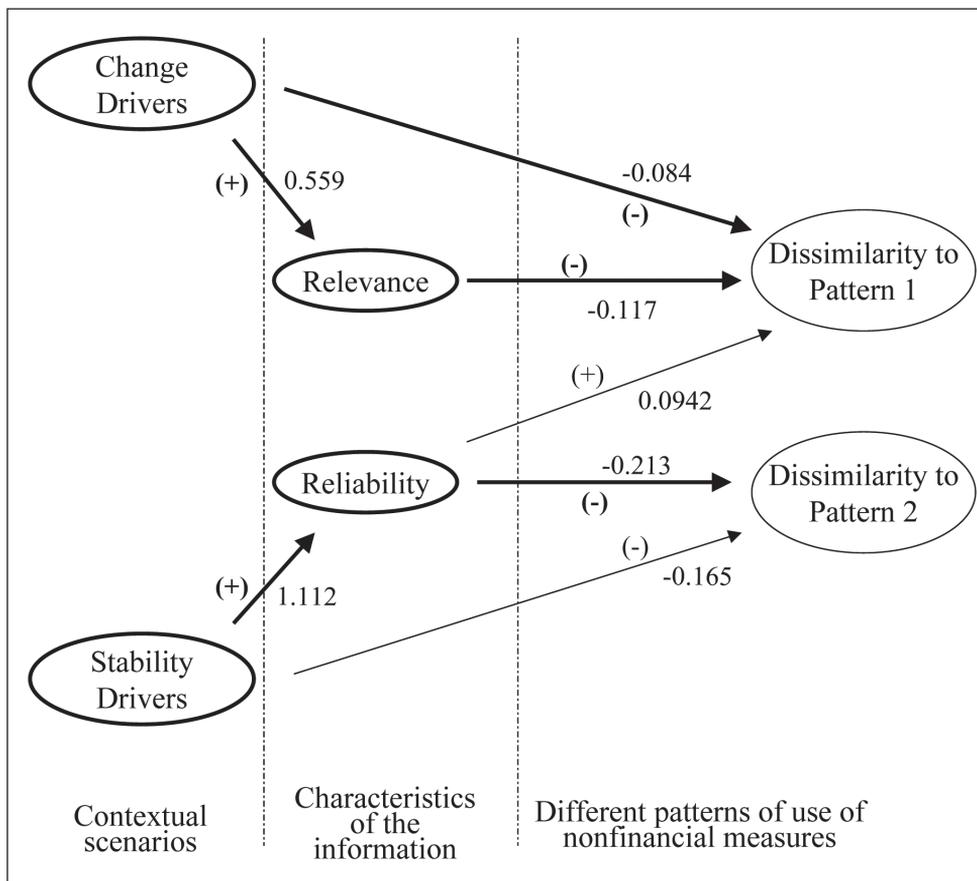


TABLE 5  
STATISTICS OF FINAL MODEL

		CONTINGENCY FACTORS		CHARACTERISTICS OF INFORMATION	
		Change Drivers	Stability Drivers	Relevance	Reliability
PANEL A Dissimilarity to Pattern 1	β	-0.084	0.126		
	Standard error	0.030	0.076		
	t-student	-2.817*	1.645		
	Bootstrapping CI 95%	(-0.1420;-0.0258)*	(-0.0191;0.2705)		
	β			-0.117	0.094†
	Standard error			0.046	0.046
	t-student			-2.523*	2.044**
	Bootstrapping CI 95%			(-0.2329;0.0003)*	(-0.0169;0.2054)

(continúa pág. sig.)

**TABLE 5 (Cont.)**  
**STATISTICS OF FINAL MODEL**

		CONTINGENCY FACTORS		CHARACTERISTICS OF INFORMATION	
		Change Drivers	Stability Drivers	Relevance	Reliability
<b>PANEL B</b> Dissimilarity to Pattern 2	$\beta$	0.050	-0.165		
	Standard error	0.054	0.138		
	t-student	0.936	-1.195		
	Bootstrapping CI 95%	(-0.0561;0.1569)*	(-.4322;0.1025)		
	$\beta$			0.070	-0.213
	Standard error			0.073	0.073
	t-student			0.972	-2.924*
	Bootstrapping CI 95%			(-.0786;0.2203)	(-0.3670;-0.0581)*

\* Significant at 5%.

\*\* Significant at 10%.

\* The confidence interval excludes zero which means it is statistically significant

† Contrary to the t-student statistic, the bootstrapping confidence interval includes zero, which means that there is no empirical evidence to support an estimated coefficient different from zero.

With regard to dissimilarity to pattern 1 (Panel A in Table 5), the estimated coefficients for the contingency factors are ( $\beta = -0.084$ ) for change drivers and ( $\beta = 0.126$ ) for stability drivers. The t-statistic amounts to -2.817, and 1.645, respectively. There is empirical evidence of a negative relationship with change drivers. The coefficient for the non-financial information characteristic of relevance is ( $\beta = -0.117$ ). The t-statistic is -2.523, and the bootstrapping confidence interval is [-2.329; -0.003]. Both give empirical evidence of a negative relationship with the perceived usefulness of relevance. As for reliability, the coefficient amounts to ( $\beta = 0.094$ ), with a t-statistic and a confidence interval of (t-s=2.044, [-0.016; 0.205]). It follows that the sample does not clearly support the significance of the reliability characteristic. Altogether, results on dissimilarity to pattern 1 may be interpreted in the following way: as the perceived usefulness of relevance increases due to the presence of change drivers, the PMS composition gains in similarity to the composition of pattern 1 (or the use of non-financial measures for relevance reasons). The distance between the firms' PMS and pattern 1 is reduced, making the two compositions look more alike (less dissimilar).

With respect to dissimilarity to pattern 2 (Panel B in Table 5), the estimated coefficient for stability drivers has the expected sign ( $\beta = -0.165$ ) although not statistically significant, as t-s = -1.195. Moving on to the characteristics, there is empirical evidence of a negative relationship with the characteristic of reliability ( $\beta = -0.213$ , and t-s=-2.924). The negative sign has exactly the same explanation as in the case of relevance; i.e., as the perceived usefulness of reliability reasons increases due to the presence of stability drivers, the PMS composition becomes more similar to the composition of pattern 2.

In summary (see Figure 2), in the presence of change drivers (stability drivers), when the quality of relevance (reliability) is perceived as more useful, the PMS composition approaches pattern 1 (pattern 2). Our results then validate the conclusions of the qualitative analysis that managers with differing perceptions on the specific qualities that make non-financial information useful, result in the different forms this same information is used,

though its relevance remains the same. As a consequence, for the sample analyzed, the final model is more suitable than Model 1 in explaining the introduction of non-financial measures into the PMS.

### *Limitations*

The current study has limitations that should be noted. One is the sample size. Even though suitable econometric techniques have been used, a Structural Equation Model could have been applied in the event of a larger sample.

Another limitation is that the population was the industrial sector in Navarra (Spain). This may restrict the possibility of extrapolating the results to other sectors and countries, in case these other sectors and countries would have a different behavior from the one in our population <sup>(21)</sup>.

Finally, the interviews conducted after administering the questionnaire revealed additional arguments that are worth including in a revised instrument. For instance, the manager of one of the companies noted with reference to the comparability quality of non-financial measures:

«We have not taken into account the behavior of prices and indexes to analyze our performance and compare it with that of our competitors. Working hours, defects ratio, complaints, initiatives, etc., will be the same now and always».

## **7. CONCLUSIONS AND FINAL COMMENTS**

On a theoretical ground, it is possible to claim that non-financial information has many characteristics or qualities. However, empirical studies have practically focused on the quality of relevance. It is generally assumed that firms react to changes in contingent factors by adjusting the weight assigned to non-financial measures vs. financial measures in reports: the greater the importance of non-financial measures, the broader the scope (and relevance) of the PMS. Empirical studies using regression and factor analysis techniques come up with mixed results. Therefore, there is room for further exploration of the qualities of non-financial measures that make information useful.

From the analysis of a sample of medium to large industrial companies located in the region of Navarra (Spain), we find that *i)* managers' perceptions of the usefulness of relevance and reliability changes depending on the contextual circumstances the companies face, and *ii)* these different perceptions result in two differential uses of non-financial measures.

The first use has to do with reasons of relevance in situations characterized by high market uncertainty and the adoption of advanced manufacturing technologies, management practices and explorative strategies. On the other hand, the second is the use of non-financial information for reasons of reliability in a context where there is low market uncertainty, cost-based competence and high standardization levels.

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(21) This limitation is shared with other studies like Ittner *et al.* (2003b). Though they acknowledge the limitation in terms of generalization, they claim that «a single industry analysis has substantially higher internal validity than a multi-industry analysis» (p. 722).

The use of non-financial measures for the sake of reliability has no effect on the essence of the information rendered by traditional accounting indicators. These measures supplant accounting indicators since they are considered to provide similar information. However, they improve some attributes of the PMS such as accuracy, analytical power, timeliness, clarity and instructiveness. On the other hand, the use of non-financial measures for relevance implies a change in information content rendered by accounting models. Non-financial measures are seen as complementary to the financial information which improves relevance (integration and scope) of PMS.

Finally, the sample companies show a significant difference in the distribution of weights among non-financial measures, reflected in different scores for the individual measures. These differences in the distribution of weights might cancel out, but not necessarily alter the sum of total scores given to non-financial information (global importance). The two differential uses identified (for relevance and for reliability reasons) are in correspondence with two different non-financial measure weight patterns. We therefore, conclude that different managers' perceptions on the characteristics' usefulness do not affect the global weight given to non-financial measures. Notwithstanding, these perceptions certainly affect the way companies use non-financial information.

## 8. BIBLIOGRAPHY

ABERNETHY, M. A., and LILLIS, A. M. 1995. The impact of manufacturing flexibility on Management Control System Design, *Accounting, Organizations and Society*, 20(4), 241-258.

AMIR, E., and LEV, B. 1996. Value relevance of non-financial information: the wireless communication industry. *Journal of Accounting and Economics*, 22 (August-December), 3-30.

ASHER, H. B. 1983. *Casual modeling*, Newbury Park, CA: Sage Publishing.

BAINES, A., and LANGFIELD-SMITH, K. 2003. Antecedents to management accounting change: a structural equation approach, *Accounting, Organizations and Society*, 28(7-8), 675-698.

BANKER, R. D.; POTTER, G., and SCHROEDER, R. G. 1993. Reporting manufacturing performance measures to workers: an empirical study, *Journal of Management Accounting Research*, 5, 33-55.

BANKER, R. D.; POTTER, G., and SRINIVASAN, D. 2000. An empirical investigation of an incentive plan based on non-financial measures, *The Accounting Review*, 75 (1), 65-94.

BRADLEY, P. C., and THOMAS, A. L. 2000. *Bayes and empirical bayes methods for data analysis*, Chapman & Hall/CRC, Second edition.

BRANCATO, C. K. 1995. *New corporate performance measures, a research report*, The Conference Board Europe, Report Number 1118-95 RR.

CARR, S.; MAK, Y. T., and NEEDHAM, J. E. 1997. Differences in strategy, quality management practices and performance reporting systems between ISO accredited and non-ISO accredited companies, *Management. Accounting Research*, 6, 383-403.

CAVALUZZO, K. S., and ITTNER, C. D. 2004. Implementing performance measurement innovations: evidence from government, *Accounting, Organizations and Society*, 29 (3-4), 243-267.

CHANG, R.; CHANG, Y., and PAPER, D. 2003. The effect of task uncertainty, decentralization and AIS characteristics on the performance of AIS: an empirical case in Taiwan, *Information & Management*, 40, 691-703.

CHENHALL, R. H. 1993. Reliance on manufacturing performance measures, strategies of manufacturing flexibility, advanced manufacturing practices, and organizational performance: an empirical inves-

tigation, *Paper presented at the Strategic Management Accounting Seminar*, Macquarie University, Sydney.

CHENHALL, R. H. 1997. Reliance on manufacturing performance measures, total quality management and organizational performance, *Management Accounting Research*, 8 (2-3), 187-206.

CHENHALL, R. H. 2003. Management control systems design within its organizational context: findings from contingency-based research and directions for future. *Accounting, Organizations and Society*, 28, 127-168.

CHENHALL, R. H., and MORRIS, D. 1986. The impact of structure, environment, and interdependence on the perceived usefulness of management accounting systems, *The Accounting Review*, 61 (1), 16-35.

CHENHALL, R. H., and LANGFIELD-SMITH, K. 1998. The relationship between strategic priorities, management techniques and management accounting: an empirical investigation using a system approach, *Accounting, Organization and Society*, 23 (3), 243-264.

DAVILA, A., and FOSTER, G. 2007. Management Control Systems in Early-Stage Startup Companies, *Accounting Review*, 82 (5), 907-937.

DENT, J. F., and EZZAMEL, M. 1987. Organizational control and management accounting, en EZZAMEL, M. Hart, *Advanced Management Accounting: An Organizational Emphasis*, 86-112.

DHAVALE, D. G. 1996. Problems with existing manufacturing performance measures, *Journal of Cost Management*, Winter, 50-55

DIXON, J. R.; NANNI, A. J., and VOLLMANN, T. E. 1990. *The New Performance Challenge: Measuring Operations for World-Class Competition*, Homewood, Illinois, Business One Irwin.

EMMANUEL, C., and OTLEY, D. 1995. *Readings in Accounting for Management Control*, Chapman and Hall.

EUSKE, K. J.; LEBAS, M. J., and McNAIR, C. J. 1993. *Best practices in world class organization*, CAM-I, R-93-CMS-01, February.

FASB. 1980. Statement of financial accounting concepts n.º 2.: Qualitative characteristics of accounting information, *Financial Accounting Standards Board, of the Financial Accounting Foundation*.

FASC. 2002. «Recommendations on disclosure of non-financial performance measures», American Accounting Association, *Accounting Horizons*, 16 (4), 353-362.

FISHER, J. 1992. «Use of non-financial performance measures», *Journal of Cost Management*, Spring, 31-38.

GOOLD, M., and QUINN, J. J. 1990. The paradox of strategic controls, *Strategic Management Journal*, 11, 43-57.

GORDON, J. N. 1984. Management accounting systems, perceived environmental uncertainty, and organization structure: an empirical investigation, *Accounting, Organizations and Society*, 9 (1), 33-47.

GOVINDARAJAN, V. 1984. Appropriateness of accounting data in performance evaluation: an empirical examination of environmental uncertainty as an intervening variable, *Accounting, Organizations and Society*, 9 (2), 25-135.

— 1988. A contingency approach to strategy implementation at the business unit level: integrating administrative mechanisms with strategy, *Academy of Management Journal*, 31 (4), 828-853.

GREEN, W. 1993. *Econometric Analysis*, Englewood Cliffs (NJ): Prentice Hall, Inc.

GRÖJER, J. E. 2001. «Intangibles and accounting classifications: in search of a classification strategy», *Accounting, Organizations and Society*, 26 (7-8), 695-713.

HARTMANN, F. 2000. The appropriateness of RAPM: toward the further development of theory, *Accounting, Organizations and Society*, 25 (4-5), 451-482.

HIRST, M. K. 1983. Reliance on accounting performance measures, task uncertainty and dysfunctional behavior, *Journal of Accounting Research*, 21, 596-605.

- HOQUE, Z., and ALAM, M. 1997. Competition, new manufacturing practices, changes in MAS and managerial choice of the balanced scorecard to performance measures: an empirical investigation, Paper presented at the *1997 European Accounting Association Annual Congress in Graz*, April.
- ITTNER, C. D., and LARCKER, D. F. 1995. Total quality management and the choice of information and reward systems, *Journal of Accounting Research*, 33 (Supplement), 1-34.
- 1997. Quality strategy, strategic control systems, and organizational performance, *Accounting, Organizations and Society*, 22 (3-4), 293-314.
- 1998a. Innovations in performance measurement: trends and research implications, *Journal of Management Accounting Research*, 10, 205-239.
- 1998b. Are non-financial measures leading indicators of financial performance? An analysis of customer satisfaction, *Journal of Accounting Research*, 36, 1-35.
- ITTNER, C. D.; LARCKER, D. F., and MEYER, M. W. 2003a. Subjectivity and the weighting of performance measures: evidence from a Balanced Scorecard, *The Accounting Review*, 78 (3), 725-758.
- ITTNER, C. D.; LARCKER, D. F., and RANDALL, T. 2003b. Performance implications of strategic performance measurement in financial services firms, *Accounting, Organizations and Society*, 28 (7-8), 715-741.
- KAPLAN, R. S. 1983. Measuring manufacturing excellence: a new challenge for managerial accounting, *The Accounting Review*, 58 (4), 686-705.
- KAPLAN, R. S., and NORTON, D. P. 1992. The balanced scorecard-measures that drive performance, *Harvard Business Review*, January/February, 71-79.
- 1993. Putting the balanced scorecard to work, *Harvard Business Review*, September/October, 134-147.
- LANGFIELD-SMITH, K. 1997. Management control systems and strategy: a critical review, *Accounting, Organizations and Society*, 22 (2), 207-232.
- LI, E. Y. 1997. Perceived importance of information system success factors: a meta analysis of group differences, *Information & Management*, 32, 15-28.
- LIPE, M., and SALTERIO, S. E. 2000. The balanced scorecard: judgmental effects of common and unique performance measures, *The Accounting Review*, 75 (3), 283-298.
- LUFT, J., and SHIELDS, M. 2002. Learning drivers of financial performance: judgement and decision effects of financial measures, non-financial measures, and statistical models, *Working Paper*, Michigan State University.
- McKINNON, S. M., and BRUNS, W. J. 1992. *The Information Mosaic*, Boston, MA: Harvard Business School Press.
- MANGALISO, M. 1995. «The strategic usefulness of management information as perceived by middle managers», *Journal of Management*, 21 (2), 231-250.
- MILES, R. E., and SNOW, C. C. 1978. *Organizational Strategy, Structure and Process*, New York: McGraw-Hill.
- MOONEY, C., and DUVAL, R. 1993. *Bootstrapping: A nonparametric approach to statistical inference*, Newbury Park, CA: Sage Publications, Inc.
- MORISSETTE, R. 1998. Financial and non-financial information: toward an integrative theory of information choices in organizations, Paper presented at the *European Accounting Association Annual Conference in Antwerp*.
- OTLEY, D., and FAKIOLAS, A. 2000. Reliance on accounting performance measures: dead end or new beginning?, *Accounting, Organization and Society*, 25, 497-510.
- PARKER, R. J., and KOHLMAYER, J. M. 2005. Organizational justice and turnover in public accounting firms: a research note, *Accounting, Organizations and Society*, 30 (4), 357-369.

PERERA, S.; HARRISON, G., and POOLE, M. 1997. Customer-focused manufacturing strategy and the use of operation-based non-financial performance measures: a research note, *Accounting, Organizations and Society*, 22 (6), 557-572.

PORTER, M. 1985. *Competitive advantage: Creating and sustaining superior performance*, New York: Free Press.

SINGLETON-GREEN, B. 1993. If it matters, measure it!, *Accountancy*, May, 111(1197), 52-53.

STRAUSS, A., and CORBIN, J. 1990. *Basics of qualitative research*, Newbury Park, CA: Sage Publications, Inc.

VAGNEUR, K., and PEIPERL, M. 2000. Reconsidering performance evaluative style, *Accounting, Organization and Society*, 25, 511-525.

VENKATRAMAN, N. 1989. The concept of fit in strategy research: toward verbal and statistical correspondence, *Academy of Management Review*, 14 (3), 423-444.

WIDENER, S. K. 2004. An empirical investigation of the relation between the use of strategic human capital and the design of management control systems, *Accounting Organizations and Society*, 29(3-4), 377-399.

## APPENDIX A

### Questionnaire

All questions use a five-point scale:

- 1 = not at all;
- 2 = to a very little extent;
- 3 = to some extent;
- 4 = to a considerable extent, and
- 5 = to a very great extent.

### Contingent factors

A. *Goals*.—In what extent the following goals are important for the accomplish of the strategic aims of your company?

- Low cost (efficiency).
- Product characteristics variation.
- High standardization level.
- Ability to change the production program.
- Delivery schedule maintenance.
- High quality.
- Ability to adapt the capacity to different volumes of production.

B. *Programs*.—In what extent has your company implemented each of the following programs over the past three years?

- Programs to improve the quality and reliable delivery of materials and components provided by suppliers.
- Programs to reduce waste or non-value added activities throughout the production process.
- Programs to reduce time delays in manufacturing and designing products (i.e. improve cycle time).
- Involvement of employees in quality improvement programs (e.g. training, involvement in improvement teams).
- Involvement of functional personnel (manufacturing, marketing, R&D) in strategy formulation.
- Developing close contact between manufacturing and customers.
- Programs to coordinate quality improvements between parts of the organization.

### Non-financial performance measures

In what extent are each of the following measures used for performance evaluation in the manufacturing department of your company?

- I1 Material purchase price variation.
- I2 Measurement of machine utilization and down time.

- I3 Reduction in the set-up times.
- I4 Inventory turnover ratio.
- I5 Repairing time.
- I6 Product defects.
- I7 Cost for material scrap loss.
- I8 Number of reworked units.
- I9 Costs of quality.
- I10 Rate of introduction of new products.
- I11 Evaluation of the ability to vary product characteristics.
- I12 Number of components of each product.
- I13 Full cost of the products.
- I14 Length of cycle time from order to delivery.
- I15 Manufacturing overtime.
- I16 Absenteeism.
- I17 Labor utilization/efficiency statistics.

### Qualities of non-financial performance measures

*(Reasons for introducing and maintaining non-financial measures and qualities provided by using them)*

In what extent may the following reasons justify the inclusion and maintenance of non-financial performance measures in the case of your company?

- Economic Soundness.**—Non-financial operation-based indicators give, in many cases, similar information than do accounting measures but they are cheaper (i.e.. the information coming from the introduction of statistic control process).
- Accuracy.**—Since non-financial indicators are direct measures, they are not submitted to the allocation process which, in the new world of increasing overhead costs, reduces the reliability of accounting data (people know that accounting numbers are very sensible to changes in allocation rules and can be manipulated, so their reliability has decreased).
- Traceability or analytical power.**—Accounting indicators give too aggregate information so in some cases they are not appropriate to track both the causes of the problems as well as the principal sources of improvements. On the contrary, non-financial measures give information about each of the relevant variables of the process. Cost variances are passengers, not drivers. In most cases, the causes for deviations and the corrective actions are not revealed directly.
- Timeliness** (not delay event occurring and information reported).—Non-financial measures give real time information for being a direct measure of a variable. On the contrary, traditional accounting indicators are the consequence of multiple transformations over different measures. As a result, they arrive too late, since the develop of the complete accounting process is needed for their elaboration.
- Comprehensiveness or Clarity.**—In a world of decentralized decisions, it is important for the information to be expressed in the same way than the decisions which have to be made in order to avoid mistaken interpretations. That is one of the reason why low level managers in my company prefer non-financial measures rather than accounting ones.

- Instructiveness.**—Some non-financial performance measures of quality, time, etc. move the people more decisively to decision making than accounting-based measures do.
- Process-oriented (Integration).**—Non-financial information is more convenient than accounting measures in my company because it focus on process, and not on functional silos. Therefore, this information helps the coordination of activities among different tasks which is an important aspect in the new context of process-oriented management that we apply in our company.
- Future-oriented (Scope).**—Accounting measures are short-run oriented whereas some non-financial measures are very useful in reflecting the long-run performance of my firm. As a result, for most strategic decisions, non-financial performance measures are more adequate.
- Organizational effects-oriented (Integration).**—All accounting indicators have the same perspective in analyzing economic facts, that is to say, the consequence of these facts on resources consumption. On the contrary, non-financial measures evaluate the consequences of the same and another facts but according to different goals. In other words, whereas accounting information focuses on efficiency targets, trying to minimize the sacrifice of resources, non-financial information focuses on effectiveness targets, taking into account all different ways on which an economic fact can influence any of the goals of the company, such as quality, time, flexibility, etc.
- Probabilities and performance improvements-oriented (Scope).**—Accounting measures give «ex-post» information. They inform about the economic consequences of facts that happened in the past. Therefore, accounting-based information is principally oriented to the control of the activities. On the other hand, non-financial indicators adopt a present and future perspective, focusing on the possibilities of performance improvements by giving «ex-ante» information.
- Adaptability (Integration).**—Non-financial performance measures can be easily changed as managers define new critical or strategic variables.
- New areas of interest-oriented (Scope).**—Introducing non-financial indicators is an essential part in adopting new advanced management practices, because these new models of management need specific types of information that are not presented in traditional accounting models.