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Article

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Article

The Impact of Environmental Uncertainty on Accounting Information Relevance and Performance: A Contingency Approach

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Abstract: This paper examines the association between environmental uncertainty, accounting information relevance, and organizational performance. From a contingency approach, this paper attempts to contribute to a stream of research that investigates the relationship between accounting information relevance and organizational performance. The presence of environmental uncertainty in this relationship has not been fully established. This paper contributes to this area by suggesting a framework to study and explain this connection. An online questionnaire-based survey was conducted, which produced 119 valid responses (a response rate of 23%) from large manufacturing companies operating in Portugal. The results suggest that in contexts of environmental uncertainty, the relevance of non-financial information increases. However, the relevance of financial information continues to outstrip that of non-financial information. The results also suggest that financial information and non-financial information are complementary, and not substitutes, and can be used simultaneously in different situations. These results have several implications for professionals involved in decision-making activities. It offers findings which are potentially useful for both theory and practice. The study addresses an identified gap in the literature and adds to the existing body of work analyzing the association between environmental uncertainty, accounting information relevance for decision-making purposes, and organizational performance.

Keywords: environmental uncertainty; financial information; non-financial information; organizational performance; contingency theory; survey; Portugal



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1. Introduction

In recent decades the organizational environment has changed, being more complex, turbulent, and unpredictable than in the past, posing new challenges to managers as they must make decisions in uncertain environments (Al-Mawali and Am 2016; Baines and Langfield-Smith 2003; Chenhall 2003; Chenhall and Langfield-Smith 1998a; Chong 1996; Otley 2016). Recently, in dealing with the unprecedented situation of the COVID-19 pandemic, decision makers have faced many types of environmental uncertainty; for example, uncertainty about the reliability of information flows (Lodge and Boin 2020), irrational reactions of financial markets, extreme volatility of the economy, etc. Making decisions in such an environment where information is incomplete and there are no correct and clear answers is unprecedented in its degree of uncertainty (Aon 2020). Nevertheless, decision makers must obtain proper information to make strategic decisions that would influence organizational competitive advantages and performance (Adeniran and Obembe 2020; Oyewo 2021).

Although several empirical studies have shown the influence of perceived environmental uncertainty on decision-making, few have examined the role of accounting information in explaining this association (Abu-Rahma and Jaleel 2019). In this context, accounting

information becomes relevant, namely non-financial, external, and future-oriented information, to support organizational change and decision-making. For an organization to survive and operate with success, it is critical that managers have access to useful and timely information so they can act and make the best decisions (Al-Mawali and Am 2016; Alves 2017; Oyewo 2021; Thuan et al. 2022; Visedsun and Terdpaopong 2021).

In this study, accounting information is defined as the formalized financial and non-financial information (Massicotte and Henri 2021) provided on a regular basis for decision-making purposes. However, a major problem that managers face is the need for credible information to assist them in the decision-making process (Frazer 2020). Additionally, despite non-financial information having gained growing relevance (Czaja-Cieszyńska et al. 2021), it does not substitute for financial information, which is considered of little relevance in uncertain decision-making contexts, because it is too aggregated and available too late (Chenhall and Langfield-Smith 1998b; Johnson and Kaplan 1987), even if in some cases, financial information continues to have the confidence of managers in decision-making (Bhimani and Langfield-Smith 2007; Chow and Van der Stede 2006; Hyvönen 2007). Non-financial information is, therefore, complementary to financial information and these two types of information can be used simultaneously in different situations or for different purposes (Chenhall and Langfield-Smith 2007; Chow and Van der Stede 2006; Lau and Sholihin 2005; Massicotte and Henri 2021; Monteiro et al. 2021; Visedsun and Terdpaopong 2021).

Following the contingency approach, several authors argue that the fit between internal factors (e.g., organizational structure, management accounting systems and characteristics of accounting information) and external factors (e.g., environmental uncertainty and intensity of competition) leads to a better management and organizational performance (Al-Mawali and Am 2016; Baines and Langfield-Smith 2003; Boulianne 2007; Chenhall 2003; Chong 1996; Löfsten and Lindelöf 2005; Oyewo 2022; Turner et al. 2017). For example, some studies suggest that giving greater weight to non-financial and external information in a context of environmental uncertainty improves organizational performance (Al-Mawali and Am 2016; Hoque 2004, 2005; Hoque and James 2000). Thus, to promote organizational performance, it is critical to adjust the accounting information relevance to the level of environmental uncertainty.

In fact, some empirical studies report a direct and positive effect of environmental uncertainty on accounting information relevance/use for decision-making purposes (e.g., Al-Mawali and Am 2016; Cescon et al. 2019; Latan et al. 2018; Oyewo 2021, 2022). Furthermore, previous literature also shows a direct and positive effect of accounting information or management accounting practices on performance (e.g., Adeniran and Obembe 2020; Baines and Langfield-Smith 2003; Cadez and Guilding 2008; Hoque and James 2000; Latan et al. 2018; Turner et al. 2017; Visedsun and Terdpaopong 2021). Concerning moderation analysis, Hoque (2005) showed that environmental uncertainty moderates the relationship between the use of some non-financial performance measures for performance evaluation and organizational performance. Al-Mawali and Am (2016) concluded that environmental uncertainty moderates the relationship between customer accounting information use and organizational performance. However, to the best of our knowledge, no recent study examines, specifically, the association between environmental uncertainty, accounting information relevance, and organizational performance, or investigates the influence of environmental uncertainty on the relationship between non-financial information relevance for decision-making purposes and organizational performance.

Therefore, the main purpose of this paper is to analyze the association between environmental uncertainty, accounting information relevance in decision-making, and organizational performance. Furthermore, we intend to analyze how environmental uncertainty moderates the relationship between non-financial information relevance and organizational performance. In this way, this paper aims to answer to the following research questions: What is the association between environmental uncertainty, accounting information relevance, and organizational performance? How does environmental uncertainty influence the relationship between non-financial information relevance and organizational performance?

This study provides additional insights regarding the relevance of financial and non-financial information for decision-making purposes under uncertainty contexts and its influence on organizational performance, thus contributing to the literature in this research field. Hence, it extends the knowledge on which is the most suitable accounting information for certain situations. Moreover, our study also documents the moderating role of environmental uncertainty on the relationship between non-financial information relevance for decision-making purposes and organizational performance.

The remainder of the paper is structured as follows. In Section 2, we present a summary of the relevant literature and develop our research hypotheses. The research design of this study, including the sample, data collection, and variables measurement, is detailed in Section 3. Section 4 presents and discusses the results regarding the association between the degree of environmental uncertainty, accounting information relevance, and organizational performance. Finally, Section 5 provides the main conclusions, theoretical and practical implications, and limitations of this research, outlining, also, future research opportunities.

2. Theoretical Framework and Research Hypotheses

Organizational environment considers the set of physical and social factors external to organizations that influence their internal characteristics and are therefore considered in the decision-making process (Haldma and Lääts 2002; Löfsten and Lindelöf 2005). Factors such as globalization of operations, increased competition, technological changes, the demand for continuous improvement, and new demands on social and environmental responsibility cause constant changes that lead to increased environmental uncertainty (Latan et al. 2018; Löfsten and Lindelöf 2005; Mia and Clarke 1999; Newkirk and Lederer 2006; Otley 2016). Environmental uncertainty represents a challenge for every organization today and is related to the lack of information and the speed of information, which limit actions (Latan et al. 2018). Given its influence on organizational structure and systems, environmental uncertainty is one of all the variables used in the pioneer contingent studies that has gained the widest attention in management accounting research (Otley 2016).

Recently, in dealing with the unprecedented situation of the COVID-19 pandemic, many decision makers have faced environmental uncertainty, about the reliability of information flows (Lodge and Boin 2020), irrational reactions of financial markets, extreme volatility of the economy, etc. Making decisions in such an environment is unprecedented in its degree of environmental uncertainty (Aon 2020). In these contexts, the information needed by managers in decision-making increases (Baines and Langfield-Smith 2003; Chenhall and Langfield-Smith 1998a, 1998b; Chong 1996; Latan et al. 2018), given the increased unpredictability of future events (Chenhall and Morris 1986). In these conditions of high uncertainty, sophisticated accounting information can help managers enhance decision-making, providing some alternatives and solutions (Latan et al. 2018). On the other hand, environmental uncertainty makes it more necessary for managers to resort to strategic planning (Baines and Langfield-Smith 2003; Newkirk and Lederer 2006) and thus it encourages the introduction of action plans to respond to threats and opportunities (Mia and Clarke 1999).

Managers that face greater environmental uncertainty attach a greater utility to non-financial information, because they consider it more suitable (Boulianne 2007; Chenhall and Morris 1986; Hoque 2005; Hoque and James 2000; Lal and Hassel 1998; Monteiro et al. 2022). Traditional accounting information, mainly on financial and internal events, is too aggregated and inappropriate (Chenhall and Langfield-Smith 1998b; Johnson and Kaplan 1987) and is therefore inadequate and unhelpful in contexts of environmental uncertainty (Hayes 1977). Another limitation of this information is that it does not reflect the efficiency of organizations concerned with intangible factors such as quality, continuous improvement, and customer satisfaction (Baines and Langfield-Smith 2003). In these cases, decision makers need timely, non-financial, and external accounting information (e.g., on markets, customers, and competitors) (Afifa and Saleh 2021; Boulianne 2007; Chenhall and Morris 1986). This is the most relevant information for making better decisions (Baines and

Langfield-Smith 2003), as well as to focus management control on the strategic uncertainties of the organization (Vaivio 1999). It is within this context that the first research hypothesis is formulated.

Hypothesis 1. *The relevance attributed to non-financial information for decision-making is greater when environmental uncertainty is higher.*

As previously mentioned, traditional management accounting information, mostly internal and financial information, has lost some relevance for decision makers in the current circumstances of the organizational environment (Johnson and Kaplan 1987; Ma et al. 2022). Under such circumstances, non-financial, external, and timely accounting information has won the confidence of managers because it alerts them to new situations, allowing a better understanding and control of costs, and enables the achievement of competitive advantages (Chenhall and Langfield-Smith 1998a; Oyewo 2022; Vaivio 1999). Quantitative non-financial information, in particular, helps to attain organizational alignment by integrating the horizontal and vertical dimensions of performance (Bertolotti et al. 2019). Moreover, non-financial information gains relevance for assessing performance in various areas of the organization, such as processes and operations, human resources, customers, and corporate strategy (Baines and Langfield-Smith 2003; Bhimani and Langfield-Smith 2007; Chenhall and Langfield-Smith 2007). Managers know that good performance in these areas leads to good non-financial performance, which increases an organization's financial performance (Baines and Langfield-Smith 2003; Turner et al. 2017). For instance, Turner et al. (2017) have shown that customer performance positively influences financial performance.

However, non-financial information does not replace financial information, and in many cases financial information is more relevant than non-financial information (Bhimani and Langfield-Smith 2007; Chow and Van der Stede 2006; Hyvönen 2007; Massicotte and Henri 2021). According to Bhimani and Langfield-Smith (2007), in strategy development both financial and non-financial information is used, while in strategy implementation greater emphasis is placed on financial information. In turn, Massicotte and Henri (2021) report the use of financial and non-financial information to oversee strategy implementation. Therefore, several authors consider that the main purpose of non-financial information is to complement financial information (Chenhall and Langfield-Smith 2007; Chow and Van der Stede 2006; Lau and Sholihin 2005), which is not sufficient for decision-making purposes (Monteiro et al. 2021). Additionally, for companies' performance measurement, financial measures are usually used, while non-financial measures such as customer satisfaction and loyalty, and employee satisfaction, cannot be ignored (Visedsun and Terdpaopong 2021). Based on the literature review, the following two hypotheses are proposed.

Hypothesis 2. *Managers assign greater relevance to financial information for decision-making than to non-financial information.*

Hypothesis 3. *Managers believe that financial information and non-financial information are complementary.*

Contingency research in management accounting considers that several internal and external contingent factors influence the characteristics of management accounting systems and accounting information required for decision-making (e.g., Abdel-Kader and Luther 2008; Cescon et al. 2019; Chenhall and Morris 1986; Chong and Chong 1997; Haldma and Lääts 2002; Hoque 2005; Hoque and James 2000; Mia and Clarke 1999; Oyewo 2022; Turner et al. 2017). In fact, according to Otley (2016), contingency research seeks to discover when specific accounting information and management accounting practices might be most appropriate for organizations in their specific circumstances. Furthermore, several studies also conclude that the fit between contingent factors such as environmental uncertainty, technology, business strategy, and organizational structure, management accounting sys-

tems, and accounting information required for decision-making improves organizational performance (e.g., [Al-Mawali and Am 2016](#); [Baines and Langfield-Smith 2003](#); [Boulianne 2007](#); [Cadez and Guilding 2008](#); [Chong 1996](#); [Hoque 2005](#); [Hoque and James 2000](#); [Löfsten and Lindelöf 2005](#); [Mia and Clarke 1999](#); [Oyewo 2022](#); [Turner et al. 2017](#)). For instance, [Al-Mawali and Am \(2016\)](#) show that the fit between environmental uncertainty and customer accounting information use improves organizational performance. In contexts of environmental uncertainty, if higher relevance is attributed to non-financial information, organizational performance will also be greater ([Hoque 2004, 2005](#); [Hoque and James 2000](#)). Quality non-financial information contributes to decision-making success which, in turn, is relevant for business success ([Monteiro et al. 2022](#)). Therefore, the following research hypothesis is formulated:

Hypothesis 4. *The match between environmental uncertainty and non-financial information relevance improves organizational performance.*

3. Research Design

The goals of this section are threefold: (i) to present the data collection instrument, (ii) to describe the sample and procedure of data collection, and (iii) to define the variables considered in the construction of the survey questionnaire.

3.1. Data Collection

A quantitative research approach was adopted to test the developed hypotheses. For the data collection, an online questionnaire-based survey was chosen, primarily because it could reach many respondents ([Abdel-Kader and Luther 2008](#)), in addition to enabling the respondent to answer how and where he/she wants, without feeling the pressure to respond immediately ([Gillham 2008](#)). The questionnaire also allowed us to collect the data needed to test the developed hypotheses in the previous section ([Gillham 2008](#)). Furthermore, with a questionnaire survey, it is possible to collect sufficient data to allow the generalization of results to the population being analyzed, which allows advances in contingency research that comes from the ascertainment of general patterns ([Chenhall 2003](#)).

As this instrument is not without limitations, to minimize them, the recommendations of [Hill and Hill \(2008\)](#) were followed. The questions were organized into sections to create a common thread between them and a pre-test was conducted. We sent to experts (i.e., three academics and five practitioners) a draft of the questionnaire for review and recommendation. The purposes of the pre-test were threefold: (i) to assess the adequacy of our questionnaire design, (ii) to verify whether the items captured the relevant dimensions of our variables, and (iii) to verify whether practitioners found the questionnaire items understandable and plausible. The feedback led to minor changes in the structure of the questionnaire and the wording of some individual items.

To implement the survey, we chose to send it by electronic mail, as in previous studies (e.g., [Cadez and Guilding 2008](#); [Cescon et al. 2019](#); [Holm et al. 2016](#); [Hyvönen 2007](#); [Latan et al. 2018](#); [Lau and Sholihin 2005](#); [Massicotte and Henri 2021](#); [Monteiro et al. 2022](#)). A free software program available on the internet was used for this purpose. It does not require programming skills and is inexpensive to use ([Fleming and Bowden 2009](#); [Ganassali 2008](#)). Compared with conventional questionnaire-based surveys (i.e., mail, telephone, and on-site), online questionnaire-based surveys have two main advantages: (i) low-cost administration, enabling large sample sizes, and (ii) speed and accuracy of data collection ([Fleming and Bowden 2009](#)). Moreover, [Loomis and Paterson \(2018\)](#) stress that there are no significant differences between the two data collection modes regarding response rate, item nonresponse, and nature of the data, which validates this approach.

3.2. Sample and Procedure

After finalizing the questionnaire, the target population of the study was selected. For this, we asked the National Statistics Institute (NSI) a list of the top 500 manufacturing

companies, according to turnover, operating in Portugal. The choice of the larger manufacturing companies is justified by the fact that several studies state that larger companies have greater information needs for planning, control, and decision-making purposes (Abdel-Kader and Luther 2008; Alves 2010; Chenhall 2003; Chenhall and Langfield-Smith 1998a; Haldma and Lääts 2002). In addition, most of the studies reviewed had as targets the larger manufacturing companies (e.g., Baines and Langfield-Smith 2003; Cescon et al. 2019; Hoque and James 2000; Oyewo 2021; Visedsun and Terdpaopong 2021). Therefore, to be able to compare our results with those of these studies, it was considered important that the target population had similar characteristics.

Since we needed email addresses to send the questionnaire and collect the data, we updated the information provided by the NSI through a telephone call made to all companies. This led to the exclusion of nine companies¹. After that, the questionnaire was sent to the person in charge of the financial department of 491 large manufacturing companies operating in Portugal that are the subjects of this study. Three months after the first mailing, a second mailing of questionnaires was carried out. Aware that the number of contacts, the persistence of the researcher, and the personalization of those contacts significantly affect the response rate to surveys (Ganassali 2008), along with the third mailing of questionnaires, we started making phone calls inviting financial managers to participate in the study. At the end of this process, 119 questionnaires were received. As there was a need to exclude five questionnaires because they were incorrectly completed (Gillham 2008), 114 usable responses were considered, which corresponds to a response rate of 23%. This response rate is above or in line with those of previous studies on management accounting (Baines and Langfield-Smith 2003; Cescon et al. 2019; Holm et al. 2016; Latan et al. 2018; Monteiro et al. 2022; Visedsun and Terdpaopong 2021).

Regarding the characteristics of the firms surveyed (turnover and number of employees) it was verified that 49% of the firms had turnover exceeding EUR 55 M and 57% had more than 250 employees (Table 1). Regarding the respondents, it appears that 50% were in an administrative/financial position.

Table 1. Characteristics of sample and respondents.

Description	Quantity (%)
Size (turnover EUR):	
Less than 25 M	13 (11.40%)
25 M to 35 M	21 (18.42%)
35 M to 55 M	24 (21.05%)
55 M to 90 M	22 (19.30%)
More than 90 M	34 (29.82%)
Size (number of employees):	
Less than 100	15 (13.16%)
100 to 249	34 (29.82%)
250 to 500	38 (33.33%)
More than 500	27 (23.68%)
Position of respondents:	
Managing/financial director	57 (50.00%)
Management controller	22 (19.30%)
Accountant	21 (18.42%)
Administrator/manager	7 (6.14%)
Other	7 (6.14%)

To examine possible differences between respondents and non-responding companies concerning turnover and number of employees, like Drury and Tayles (2006) and Gilding et al. (2000) we used the nonparametric test of Mann-Whitney. Regarding the turnover, some differences were found in central tendency. Through the analysis of the median, it was found that firms with higher turnover were also the ones that answered the questionnaire.

3.3. Variables Measurement

Some instruments developed in previous studies were used or adapted to measure the variables needed to test the research hypotheses developed in this study. Besides ensuring a greater reliability and validity of the information gathered, using instruments tested in other studies allows a more accurate comparison of results (Chenhall 2003). In this context, we will describe how the variables were operationalized and the instruments used to measure them.

The environmental uncertainty variable was measured based on an instrument developed by Teo and King (1997) and used later by Newkirk and Lederer (2006). Some adjustments were made in this instrument resulting from the studies of Chenhall (2003) and Löfsten and Lindelöf (2005). We added two items presented by Löfsten and Lindelöf (2005) (the intensity of research and development; and the legal, political, and economic constraints), and an item suggested by Chenhall (2003) (the requirements in terms of social and environmental responsibility) that recognizes social and environmental issues as relevant sources of environmental uncertainty (Latan et al. 2018). Respondents were requested to indicate their perception about the predictability of 15 items using a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Rating on these items was averaged to determine the environmental uncertainty index. Prior studies have used a similar approach to measure environmental uncertainty (e.g., Hoque 2005; Oyewo 2022).

In order to measure accounting information relevance (financial and non-financial), we used an instrument based on a set of items identified in the literature (Baines and Langfield-Smith 2003; Chow and Van der Stede 2006; Vaivio 1999). Comprising 25 items, this instrument considers nine items to measure financial information relevance (indicators of costs, results, profitability, and return on investment) and 16 items to measure non-financial information relevance (indicators related to processes and operations, employees, and suppliers and customers). Respondents were asked to indicate the relevance attributed to these items of financial and non-financial information to decision-making purposes using a Likert-type scale ranging from 1 (no impact) to 5 (very relevant). The respective scores were additively combined and averaged to derive indexes for financial information relevance and non-financial information relevance. A similar approach was used by Baines and Langfield-Smith (2003).

To measure the organizational performance variable, an instrument previously used by Hoque and James (2000) and modified by Cadez and Guilding (2008) was adopted. This instrument, which was used in several studies (e.g., Abernethy and Lillis 1995; Baines and Langfield-Smith 2003; Chenhall and Langfield-Smith 1998b; Oyewo 2022), consists in asking respondents to assess the organization's performance compared to that of competitors. This instrument considers seven² financial and non-financial dimensions and uses a Likert-type scale ranging from 1 (much worse than competitors) to 5 (much better than competitors). Rating on these dimensions was averaged to determine the organizational performance index for each company. Prior studies have used a similar approach to measure organizational performance (e.g., Cadez and Guilding 2008; Oyewo 2022).

Statistical analysis of the data collected was performed using the SPSS program, as in previous studies (e.g., Hoque 2005; Monteiro et al. 2021; Monteiro et al. 2022). We carried out univariate, bivariate, and multivariate analyses. In the next section, we proceed to the presentation and discussion of results.

4. Results and Discussion

The goals of this section are to describe the variables and analyze the association between environmental uncertainty, financial and non-financial information relevance in decision-making, and organizational performance. In addition, we analyze how the interaction between environmental uncertainty and non-financial information relevance for decision-making purposes influences organizational performance. That is, in this section we present a descriptive analysis of the variables and test the hypotheses developed in Section 2.

4.1. Descriptive Analysis

The reliability and descriptive statistics of the variables under study are presented in Table 2. As shown, and except for environmental uncertainty, the variables were established with all the items considered in the questionnaire. For the creation of the environmental uncertainty variable, 2 of the 15 items were excluded (the shortage of skilled labor and the shortage of materials) since Cronbach's alpha improves with this exclusion. We used Cronbach's alpha to assess the reliability, or internal consistency, and it appears that all the items had a good or very good internal consistency (Marôco 2021; Pestana and Gageiro 2014).

Table 2. Reliability and descriptive statistics of variables.

Variable	Number of Items Used	Cronbach's Alpha	Mean (n = 114)	Standard Deviation
Environmental uncertainty (EU)	13	0.79	3.31	0.53
Financial information (FI)	9	0.87	4.24	0.55
Non-financial information (NFI)	16	0.93	4.04	0.62
Process and operations (PO)	5	0.87	4.13	0.68
Employees (E)	5	0.90	3.75	0.76
External environment (EE)	6	0.88	4.21	0.67
Organizational performance (OP)	7	0.86	3.60	0.50

Regarding environmental uncertainty, the perception of respondents indicated that the level of uncertainty was moderate (3.31) and resulted essentially from the intense competition on prices, quality, and product differentiation, and the high level of social and environmental responsibility. Thus, it seems that factors related to intense competition drive environmental uncertainty (Baines and Langfield-Smith 2003; Mia and Clarke 1999). The same was true regarding the requirements in terms of social and environmental responsibility, as advocated by Chenhall (2003) and Latan et al. (2018), which were perceived by respondents as very high. In fact, most Portuguese companies operate in the highly competitive environment of the European Union (Monteiro et al. 2021). In addition, social and environmental issues have been also one of the biggest priorities of the European Union.

Concerning the relevance attributed to financial and non-financial information for decision-making purposes, the results indicate that it was significant (high or very high). The financial indicators considered most relevant were the overall results of the organization, production costs, and sales costs. In turn, the most relevant non-financial indicators were related to customer satisfaction, loyalty, and complaints, all of which are external indicators. Curiously, non-financial indicators related to employees were deemed the least relevant for decision-making.

Respondents' perceptions of organizational performance when compared to competitors' performance are also shown in Table 2. The results obtained reveal that respondents considered their organization's performance to be moderately higher than that of competitors.

4.2. Hypotheses Testing

In this section we demonstrate how the hypotheses formulated in the second section of the paper were tested, using bivariate and multivariate analyses. An objective of this study was to examine the nature and strength of the association between key variables. This was achieved using correlation analysis, in particular Spearman correlations. Here, when the coefficients are closer to 1 it means a strong positive association between two variables; in contrast, coefficients closer to zero imply weak association. A summary of the results obtained is presented in Table 3.

Table 3. Spearman correlations.

Variable	EU	FI	NFI	PO	E	EE	OP
Environmental uncertainty (EU)	1						
Financial information (FI)	0.09	1					
Non-financial information (NFI)	0.21 *	0.76 **	1				
Process and operations (PO)	0.12	0.73 **	0.85 **	1			
Employees (E)	0.23 *	0.63 **	0.90 **	0.68 *	1		
External environment (EE)	0.21 *	0.72 *	0.90 **	0.69 *	0.73 **	1	
Organizational performance (OP)	−0.06	−0.08	−0.07	−0.18	−0.07	0.02	1

**, * Significant at 1 and 5% (two-tailed), respectively.

Our analysis begins by examining the strength of the association between variables using the Spearman correlation coefficient (Table 3). It appears that there was a positive association, although weak, between environmental uncertainty and non-financial information relevance, related to employees and the external environment. These results are statistically significant (p -value < 0.05), suggesting that with increasing environmental uncertainty greater emphasis should be placed on non-financial information in decision-making. It should be noted, however, that this association between environmental uncertainty and non-financial information relevance was not evident when it comes to information related to processes and operations. Still, the results allow supporting Hypothesis 1. These results are consistent with those of other studies, conducted in other countries (Boulianne 2007; Chenhall and Morris 1986; Chong and Chong 1997; Hoque 2005; Hoque and James 2000; Lal and Hassel 1998). Therefore, we can state that the relevance attributed to non-financial information for decision-making purposes is greater when environmental uncertainty is higher. In these contexts, managers need sophisticated accounting information to enhance decision-making quality (Latan et al. 2018) and non-financial information, in particular, contributes to decision-making success (Monteiro et al. 2022).

No statistically significant association was evidenced between environmental uncertainty and financial information relevance in decision-making. Regarding the relevance attributed to accounting information, the results (Table 3) indicate a strong and positive association between the relevance attributed to financial information and the relevance attributed to non-financial information in decision-making. Thus, it appears that when greater relevance was attributed to financial information in decision-making it was also attributed to non-financial information, whether related to processes and operations and employees (p -value < 0.01), non-financial information connected with customers and suppliers (p -value < 0.05), or vice versa. As argued by Chenhall and Langfield-Smith (2007), non-financial information complements financial information but does not replace it, confirming Hypothesis 3. These findings are in line with the results obtained by Lau and Sholihin (2005) and Chow and Van der Stede (2006). Financial information is not sufficient for decision-making purposes (Monteiro et al. 2021). In several situations, both financial and non-financial information is used (Bhimani and Langfield-Smith 2007; Massicotte and Henri 2021). Therefore, we can state that financial information and non-financial information are complementary.

To compare the relevance given to financial information and non-financial information, both overall and partial (processes and operations, employees and outside), we used the nonparametric Wilcoxon test, which allows comparing measures of central tendency of two variables (Marôco 2021; Pestana and Gageiro 2014). Previous studies have used the Wilcoxon test for similar analyses (e.g., Holm et al. 2016). The results obtained and summarized in Table 4 show that there are statistically significant differences (p -value < 0.01) between the relevance attributed to financial information and non-financial information in decision-making. Through the analysis of the measure of central tendency of these

variables it was found that the median of the relevance attributed to financial information (4.17) is above the median of relevance attributed to non-financial information (4.06). However, despite this difference between the relevance attributed to financial information and non-financial information related to processes and operations and employees, no statistically significant differences between the relevance attributed to financial information and non-financial information related to the external environment could be demonstrated. In this context, as verified by [Bhimani and Langfield-Smith \(2007\)](#), there are situations in which financial information is considered more relevant to decision-making than non-financial information. In this study, these situations fell into the contexts of decision-making associated with processes and operations, and employees. These results confirm Hypothesis 2 and are consistent with those obtained by other authors ([Chow and Van der Stede 2006](#); [Hyvönen 2007](#)). Financial information remains relevant for managers ([Hyvönen 2007](#)). Therefore, we can state that managers assign greater relevance to financial information for decision-making than to non-financial information in decisions related to internal processes, operations, and employees.

Table 4. Wilcoxon tests: relevance of financial and non-financial information.

Description	Financial and Non-Financial	Financial and Process	Financial and Employees	Financial and External Environment
Z	−4.87	−2.54	−7.02	−0.12
Asymp. Sig. (two-tailed)	0.00	0.01	0.00	0.90

To test Hypothesis 4, and thus assess the adjustment between the environmental uncertainty and the relevance assigned to non-financial information, as in previous studies (e.g., [Hoque 2005](#); [Hyvönen 2007](#); [Oyewo 2022](#)), we used the linear regression model that allows estimating the direct effects and interaction of independent variables on the dependent variable. Following [Afifa and Saleh \(2021\)](#) and [Oyewo \(2022\)](#), before performing the regression analysis, multicollinearity between the predictor variables considered in each regression model was inspected using correlation analysis. Table 3 shows that all Spearman correlations were at the acceptance level (low correlation levels) and, thus, there was no problem with multicollinearity. Consequently, a regression model was run using the SPSS program. According to [Gerdin and Greve \(2008, p. 1003\)](#) “one frequently used technique for testing the existence of a significant difference in regression coefficients is the moderate regression analysis (MRA)”.

MRA has usually the following format:

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 X_2 + e$$

where Y represents organizational performance (dependent variable); X_1 represents environmental uncertainty (independent variable); X_2 represents the non-financial information relevance (moderator); $X_1 X_2$ is the moderating effect that X_2 has on the relationship between X_1 and Y ; α_0 represents a constant; and e is the error variable ([Gerdin and Greve 2008](#)).

The results (Table 5) show that there was no effect of environmental uncertainty in the relevance attributed to non-financial information and in the interaction between these variables on the dependent variable related to organizational performance. This is because the linear regression model and the effects (direct and interactive) of independent variables on organizational performance were not statistically significant.

Table 5. Results of regression.

Variable	Coefficient	Standard Error	t-Value	p-Value
Constant (α_0)	6.02	1.93	3.12	0.00
Environmental uncertainty (X_1)	−0.71	0.59	−1.21	0.23
Non-financial information (X_2)	−0.59	0.48	−1.24	0.22
X_1X_2	9.173	0.14	1.21	0.23
$R^2 = 0.01$; $F_{3,110} = 0.53$; $p = 0.66$				

In order to verify a possible partial effect of non-financial information and environmental uncertainty on the organizational performance, we used the linear regression for each of the components of non-financial information (processes and operations, employees, and external environment). The results presented in Table 6 confirm that there was no direct effect of the relevance attributed to non-financial information, nor any effect resulting from the interaction with environmental uncertainty on the organizational performance. The models presented and the effects of independent variables on organizational performance are not statistically significant.

Table 6. Additional regression analysis (partial effects).

Variable	Coefficient	Standard Error	t-Value	p-Value
Constant (α_0)	3.78	1.99	1.89	0.06
Environmental uncertainty (X_1)	0.08	0.61	0.14	0.89
Process and Operations (X_2)	−0.05	0.48	−0.09	0.92
X_1X_2	−0.02	0.15	−0.13	0.90
$R^2 = 0.02$; $F_{3,110} = 0.80$; $p = 0.49$				
Constant (α_0)	5.77	1.42	4.07	0.00
Environmental uncertainty (X_1)	−0.67	0.44	−1.55	0.13
Employees (X_2)	−0.56	0.37	−1.51	0.13
X_1X_2	0.17	0.11	1.54	0.13
$R^2 = 0.02$; $F_{3,110} = 0.81$; $p = 0.49$				
Constant (α_0)	5.96	1.67	3.57	0.00
Environmental uncertainty (X_1)	−0.78	0.52	−1.51	0.13
External environment (X_2)	−0.54	0.40	−1.37	0.17
X_1X_2	0.18	0.12	1.48	0.14
$R^2 = 0.02$; $F_{3,110} = 0.81$; $p = 0.49$				

As there was no direct effect from environmental uncertainty and the relevance assigned to non-financial information, not even one resulting from the interaction between them on organizational performance, Hypothesis 4 is not confirmed. In this sense, the results are surprising and contradict the results obtained by [Hoque and James \(2000\)](#), [Hoque \(2005\)](#), and [Al-Mawali and Am \(2016\)](#), who concluded that organizational performance is influenced by the interplay between environmental uncertainty and the relevance assigned to non-financial information for decision-making or the use of customer accounting information. These differences can occur because other aspects are not being considered, which may also influence environmental uncertainty, non-financial information relevance, and organizational performance. Therefore, additional research should be conducted to investigate this association.

5. Conclusions

In recent years, the organizational environment has changed significantly because of the globalization of business, increased competition, rapidly changing technologies and demands for continuous improvement, and more recently as a result of the pandemic crisis and the recent war in Ukraine, all of which have increased uncertainty for companies. In

these circumstances, managers need not only more accounting information, but also more timely accounting information to make better decisions and thus achieve their goals. That is why non-financial information becomes relevant in decision-making, and also because it is available sooner and a good non-financial performance may translate into good financial performance.

From the literature review, four hypotheses were formulated aiming to analyze the association between environmental uncertainty, (financial and non-financial) accounting information relevance in decision-making, and organizational performance. It appears that the organizational environment of large manufacturing companies operating in Portugal has a moderate uncertainty, resulting mainly from intense competition and high demands for social and environmental responsibility. In situations of higher environmental uncertainty, greater emphasis is given to non-financial information for decision-making, particularly to the non-financial information related to employees and customers, and supplier assessment. However, in general, managers continue to attach greater relevance to financial information than to non-financial information related to processes, operations, and employees. The same is not true for non-financial information related to the external environment. Our results suggest that in the evaluation of customers and suppliers, non-financial information is of similar relevance to managers as financial information. Furthermore, when greater relevance is assigned to financial information, greater emphasis is also given to non-financial information. Thus, we conclude that financial information and non-financial information are complementary.

Regarding the impact of environmental uncertainty and the relevance attributed to non-financial information on organizational performance, contrary to the results of [Hoque and James \(2000\)](#), [Hoque \(2005\)](#), and [Al-Mawali and Am \(2016\)](#), the data collected did not reveal statistically significant results. Thus, there is a need to understand what additional factors (e.g., contingent factors such as competitiveness, strategy, technology, organizational structure, and organizational and national culture) can influence these variables and have led to different findings.

The implications of this paper are relevant not only for researchers but also for practitioners (e.g., accounting professionals and managers). From the theoretical point of view, the results of this study contribute to theory by validating the findings of previous contingency studies regarding the influence of environmental uncertainty on non-financial information relevance for decision-making purposes. In line with the contingency perspective, non-financial information is more relevant under specific circumstances, that is, uncertainty contexts. Nevertheless, this information should be combined with financial information, given their complementary nature. The results regarding the influence of environmental uncertainty on the relationship between non-financial information relevance and organizational performance, however, challenge findings of previous studies. Thus, further research is needed to examine this relationship, considering also what additional factors can influence this relationship and justify the different results achieved.

From the practical point of view, the findings of this research reveal the need for accounting professionals and managers to provide and use non-financial information in decision-making, namely in uncertainty contexts. In these contexts, given their complementary nature, not only non-financial information should be provided and used, but also financial information. These findings support the implementation of accounting practices, in particular strategic management accounting practices, which collect and provide financial and non-financial information. Some of these strategic management accounting practices are particularly devoted to providing non-financial information on customers, which is considered relevant to decision-making purposes. Therefore, organizations regarding the external environment as uncertain have a greater tendency to use strategic management accounting practices to survive intense competition ([Oyewo 2022](#)).

This study has some limitations that should be considered when interpreting the results. A main limitation relates to the instrument used for data collection, the questionnaire-based survey, as it restricts the number of questions, prevents the placement of new

questions to clarify certain situations detected, does not allow the respondent to aid in the interpretation of questions, and is not always filled in by the most suitable person. Another limitation arises from the fact it was a “cross section” study. Studies with contingency approaches have been the target of some criticism (Chapman 1997; Tillema 2005). Longitudinal studies using qualitative methods, such as case studies, may help to overcome these criticisms, since these approaches consider the specific context of the organizations not captured by questionnaire-based surveys (Otley 2016). However, “surveys” are needed to make generalizations and thus build a coherent whole (Chenhall 2003; Tillema 2005).

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Notes

- ¹ One company was excluded because it ceased activity. Another company has been excluded for failing to engage in the transformation. Two companies were excluded because they had ceased to form two new companies (already part of the list supplied by the INE). Finally, five companies were excluded because we could not reach them (via phone and email).
- ² We adopted the seven dimensions used by Cadez and Guilding (2008).

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