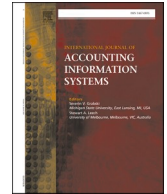




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The impact of information systems and non-financial information on company success

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ABSTRACT

This study aims to develop and evaluate a model that seeks to measure the impact of Accounting Information System Quality, Internal Control System Quality and Non-Financial Information Quality on company success (Decision-Making Success and Non-Financial Performance). This model is empirically tested with data obtained from the managers of 381 Portuguese companies. We use structural equation modelling in the analysis of causal relationships between different constructs. The results show that information and control systems quality (accounting and internal control) have a direct impact on Non-Financial Information Quality and an indirect impact on Decision-Making Success. The results also indicate that Quality Non-Financial Information does not contribute directly to Non-Financial Performance but contributes indirectly via Decision-Making Success. The exploratory variables prove to be crucial for the companies' Non-Financial Performance, accounting for its 62% variance. Previous research focuses primarily on financial information quality and financial performance. This study is the first to empirically prove that information and control systems contribute favourably to the transparency and value-relevance of non-financial information and, consequently, to business success.

1. Introduction

Today there is an urgent need for companies to adapt to the constantly changing business environment. This environment exposes managers to voluminous data, which leads to the need to convert it into value-relevant information for decision-making. Information systems play an important role in business management because managers and other stakeholders require that information systems produce useful and quality information. However, 'a major problem that stakeholders of financial reporting face is the need for

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credible information to assist in the decision-making process' (Frazer, 2020, p. 28). The most recent literature highlights the importance of considering in the decision-making process not only financial information, but also a comprehensive set of non-financial indicators (Sievers et al., 2013). The complementarity between financial and non-financial information is highlighted in several studies (e.g., Amir and Lev, 1996; Callen et al., 2010). For instance, Shevlin (1996, p. 31), using a sample of cellular phone companies, concluded that the financial information is value-relevant after the inclusion of the non-financial information and that the non-financial information they examine is value-relevant by itself and also incremental to the financial information. In fact, non-financial information influences manager behaviour in decision-making (Cohen et al., 2012).

Research in the fields of accounting and decision-making highlights the need to adapt the accounting information system to the organisational requirements for communication and control of information (Nicolaou, 2000). For Hla and Teru (2015), the accounting information system is a computer-based system that increases the control of the organisation. An accounting information system is considered a system that collects and processes data in terms of money and is an important source of accounting information (Neogy, 2014) that assists in the management and control of aspects within a company's economic-financial domain (Soudani, 2012). According to Sajady et al. (2008, p. 50), the 'accounting information systems are considered as important organisational mechanisms that are critical for effectiveness of decision management and control in organisations'. For Rashedi and Dargahi (2019, p. 33), an accounting information system 'provides financial information that is essential to monitor and manage organisational resources together with conventional accounting controls'. The literature also suggests that the qualitative characteristic of an accounting information system can be maintained if there is a sound and effective internal control system (Hla and Teru, 2015; Neogy, 2014). According to the International Standards on Auditing, an internal control system should be the basis of every company's development plan and should help it to properly organise and control all its activities (Dimitrijevic et al., 2015). In addition, internal control contributes to precise financial information that reflects the true operations of a firm's business activities (Campbell et al., 2016).

Previous studies suggest that Accounting Information System Quality and Internal Control System Quality contribute to accounting information quality, with a consequent impact on decision-making and business success (e.g., Bozzolan and Miihkinen, 2019; Frazer, 2020; Gal and Akisik, 2020; Monteiro et al., 2021a; Monteiro et al., 2021b). Phornlaphatrachakorn (2019) empirically shows that the Internal Control System Quality influences the Decision-Making Success directly and indirectly through the usefulness of the accounting information. Likewise, Monteiro et al. (2021b), demonstrated that the Internal Control System Quality has direct impact on the Financial Information Quality and an indirect impact on Decision-Making Success.

Rashedi and Dargahi (2019) study proves that the accounting information systems and the effectiveness of internal control have a significant influence on the financial reporting quality. Monteiro et al. (2021a) found that both Internal Control System Quality and Accounting Information System Quality contribute to the financial information quality and, consequently, the usefulness of the financial.

Beyond financial information, Sievers et al. (2013) stress the importance of non-financial information. In fact, in recent years, non-financial information has received increasing attention from organisations and academics (Ahmad and Zabri, 2016), because it can determine the success of companies.

However, we have not identified studies that assess the importance of information and control systems for the Non-Financial Information Quality and the contributions of this variable to company success.

In order to fill this gap in the literature, this study aims to develop and evaluate a model to prove that Decision-Making Success and consequent Non-Financial Performance depend on the quality of the information and control systems quality and the Non-Financial Information Quality.

This research, in addition to filling a gap in the literature, has implications for practice, as it highlights the importance of the Non-Financial Information Quality and its determinants (information and control systems quality) for business survival and growth.

The results of the study suggest 'first-hand' that information and control systems quality improve the non-financial information quality and this, in turn, contributes positively to the success of Portuguese companies.

The paper is structured as follows: in Section 2, the successful decision-making and consequent Non-financial Performance with specific focus on its determinants are discussed, and the investigation hypotheses are presented. Section 3 provides the research method for this study. Section 4 comprises the results of the evaluation of the proposed model. Finally, Section 5 presents the discussion and the conclusion featuring future research opportunities.

2. Theoretical framework and research hypotheses

In traditional accounting, financial statement information is considered sufficient for the evaluation of companies (Orens and Lybaert, 2010). However, accounting is moving away from traditional procedures and is increasingly encompassing non-financial information. In recent decades, professionals and academics have emphasised the importance of non-financial information in decision-making (Orens and Lybaert, 2010).

Tarquino and Posadas (2020) investigate how the term 'non-financial information' is defined in the literature and concluded that the meaning of non-financial information is still ambiguous and multifaceted, with no common understanding, no single definition and no generally accepted term. Initially, non-financial information was defined as additional information not disclosed in financial statements of a company (e.g., Banker et al., 2000; Orens and Lybaert, 2010). For Upton (2001, p. 5), 'non-financial disclosures and metrics include index scores, ratios, counts and other information not presented in the basic financial statements'. According to Maj (2018), some organisations use sectoral information, which allows for a better evaluation and comparison of information. For Cohen et al. (2008, p. 167), non-financial information includes 'general economic conditions, technological changes in the client's industry, and new products from competitors'. According to Admiraal et al. (2009, p. 15), non-financial information 'comprises all quantitative

and qualitative data on the policy pursued, the business operations, and the results of this policy in terms of output or outcome, without a direct link with a financial registration system'. Most recently, authors associated the definition of non-financial information with information related to social responsibility or sustainability (e.g., [Chong et al., 2018](#); [Manes-Rossi et al., 2018](#); [Barbosa et al., 2021](#)). [Manes-Rossi et al. \(2018\)](#), basing their findings on the literature, indicate that non-financial information 'refers to a broad range of themes and issues such as environmental and social policies and impacts (e.g., resource and energy use, greenhouse gas emissions, pollution, biodiversity, climate change, waste treatment, health and safety of employees, gender equality, education) and is pivotal to improve accountability and transparency towards stakeholders'.

In fact, the interest in non-financial information has led to a wider adoption of reporting (annual report or separate reports) by companies to provide stakeholders with financial information and non-financial information related to business activity and aspects of social and environmental issues.

Several studies have emerged with the aim of assessing the value-relevance of corporate non-financial information ([Orens and Lybaert, 2010](#)). Value-relevance of non-financial information exists when information is deemed useful enough to be analysed and considered in the decision-making process ([Flöstrand and Ström, 2006](#)). In this respect, [Callen et al. \(2010, p. 61\)](#) find that non-financial information is relevant in explaining annual returns, share prices and investment grading by investors (long-term) and that 'non-financial variables are value-relevant after controlling for financial variables suggesting that the two types of variables are complements'. Furthermore, [Flöstrand and Ström \(2006, p. 580\)](#) find that 'analysts tend to rely more heavily on forward-looking non-financial information than on historical non-financial information'.

Stakeholders are interested in non-financial information because they face challenges with regard to accessing information considered relevant, reliable, complete and comparable ([Barker and Eccles, 2018](#)). However, there are no standardised qualitative characteristics for non-financial information such as those which exist for financial information. [Rezaee and Tuo \(2019\)](#) classify non-financial information by the existence of true, complete, and timely information. In order to ensure the efficiency and effectiveness of activities and the reliability of information and compliance with applicable laws, companies need adequate internal control ([Frazer, 2020](#); [Campbell et al., 2016](#); [Jokipii, 2010](#)). According to [Frazer \(2020, p. 29\)](#), 'internal control encompasses the policies, rules, and procedures enacted by management to provide reasonable assurance that financial reporting is reliable, the operations are effective and efficient, and the activities comply with applicable laws and regulations'.

Economic growth and the expansion of capital markets, the emergence of new technological trends, globalisation, and competition, among other factors, have created the need, on the part of companies, for a correct assessment of their internal control system ([Silva and Sena, 2019](#)). This theme has aroused growing interest worldwide due mainly to the economic crises and financial scandals that have occurred in recent decades. Thus, according to the [American Institute of Certified Public Accountants \(AICPA\) \(2014\)](#), the internal control system allows, above all, to minimise the risk of unintentional errors or intentional fraud. According to [Frazer \(2020, p. 28\)](#), 'internal control can be successfully applied to any company to foster accurate financial reporting, non-financial information, compliance with laws and operational efficiency'.

[Dimitrijevic et al. \(2015\)](#) state that, according to the International Standards on Auditing, an internal control system should be the basis of the development plan of each company and should help it to organise and properly control all its activity. Thus, Internal Control System Quality is important for companies, that is, for their survival and sustainability of their activities in the long term, as it allows for the control/analysis of the veracity of companies' results ([Phornlaphatrachakorn, 2019](#)). Internal Control System Quality refers to a set of processes that appropriately guides companies to achieve effectiveness and efficiency of operations, quality in accounting information reporting, and enforces compliance with applicable laws and regulations ([Schroeder and Shepardson, 2016](#)). Thus, internal control procedures improve the quality of the information disclosed by the company ([Baugh et al., 2021](#); [Phornlaphatrachakorn, 2019](#)). [Monteiro et al. \(2021a, 2021b\)](#) show that there is a positive and significant relationship between Internal Control System Quality and Financial Information Quality.

[Jokipii \(2010\)](#) mentions that companies have adapted the structure of internal control systems to deal with environmental uncertainty and ensure an effective internal control system. Therefore, if an internal control system is successfully applied, it can promote the higher quality and accuracy of financial and non-financial reporting ([Bauer et al., 2017](#); [Bozzolan and Miihkinen, 2019](#); [Frazer, 2020](#); [Gal and Akisik, 2020](#); [Monteiro et al., 2021a, 2021b](#)). Moreover, Internal Control System Quality increases the credibility and transparency of non-financial information ([Frazer, 2020](#)). In view of the above, the first research hypothesis is formulated:

H1. The Internal Control System Quality has a positive impact on Non-Financial Information Quality.

[Buljubašić and Ilgün \(2015\)](#) and [Patel \(2015\)](#) state that the information that is considered important in decision-making is delivered by the accounting information system. Therefore, the literature also recognises the importance of accounting information systems for the reliability and transparency of financial and non-financial information. For [Soudani \(2012, p. 137\)](#), the main advantages of the optimal use of an accounting information system in a company are linked to 'better adaptation to a changing environment, better management of arm's length transactions and a high degree of competitiveness'.

According to [Hla and Teru \(2015\)](#) and [Monteiro and Cepêda \(2021\)](#), the accounting information system had been used by companies to automate information relating business operations. The accounting information system encompasses the processes, procedures and systems that allow the production of accounting information resulting from the company's activity and to report this information in a summarised manner to internal and external stakeholders of the entity ([Turner et al., 2020](#)). Thus, according to [Kaplan et al. \(1998\)](#), the main function of the accounting information system is to document the economic events and verify the impact that they have on the company's economic and financial situation. For [Sari et al. \(2019\)](#), the accounting information system should provide important information to reduce uncertainty in decision-making and promote better planning and control of business activities.

Buljubašić and Ilgün (2015) and Patel (2015) state that the information considered important in decision-making is delivered by the accounting information system. For Neogy (2014, p. 40), the accounting information system ‘processes accounting transactions and provides information to interested users that are used to make effective decisions, to help management execute business activities correctly and finally to measure the performance of the company’. Nevertheless, according to Sajady et al. (2008), the effectiveness of the accounting information system depends on the decision-makers’ perception of the effectiveness of the information generated by the system itself to satisfy informational needs. Doll and Torkzadeh (1988) suggest that the satisfaction of the accounting information systems users depends on information content, accuracy, format, ease of use and timeliness. For Fitrios et al. (2018) and Binh et al. (2020), the Accounting Information System Quality is related to the ability of the system to process the financial data and produce the accounting information useful for decision making, thereby determining the company’s success. Following the same line, we define Accounting Information System Quality as the capacity of the system to process and convert a large amount of data into quality information (financial and non-financial), with value-relevance to the decision-making process and to development of the company’s activities efficiently and effectively. Thus, Binh et al. (2020), consider that the Accounting Information System Quality results from the combination of the quality of the system and the quality of the information. In fact, an entity can only conduct itself properly if decisions, implementation, and execution control are based on information that meets the quality criteria (Srivastava and Lognathan, 2016).

Petcharat and Mula (2009) also allude to the importance of the Management Accounting Information System (MAIS), a subsystem of the accounting information system, as it provides information on environmental and social costs, which allows for the preparing and disclosing of more complete information for superior decision-making. Zyznarska-Dworczak (2018) adds that MAIS should ensure the transparency of accounting information, related to corporate responsibility, which consequently increases the credibility of corporate responsibility reporting, as it improves the quality of non-financial information. In this context, the second research hypothesis is formulated:

H2. The Accounting Information System Quality has a positive impact on the non-financial information Quality.

According to Gal and Akisik (2020, p. 1236), ‘although financial statement information is value relevant, there is evidence that shareholders also consider nonfinancial information in their evaluation of firms’ value’. For Sievers et al. (2013), non-financial indicators can support managers’ decision-making. However, a major problem that financial reporting users face is the lack of access to reliable information in support of the decision-making process (Frazer, 2020). Harren (1979) defines the decision-making model as a description of a psychological process in which the decision maker must organise the necessary information, analyse the various alternatives to solve the problem, and commit to an action. For Aritz et al. (2017, p. 164) ‘in an organisational setting, decision making typically involves identifying goals, gathering information, and using that information to determine the best course of action to achieve the designated goal’. However, according to Shabsavarani and Abadi (2015), the process involves continuous risk because it is associated with an opportunity cost (loss owing to a missed opportunity). Therefore, the Decision-Making Success refers to the ability of business decision makers to manage problems successfully (Powell, 1987; White et al., 2015). In this study, we define Decision-Making Success as the ability of companies to choose the best business alternatives or options, using that information in a way that accomplishes a desired aim or result. Thus, for success, decision makers need information to support their choices, that is, information of both qualitative and quantitative nature (Smith, 2020). Furthermore, this author mentions that as much data as possible, in real time, can help the decision maker to make the best choices.

According to Buljubašić and Ilgün (2015), the type of information that a manager needs depends on his or her role in the organisation. One the other hand, decision-making differs in many ways and varies depending on some aspects of the information needed (i.e., the amount, complexity and accuracy of the information) and the complexity of the process to obtain that information (Athanasou and Perera, 2019). This is because all of the information that is needed is not always easily accessible, and/or made available by companies in a timely manner, especially when it comes to non-financial information.

In recent years, non-financial information has received increasing attention from organisations (Ahmad and Zabri, 2016). Non-financial indicators can, according to Laskin (2016), satisfy the existing gap in terms of information needed for decision-making. According to the same author, the use of this type of information can contribute to a correct assessment of the company. Therefore, the literature suggests that non-financial information is important, and that it determines Decision-Making Success (Barker and Eccles, 2018; Boulianne, 2007). In this context, the third research hypothesis of this research is formulated:

H3. Quality Non-financial Information has a positive impact on Decision-Making Success.

The competitive environment increasingly generates new challenges for management. These challenges must be strategically addressed in order to enable the achievement of better performance.

Chandler (1977) mentions that in the early 1900 s, performance measurements were used primarily as control mechanisms. Graça and Camarinha-Matos (2017) state that these measurements or indicators are a set of quantifiable metrics used by companies to assess their performance, in line with their strategic and operational goals. Chow and Van Der Stede (2006, p. 1) highlight that performance measurement plays an important role in running an organisation, since they are ‘translating strategy into desired behaviors and results, communicating these expectations, monitoring progress, providing feedback, and motivating employees through performance-based rewards and sanctions’.

Within the scope of economic theory, the evaluation of managerial performance should include both financial and non-financial performance indicators (Said et al., 2003). Financial performance is defined as an indicator of profitability (Freedman and Jaggi,

1992). Companies have measured managerial performance using financial measurements, such as return on capital employed, return on assets, net profit margin and earnings per share (Barbosa et al., 2021; Malarvizhi and Matta, 2016). In this study, Non-Financial Performance is defined as the result of a company's efforts in relation to customer satisfaction and loyalty, working conditions and employee satisfaction/retention, product/service quality, the company's general quality, market share, productivity, and innovation as well as environmental and social issues (corporate social responsibility). In fact, recent research has placed greater emphasis on non-financial performance, considering 'measures such as customer satisfaction, employee satisfaction, productivity, product quality, and market share in compensating managers' (Banker et al., 2000, p. 66). Soudani (2012), includes other indicators, as for example, improvement of customer service, employee and customer retention rate, and social responsibility practices/activities.

Said et al. (2003, p. 193) state that the 'contextual factors, environmental factors, and strategic plans vary across firms and, in turn, adopting appropriate nonfinancial measures determines the performance consequences of such measures. According to Banker et al. (2000, p. 65), 'a growing literature suggests that because current nonfinancial measures are better predictors of long-term financial performance than current financial measures, they help refocus managers on the long-term aspects of their actions'. However, some non-financial performance indicators can be difficult to measure in an accurate, efficient, and timely manner (Chow and Van Der Stede, 2006).

Flöstrand and Ström (2006) study shows that the relevance of non-financial information is associated with the company's size and that the use of non-financial information is related to the level (extent) of the non-financial information. This leads to the conclusion that companies that value non-financial information are the best performing. Thus, it is expected that companies with better financial/non-financial performance are the most likely to disclose quality non-financial information. In this sense, the fourth research hypothesis is formulated:

H4. Quality Non-Financial Information has a positive impact on Non-Financial Performance.

Anggoro (2018) points out that managers' decisions have significant consequences for the firm's performance and success. In fact, Patel (2015) and Phornlaphatrachakorn (2019) maintain that effective and efficient decision making will ultimately positively affect the firm's profitability, i.e., its financial performance. According to Anggoro (2018) managers' decisions influence the firm's performance and success. Given this framework, the fifth and final hypothesis of this research is formulated:

H5. Decision-Making Success has a positive impact on Non-Financial Performance.

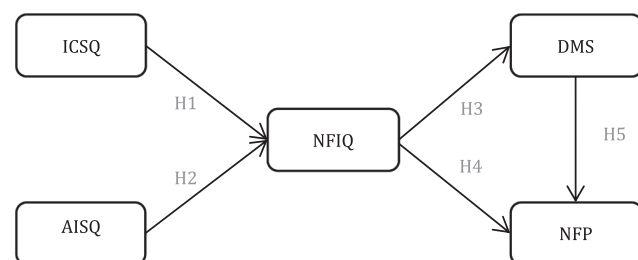
Fig. 1 displays the proposed hypotheses.

3. Methodology

This study follows a quantitative methodological approach to test the proposed model hypotheses. A survey, by questionnaire, was addressed to the managers of Portuguese companies to collect data. The theoretical model was tested on a sample of Portuguese companies because, despite there being a higher number of new companies than companies facing insolvency proceedings (data from 2018), the number of company bankruptcies is still worrisome for the Portuguese economy. Moreover, this study is applied to a country that is one of the least developed in the Eurozone and the smallest in the Organisation for Economic Co-operation and Development (OECD) (Mani et al., 2018).

The online questionnaire was developed in Lime Survey software. For this study, the questionnaire is divided into 2 groups. The first group incorporates questions about the company. The second group covers items that allow the measuring of each of the dimensions shown on the model. This study uses previously validated or adapted measurement scales from the literature. A five-point scale ranging from 'strongly disagree' to 'strongly agree' was used.

The questionnaire was constructed based on a research work with a similar population to ensure data reliability and validity, following procedures advised by Moser and Kalton (2017). Thus, we used validated measurement scales or those adapted from previous studies. Appendix A describes the measurement scales used in this study.



Legend: ICSQ – Internal Control System Quality; AISQ – Accounting Information System Quality;
NFIQ – Non-Financial Information Quality;
DMS – Decision-making Success; NFP – Non-Financial Performance.

Fig. 1. Research model.

The sampling selection was conducted in the Iberian Balance Sheet Analysis System (SABI) database. In this process, the following filters were applied: (1) all companies with e-mail address (Portugal); (2) last number of employees: minimum 50; (3) companies with auditing; (4) companies whose legal form is: sole proprietorship, foreign entity, joint stock company, limited liability company or sole proprietorship; and (5) active companies. The application of the sample selection criteria generates a list of 7,812 Portuguese companies. Despite the substantial number, it was decided to apply the survey to all companies listed instead of limiting the study to one region or district of the country.

As mentioned above, a questionnaire is applied to managers of Portuguese companies, as they are responsible for making the main decisions. The link to survey was sent by email to the companies and addressed to managers. Emails were sent to 7,812 companies, 13 of which were returned. From 2 to 31 March 2020, 389 observations were obtained.

There is no single criterion that determines the required sample size. However, it is generally accepted that the minimum size that ensures the appropriate use of the maximum likelihood method (the method used in AMOS software) is 100 to 150 observations (Hair et al., 1998). On the other hand, these authors mention that it is generally recognised that in the case of over-large samples (exceeding 400–500 observations), the method becomes excessively sensitive, causing all measures of adjustment to indicate a poor fit. The authors suggest sample sizes between 100 and 200, but larger than 200 if, for instance, the model is complex and if the data have a non-normal distribution. Thus, in this study, the sample size is adequate for the statistical analysis to be considered sufficiently robust.

Since the number of Portuguese companies is high and it is impractical to form and analyse a representative sample of these companies, we opted for a convenience sample rather than a probability sample. Previous studies involving a large population are usually based in non-probabilistic sample (Cepêda and Monteiro, 2020; Montenegro and Rodrigues, 2020; Monteiro et al., 2021d).

After the operationalisation of the survey, we prepared the data for analysis. In the preliminary analysis of the data, all the procedures for the 'cleaning' of the data were performed in the SPSS software, which involved the following 4 steps: (1) treatment of missing data, (2) analysis of extreme data (outliers), (3) analysis of central tendencies and normality and (4) analysis of the sample size. The preliminary analysis of the data results in the elimination of 8 responses, leaving the final sample represented by 381 observations. This analysis also shows that the data does not follow a normal distribution.

Then, we proceed to statistical analysis using Structural Equation Model (SEM). SEM simultaneously estimates a series of multiple regression equations by specifying the structural model (Hair et al., 1998). This technique is most suitable for models in which a dependent variable becomes an independent variable in subsequent relationships, as is the case in this study. Thus, the SEM specifies which latent variables have a direct or indirect impact on the values of other latent variables included in the model (Byrne, 1998).

SEM is a powerful and multivariate technique involving two phases: (1) evaluation of the measurement model and (2) evaluation of the structural model.

The evaluation of the measurement involves measuring the relationship between observed and unobserved variables. According to Marôco (2010), confirmatory factor analysis is the first step in evaluating a measurement model. Confirmatory factor analysis encompasses the inferential statistics that allow for hypothesis testing about the unidimensionality of a set of measures (Steenkamp and van Trijp, 1991). The construct validity involves verifying the requirements of unidimensionality, reliability and validity (convergent and discriminant). The structural model measures the relationship between unobserved variables.

Although there are several methods for estimating parameters in SEM, such as the maximum likelihood, minimum generalised square, minimum weighted square and asymptotically free distribution (Ainur et al., 2017; Alhija, 2010), in this study we used the maximum likelihood method because it is a robust method for samples that do not follow a normal distribution of data except in the presence of extreme violation of normality (asymmetry > 2–3 and kurtosis > 7–10) (Marôco, 2010), which is not the case in this study. The sample size (381 observations) and the absence of extreme violation of normality of the data reinforce our choice of this estimation technique.

SEM, through confirmatory factor analysis, allows the evaluation of the goodness-of-fit of the model, and is re-specified until the appropriate goodness-of-fit indicators are obtained. Unlike the evaluation of the measurement model, the analysis of the structural model consists in evaluating the relationship between the variables of the theoretical model simultaneously and globally.

The robustness of the results is confirmed by the model' Goodness-of-Fit. According to Preacher (2006, p. 231), 'Goodness of fit is

Table 1

Main goodness-of-fit measures and reference values.

	Measure Code	Description	Reference Value
Absolute fit measures	χ^2	Chi-square	$p \geq 0.05$
	$\chi^2/g.l.$	Normed Chi-square	>1 and < 5
	RMSEA	Root Mean Square Error of Approximation	<0.08 (<0.05, very good fit; <0.08 good fit)
	GFI	Goodness-of-Fit Index	Ranges from 0 (null fit) to 1 (perfect fit), ≥ 0.90 good fit
Incremental fit measures	NFI	Normed Fit Index	≥ 0.90 good fit
	CFI	Comparative Fit Index	Ranges from 0 to 1, higher values indicate better level of fit; ≥ 0.90 good fit
Parsimonious fit measures	PNFI	<i>Parsimonious Normed Fit Index</i>	Ranges from 0 to 1, higher values indicate better level of fit

Source: Adapted from Hair et al. (1998).

the empirical correspondence between a model’s predictions and observed data’. The author also states that ‘if the match between the model’s predictions and observed data is deemed adequate (by reaching or exceeding some benchmark), the model is said to show good fit, an indication that the theory represented by the model has received support’ (p. 231). The model is a good fit if it meets three criteria of standard measurement: absolute fit measures (determines how well the model fits the sample data); incremental fit measures (compares the theoretical model with a reference model); and parsimonious fit measures (relate the quality of fit index of the model with the number of coefficients estimated to reach that level of fit) (Hair et al., 1998). Table 1 presents the Goodness-of-Fit measures and reference values.

Although Hair et al. (1998) do not indicate reference values for PNFI, Marôco (2010) recommends values above 0.60.

Additionally, in this study the direct and indirect effects of the relationships established in the theoretical model will be analysed.

4. Results

4.1. Characteristics of the sample

After the preliminary analysis of the data, which allowed the preparation of the data for statistical analysis, we proceed to describe the sample.

In a total of 381 observations, 160 (42%) of the respondents are managers, 146 (38.3%) are financial directors and 75 (19.7%) are owner-managers of Portuguese companies. It is perceived that most respondents (56%) have professional experience of more than 15 years and that the majority of them are (63.3%) male.

Regarding the characterisation of the companies, it is verified that the majority (57.5%) are based in the districts of Lisbon, Oporto and Aveiro, and 83.2% are medium and large companies. It was found that 197 (52%) of the companies are public limited companies, 121 (32%) are private limited companies, 17 (4%) are single shareholder private limited companies, and 46 (12%) of the respondents selected the option ‘Other’ whereby 31 of the 46 companies stated that they carry out their functions in non-profit organisations.

Through descriptive analysis it was also possible to verify that most companies exercised internal control (70.1%), as well as utilised in-house accounting accountants (65.6%).

After the descriptive analysis of the data, which enabled the characterisation of the sample, we proceeded to the evaluation of the measurement model.

4.2. Structural equation model

Testing the relationships between different constructs implies using SEM because the theoretical model includes complex relationships between latent variables, and the different constructs are presented simultaneously as independent and dependent variables.

As stated above, the estimation technique used in this study is the maximum likelihood method, as it is the most widely used method (Baumgartner and Homburg, 1996) and is also considered robust against moderate violations of normality (Diamantopoulos and Siguaw, 2000). The analysis using the SEM comprises the evaluation of the measurement model and the evaluation of the structural model.

In order to assess the adequacy of the measurement scales, we assessed the unidimensionality of the measurements, the validity (convergent and discriminant) and the reliability of the constructs included in the proposed theoretical model. measurement model Results show that the items reported significantly to the respective factor/construct, thus highlighting the unidimensionality of the dimensions under analysis (Fornell and Larcker, 1981; Marôco, 2010; Steenkamp and van Trijp, 1991). With regard to reliability, as

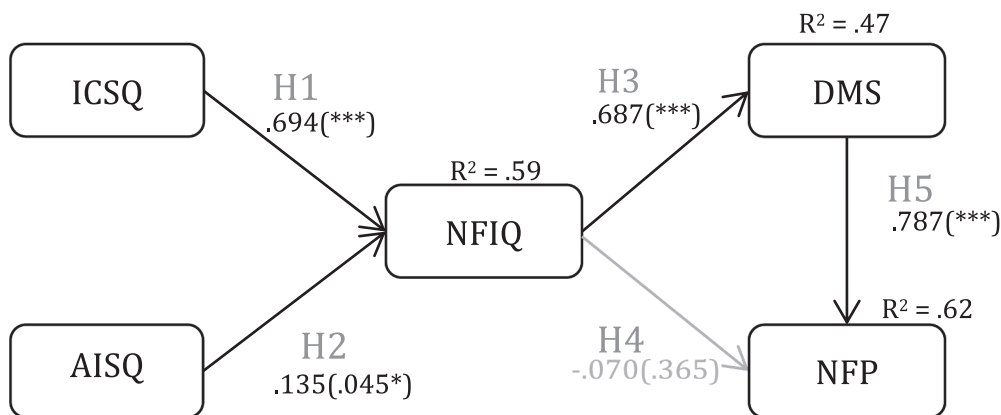


Fig. 2. Research model results.

measured by the composite reliability (CR), all constructs had a value higher than 0.70, thus conferring reliability to the measurement model (Marôco, 2010). As the values of the standardised coefficients (Sc) of each construct are higher than 0.50, they thus confer convergent validity (Steenkamp and van Trijp, 1991). Finally, it is noteworthy, that the model also presents discriminant validity, since the average variance extracted (AVE) of each construct is greater than 0.50 (Fornell and Larcker, 1981). Appendix B shows the measurement model results for each construct, showing the values obtained by each construct individually (and not the values of the overall model).

Then, the proposed theoretical model will be evaluated and the research hypotheses formulated in this study (H1-H5) will be tested.

The goodness-of-fit measures indicate that the initial theoretical model has an adequate fit, although at the threshold level of acceptability ($\chi^2 = 602.06$ (172), $\chi^2/g.l. = 3.5$, $p = .000$; RMSEA = 0.08; GFI = 0.89; NFI = 0.89; CFI = 0.91; PNFI = 0.75). All relationships in the model are statistically significant, except for the relationship between Non-Financial Information Quality and Non-Financial Performance ($\beta = -0.070$; p -value < 0.365), which refutes H4.

Next, the structural model is revised in order to eliminate the relationships that show a lack of statistical significance. The revised structural model shows an improvement in model fit [$\chi^2 = 533.63$ (172), $\chi^2/g.l. = 3.1$, $p = .000$; RMSEA = 0.067 (<0.08); GFI = 0.90 (≥ 0.90); CFI = 0.93 (≥ 0.90); NFI = 0.92 (≥ 0.90); PNFI = 0.79 (≥ 0.60)], resulting in a model with a good fit (Hair et al., 1998; Marôco, 2010).

Fig. 2 presents the standardised coefficients and the significance level (in parentheses) for each relationship postulated in the model as well as the coefficient of determination. Results prove that Internal Control System Quality and Accounting Information System Quality have a positive and significant effect on Non-Financial Information Quality ($\beta = 0.694$; p -value < 0.001; $\beta = 0.135$; p -value < 0.05, respectively), which allows us to conclude that the improvement of Internal Control System Quality and of the Accounting Information System Quality contributes to the improvement of Non-Financial Information Quality. This study finds support for H1 and H2. Both variables determine 59% of the variance of Non-Financial Information Quality. In turn, Quality Non-Financial Information has a positive and significant effect on Decision-Making Success ($\beta = 0.687$; p -value < 0.001), which allows us to conclude that Quality Non-Financial Information determines the Decision-Making Success, which supports H3. R^2 suggests that a significant portion of the variance of the Decision-Making Success variable (47%) is explained by the explanatory variables (Internal Control System Quality, Accounting Information System Quality and Non-Financial Information Quality). Finally, and as expected, the results of this research indicate that the Decision-Making Success affects the Non-Financial Performance ($\beta = 0.787$; p -value < 0.001), which allows us to conclude that the Decision-Making Success impacts Non-Financial Performance. The results allow us to support H5. Interestingly, we found that the independent variables determine 62% of the dependent (Non-Financial Performance).

The model proposed in this study has different constructs, which are presented simultaneously as independent and dependent variables. In this case, it is justified to evaluate the total and indirect effect of these model variables.

Table 2 presents the direct, indirect and total standardised effects. The results of this study indicate that Quality Non-Financial Information has no direct impact on Non-Financial Performance but has an indirect impact via Decision-Making Success ($\beta = 0.54$). Furthermore, Internal Control System Quality indirectly influences the Decision-Making Success and Non-Financial Performance ($\beta = 0.476$ and $\beta = 0.375$, respectively) and that the Accounting Information System Quality, indirectly affects the Decision-Making Success and Non-Financial Performance ($\beta = 0.093$ and $\beta = 0.073$, respectively). We stress that the indirect impact on these two variables is stronger for Internal Control System Quality than for Accounting Information System Quality.

Summarising, the results show that:

1. The higher the quality of the accounting information systems and internal control systems, the greater the reliability and transparency of non-financial information;

Table 2
Standardised effects total and indirect effects.

	ICSQ	AISQ	NFIQ	DMS
Standardised direct effects				
NFIQ	0.694	0.135	0.000	0.000
DMS	0.000	0.000	0.687	0.000
NFP	0.000	0.000	0.000	0.787
Standardised indirect effects				
NFIQ	0.000	0.000	0.000	0.000
DMS	0.476	0.093	0.000	0.000
NFP	0.375	0.073	0.540	0.000
Standardised effects total				
NFIQ	0.694	0.135	0.000	0.000
DMS	0.476	0.093	0.687	0.000
NFP	0.375	0.073	0.540	0.787

Legend: ICSQ – Internal Control System Quality; AISQ – Accounting Information System Quality; NFIQ – Non-Financial Information Quality; DMS - Decision-making Success; NFP; Non-Financial Performance

2. Non-financial information, if of quality, leads business managers to make successful decisions;
3. Having access to non-financial information by itself does not lead companies to success; to this end, this type of information must be considered in the managers' decision-making process;
4. Managers who successfully make decisions belong to companies with better Non-Financial Performance
5. The Non-Financial Information Quality is an important variable that mediates the relationship between information and control systems and business success

5. Conclusions and discussion

Accounting is an important tool for management. For [Akhtar and Liu \(2018, p. 390\)](#), the benefits of using information provided by accounting in decision-making are obvious, and they 'should be used by the external and internal evaluators of the company, to guide better decisions'. Information Systems will be useful and powerful when information provided by them is used effectively in the decision-making process ([Sajady et al., 2008](#)).

The literature suggests that Decision-Making Success and consequent business performance depends on several factors (e.g., [Sajady et al., 2008](#); [Anggoro, 2018](#); [Baugh et al., 2021](#)). In this context, the aim of this study is to develop and test a model to analyse the dependence of business success on the Internal Control System Quality, Accounting Information System Quality, and Non-Financial Information Quality.

Based on the results from an online questionnaire taken by top managers of a significant number of Portuguese firms, we validated four out of five direct relationships of the model.

Regarding H1 and H2, our findings suggest that Quality Internal Control System and Quality Accounting Information System contribute positively to Non-Financial Information Quality. Although there is no empirical evidence regarding the statistical relationship between the variables, existing studies suggest that an Internal Control System improves accounting information reliability ([Jokipii, 2010](#); [Frazer, 2020](#); [Monteiro et al., 2021a](#)). For example, [Frazer \(2020\)](#) points out that Internal Control System Quality is important for the credibility and authenticity of financial and non-financial information. [Monteiro et al. \(2021a\)](#) empirically demonstrate that the quality of both systems (accounting information and internal control) has a positive impact on financial reporting and consequently on Portuguese companies' Decision-Making Success. [Phornlaphatrachakorn \(2019\)](#), based on a sample of canned and processed foods businesses in Thailand, verifies that internal control quality has a significant positive influence on both accounting information usefulness and Decision-Making Success. [Zyznarska-Dworczak \(2018\)](#) adds that an accounting information system such as MAIS improves the transparency of non-accounting information.

[Monteiro et al. \(2021a\)](#), based on the same sample as this study, verify that the Internal Control System Quality has more explanatory power on the financial information quality than the Accounting Information System Quality. In our study, the same conclusions are obtained for the Quality Non-Financial Information. The results allow us to conclude that it is not enough to have efficient accounting information systems, it is essential to have a system that controls the process of preparing and disclosing financial and non-financial information to stakeholders. We can then say that the internal control system makes it possible to avoid or minimise the risk of unintentional errors or intentional fraud ([2014](#); [Baugh et al., 2021](#)).

On the other hand, comparing our results with those of [Monteiro et al. \(2021a\)](#), we found that the impact of the accounting information systems and the internal control system quality was greater on the financial information quality ($R^2 = 70\%$) than on the Non-Financial Information Quality ($R^2 = 59$), although in both cases the predictive power is considered substantial.

Our results supported H3 and rejected H4. Although there are no previous studies that empirically analyse the impact of Quality Non-Financial Information on Decision-Making Success, our results are consistent with the arguments of [Boulianne \(2007\)](#) and [Barker and Eccles \(2018\)](#), i.e., that non-financial information, if of high quality, is important to decision-making and determines its success. Regarding the financial information quality, previous studies verify that this type of information when used contributes to Decision-Making Success ([Monteiro, Cepêda, and Silva, 2021b](#)). Unexpectedly, our results show that the Quality Non-Financial Information has no significant influence on Non-Financial Performance, contrary of the claims of [Elshabasy \(2018\)](#).

This study allows us to draw an important conclusion, i.e., Quality Non-Financial Information does not contribute directly to Non-Financial Performance, but it contributes indirectly through Decision-Making Success. This means that the Non-Financial Information Quality is only relevant for business success if it is used to contribute to better decisions.

Furthermore, this study finds that Decision-Making Success has a positive impact on Non-Financial Performance, supporting H5. Given that there is no empirical evidence that Non-Financial Performance depends on successful decision-making, this study covers a gap in the literature.

In summary, we develop and evaluate a model whose independent variables determine 47% of the variance in Decision-Making Success and 62% in Non-Financial Performance. In addition, the information and control systems quality (internal control system and accounting system) proves to be crucial to the transparency of non-financial information.

This research contributes important insights to the academic literature and to practice. From the academic perspective, our literature review identified the absence of studies that evaluate the determinants of Non-Financial Information Quality and its impact on Decision-Making Success and Non-Financial Performance, thus contributing to the development of the literature. In fact, international studies developed in the fields of accounting and decision-making are primarily focused on the determinants and impacts of the usefulness of financial information (e.g., [Bao, 2009](#); [Nogueira and Jorge, 2017](#); [Phornlaphatrachakorn, 2019](#); [Monteiro and Cepêda, 2021](#); [Cascino et al., 2021](#); [Monteiro et al., 2021b](#); [Monteiro and Cepêda et al., 2021c](#)) and financial information quality (e.g., [Shoorvarzy and Tuz, 2011](#); [Anggadini, 2015](#); [Fitriati and Mulyani, 2015](#); [Fitrios et al., 2018](#); [Rashedi and Dargahi, 2019](#); [Monteiro et al., 2021a](#)). This study develops and evaluates a model, which highlights the importance of Non-Financial Information Quality and

its impact on Non-Financial Performance. Thus, in practical terms, this research is important for managers of companies, as it provides a better understanding of the factors that contribute positively to the Decision-Making Success and Non-Financial Performance of companies, evidencing the value relevance of the non-financial information for the business success, regardless its context.

As with all studies, this one is not without limitations. The main limitation verified in this study is due to the fact that there is no guarantee that it was the managers who filled out the questionnaires, despite the fact that the email requested it to be forwarded to such persons, and in the questionnaire, it is requested that the respondent identify the position that he or she holds in the entity. On the other hand, as the questionnaire was developed in Portuguese, it excluded respondents who lacked a sufficient level of proficiency in Portuguese. In this way, two versions should have been developed (a Portuguese version and an English version) so that all the persons with whom contact was made could participate in this study. Furthermore, this study is limited to certain companies (e.g., with more than 50 employees). Therefore, we suggest that this study be extended to companies of different sizes and from other countries (European countries or other contexts, such as the United States of America, United Kingdom and China) (Bonsón et al., 2021) for future comparisons of results, with due consideration to the characteristics of each country/region.

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Appendix A

Measurement Scales.

Constructs	Measurement	References
Internal Control System Quality	Internal control system has improved and promoted the company's operational efficiency and effectiveness.	Phornlaphatrachakorn (2019)
	Internal control system has allowed achieving firms' business targets, goals, and objectives.	Phornlaphatrachakorn (2019)
	Internal control system has allowed building and creating effective operations, activity, and business practices.	Phornlaphatrachakorn (2019)
	Internal control system has allowed the company to prepare financial information with quality.	Adapted from Phornlaphatrachakorn (2019)
	Internal control system has allowed the company to prepare non-financial information with quality.	Adapted from Phornlaphatrachakorn (2019)
	The company complies with all required regulations, i.e., laws, rules, guidelines, standards, and other related issues within internal control quality.	Phornlaphatrachakorn (2019)
	The company's internal control system has quality.	Pre-test
Accounting Information System Quality	The automated data collection speeds up the process to generate financial statements.	Adapted from Soudani (2012)
	The current accounting information system has improved the quality of non-financial reporting.	Adapted from Soudani (2012)
	Accounting information system has contributed to the integrity of the financial information reporting process.	Adapted from Soudani (2012)
	The accounting information system has contributed to the integrity of the non-financial information reporting process.	Adapted from Soudani (2012)
	The data processing caused the improvement of the quality of the financial reports.	Adapted from Soudani (2012)
	The automated data collection speeds up the process of non-financial information preparation	Adapted from Soudani (2012)
	The automated data collection speeds up the process to generate financial statements and overcome human weaknesses in data processing.	Adapted from Soudani (2012)
	The automated data collection provides a platform with access to information, which facilitates the use of it.	Adapted from Kpurugbara et al. (2016)
The company's accounting information system works efficiently and effectively.	Pre-test	
Non-Financial Information Quality	The accuracy of non-financial information helps decision-making.	Adapted from Dornier (2018)
	Non-financial information is carefully prepared to ensure its quality	Adapted from Dornier (2018)
	Non-financial information is easily understood by its user.	Adapted from Dornier (2018)
	Non-financial information includes all the information necessary to make decisions.	Adapted from Dornier (2018)
	Non-financial information is free of value judgements.	Pre-test
Decision Making Success	The decisions made allowed the company to achieve advantages in terms of operations, management and performance	Phornlaphatrachakorn (2019)
	Decisions made about investments took into account different alternatives or options, which allowed the company to choose the best solution.	Phornlaphatrachakorn (2019)
	Decisions made about future operations based on best practices/trends in doing business over the long term have contributed to better performance.	Adapted from Phornlaphatrachakorn (2019)
		Phornlaphatrachakorn (2019)

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(continued)

Constructs	Measurement	References
	The decisions taken have contributed to maximized operational efficiency and effectiveness. The decisions made in the company determine its success.	Phornlaphatrachakorn (2019) Pre-test
Non-Financial Performance	The company has improved its customer service The company has improved working conditions, regardless of the employee's position. The company has improved its performance in terms of social responsibility (voluntary effort on the part of the company in the creation of various measures to meet the expectations of the different interested parties—stakeholders). The company achieved improvements in customer satisfaction. The company has increased its employee retention rates. The company has increased its customer retention rates. The company's (non-financial) performance has been successful.	Adapted from Soudani (2012) Adapted from Soudani (2012) Adapted from Soudani (2012) Adapted from Soudani (2012) Adapted from Soudani (2012) Adapted from Soudani (2012) Pre-test

Note: for each item of the constructs follows Likert's 5-point scale, where 1 corresponds to "totally disagree" and 5 corresponds to "totally agree"

Appendix B

Measurement model results		SL
Construct		
Internal Control System Quality (CR = 0.93, AVE = 0.66)		
Internal control system has improved and promoted the company's operational efficiency and effectiveness.		0.904*
Internal control system has allowed building and creating effective operations, activity, and business practices.		0.834*
Internal control system has allowed the company to prepare financial information with quality.		0.824*
The company complies with all required regulations, i.e., laws, rules, guidelines, standards, and other issues related to internal control.		0.667*
Accounting Information Systema Quality (CR = 0.92, AVE = 0.61)		
The data processing caused the improvement of the quality of the financial reports.		0.864*
The automated data collection speeds up the process to generate financial statements.		0.758*
The automated data collection speeds up the process to generate financial statements and overcome human weaknesses in data processing.		0.744*
The automated data collection provides a platform with access to information, which facilitates the use of it.		0.752*
Non-Financial Information Quality (CR = 0.91, AVE = 0.60)		
The non-financial information is carefully prepared to ensure its quality.		0.804*
The non-financial information is easily understood by its user.		0.846*
The non-financial information includes all the information necessary to make decisions.		0.735*
The non-financial information is free of value judgements.		0.701*
Decision-Making Success (CR = 0.95, AVE = 0.73)		
The decisions made allowed the company to achieve advantages in terms of operations, management and performance.		0.857*
Decisions made about investments took into account different alternatives or options, which allowed the company to choose the best solution.		0.837*
The decisions taken have contributed to maximise efficiency and increase operational effectiveness.		0.910*
The decisions made in the company determine its success.		0.764*
Non-Financial Performance (CR = 0.93, AVE = 0.65)		
The company has improved its customer service.		0.792*
The company has improved working conditions, regardless of the employee's position.		0.850*
The company has improved its performance in terms of social responsibility (voluntary effort on the part of the company in the creation of various measures to meet the expectations of the different interested parties - stakeholders).		0.842*
The company has increased its employee retention rates.		0.721*

Notes: SL, Standardised loading; CR, composite reliability; AVE, average variance extracted. *Correlation is significant at the 0.001 level.

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