

Intellectual Capital Disclosure in Portuguese Listed Companies: A Longitudinal Approach

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Abstract: The demand for greater disclosure, including Intellectual Capital Disclosure (ICD), has significantly increased among users of accounting information. The European Union has already recognized the relevance of non-financial disclosure through different Directives. In Portugal, the implementation of Decree-Law No. 89/2017 strengthened this requirement. This study aims to determine the extent and quality of ICD disclosures of Portuguese companies listed on the Lisbon Stock Exchange (PSI) between 2016 and 2020, as well as the evolution of such disclosures, considering the impact of the implementation of Decree-Law No. 89/2017 and the effects of the COVID-19 pandemic crisis. It also aims to assess the effect of certain factors on the ICD quality index, specifically company size, the number of board members, the proportion of women on the Board of Directors, and financial performance. A content analysis of 60 Sustainability and Integrated Reports from 15 PSI-listed companies was conducted over a five-year period. Based on this analysis, extent and quality indices for ICD were developed. Subsequently, a multiple linear regression model was applied to verify the effect of the mentioned factors on the quality of IC disclosure. The results show that PSI-listed companies exhibit a satisfactory level of IC disclosure in terms of extent. However, the quality of the disclosed information remains below the extent index. Additionally, a gradual, albeit not sharp, increase was observed in both extent and quality indices over the five years analyzed. Regarding the factors influencing ICD quality, the results showed that the proportion of women on the board of directors does not significantly impact disclosure quality. This study contributes to understanding the evolution of ICDs after the implementation of Decree-Law No. 89/2017 in Portugal. It also facilitates a deeper understanding of the factors that motivate Portuguese-listed companies to disclose IC in their reports. The results indicate that challenges remain in improving ICD quality. The practical implications of this study are relevant for managers, investors, and regulators as they provide insights into the factors affecting IC disclosure and encourage the development of more effective reporting practices. Factors such as company size and the number of board members can significantly influence the quality of ICDs.

Keywords: Intellectual Capital, Disclosure, PSI, Quality, Extent

1. Introduction

In the current Knowledge Era, intellectual work is considered the primary driver of competitive advantage, rather than physical work. Intellectual Capital (IC) is now considered an organization's primary resource, enabling it to create sustainable value. IC can be defined as intangible resources which, although not present in companies' financial statements, correspond to all knowledge that generates added value and competitive advantage (Hoa et al., 2018). Nowadays, most authors defend an IC taxonomy composed of three interrelated dimensions: Human Capital (HC), Structural Capital (SC), and Relational Capital (RC) (Li et al., 2008; Cabrita & Bontis, 2008; De Luca et al., 2020).

Various authors (e.g. De Luca et al., 2020; Li et al., 2008) identified several gaps in the literature related to non-financial information disclosure, and specifically to intellectual capital disclosure. The shift to a knowledge-based economy highlighted the inadequacy of traditional financial statements in providing a comprehensive picture of a company's value (Lopes, 2010). Accordingly, an effective decision-making process should not be based solely on financial statements. The demand for more disclosure, including Intellectual Capital Disclosure (ICD), has been growing significantly among users of accounting information. ICD allows an organization's stakeholders to assess its performance and value-creation processes more effectively (An et al., 2011). Furthermore, IC information can help organizations be more transparent (Vanini and Rieg, 2019). Another important gap in the literature was identified by Abdallah et al. (2025), who suggested the need for more longitudinal studies.

The importance of non-financial disclosure was already recognized by the European Union, which, in 2004, issued Directive 2014/95/EU, aiming to improve organizational transparency across all European Union states (Badia et al., 2022). This directive took effect in 2018, becoming mandatory for certain companies, primarily

listed ones. Regulatory efforts, such as the European Directives and Portugal's Decree-Law No. 89/2017, have reinforced the need for improved non-financial reporting.

This study examines the extent and quality of ICD among Portuguese companies listed on the Lisbon Stock Exchange (PSI) between 2016 and 2020, analyzing the impact of regulatory changes and the Covid-19 crisis. The longitudinal perspective enabled us to examine whether Decree-Law nº89/2017 led to increased information disclosure. This study also aimed to assess the effect of certain factors on the disclosure quality index, more specifically: the company's size, the number of members of the board of directors, the proportion of women on the board of directors, and the financial performance.

To develop the extent and quality indices, a content analysis of sustainability and integrated reports was conducted, followed by a subsequent quantitative analysis. A multiple linear regression model was employed to test the effects. Data was collected from the companies' sustainability reports or integrated reports. The final sample consisted of 60 reports, distributed across 15 companies and spanning 5 years.

The results show a good level of IC disclosure regarding its extent. However, the quality of such information is still below the extent index. Furthermore, the multiple linear regression results indicate that the number of board members, total turnover, and total number of employees have a positive and significant impact on the quality of information disclosed on the IC. However, while the proportion of women on the board of directors also has a positive impact, this effect is not considered significant.

2. Conceptual Background

2.1 Intellectual Capital Disclosure

The interest in IC is supported by its essential competitive factor, as evidenced by companies that achieve different results when employing similar resources (Reboredo and Sowaity, 2021). IC is associated with recent economic, administrative, technological, and sociological developments, albeit in a manner that is little known and often overlooked by some (Guthrie, 2001). The most widely recognized IC taxonomy comprises three different components: human capital (HC), structural capital (SC), and relational capital (RC) (Widiatmoko et al., 2020; De Luca et al., 2020; Dumay et al., 2019; Li et al., 2008). HC refers to human resources within organizations and includes general characteristics such as education, knowledge and work-related skills, motivation, creativity, or training (Duff, 2018; Bozzolan et al., 2003). SC is the supplementary infrastructure that enables the organization to function in a repeatable and extensible manner, encompassing organizational philosophy, techniques, procedures, programs, data, systems, and related elements (De Luca et al., 2020). RC is based on the idea that companies are not considered as isolated systems but as systems that depend on their relationships with their environment, namely with the different external players, such as customers (Bozzolan et al., 2003).

The current nature of the knowledge-based economy has changed not only the way organizations create value but how it is disclosed (Haji and Ghazali, 2012). Academics and practitioners agree that financial statements do not provide a comprehensive view of a company's value. They only show a partial picture (Pablos, 2003). Non-financial information, such as the one about IC, reduces information asymmetry, improves analysts' assessments, and lowers the cost of capital (Vanini and Rieg, 2019). Several studies focus on assessing the extent and quality of ICD. ICD extent refers to the frequency or volume of disclosed IC items. It can be defined as the number of IC elements present in companies' reports. The disclosure quality can be conceptualized as the accuracy, completeness, and reliability or as the level of intensity and comprehensiveness of the information (Onuoha et al., 2020). An increase in ICD over time may suggest that companies have invested more in IC and, consequently, in its disclosure (Crossley et al., 2020). Proper disclosure of this information, combined with effective management and independent supervision, can significantly increase the perceived value of companies in the market (Wardoyo and Utami, 2024).

Considering that, among other goals, ICD aims to create financial value, it is not surprising that most studies about ICD focus on listed companies (Cuozzo et al., 2017). Several examples of studies adopting this specific type of company can be found such as the ones of Bozzolan et al. (2006), Yi and Davey (2010) or Haji and Ghazali (2012). The latter examined the trend of ICD in the annual reports of Malaysian-listed companies between 2008 and 2010. On another stance, Abeysekera and Guthrie (2005) assessed the level of ICD of the top 30 listed companies in Sri Lanka, finding that the disclosed information mainly focuses on RC and HC and that the level of ICD increased between 1998 and 2000. Regarding the relative importance of each IC component, some authors, such as Ferreira et al. (2012), emphasize the role of external capital (i.e., relational capital) in ICD, while others, such as Branco et al. (2011), stress the importance of human capital.

Following Directive 2014/95/EU, and to ensure the quality and consistency of information, since 2018, certain entities have been required to include non-financial and diversity information in their annual reports or in a separate filing. This fact had an impact on the years prior to and following its publication. For example, a significant impact on the disclosure of non-financial information was observed in the two years preceding and following the implementation of the Directive in Italian-listed companies (Agostini et al., 2022). In Portugal, Decree-Law No. 89/2017 aimed to transpose the Directive 2014/95/EU principles into Portuguese law, reinforcing the importance of transparency and consistency in non-financial information disclosed by organizations. This decree aims to strengthen the transparency of organizations in terms of sustainability, human resources, environment, social responsibility, and, in this study, IC. The Decree-Law makes it compulsory for a specific group of entities (namely listed companies) to present a non-financial statement every year, including it in the integrated management report or a separate report. While the Directive 2014/95/EU had a great impact on the ICD of Portuguese stock market companies in 2018, pressuring them to innovate due to globalization, changing technologies and increased competition, the Covid-19 pandemic crisis prompted the acceleration of these market changes in organizations in 2022 (Agostini and Nosella, 2022).

2.2 Hypotheses Development

Previous studies have found that specific company characteristics (e.g., size, profitability, leverage, industry type, or age) are determinants of ICD (see, for example, Astuti et al., 2020; Branco et al., 2011). Dimension has been identified as one important factor influencing ICD. Larger companies tend to disclose more non-financial information since they have greater visibility and are more scrutinized by their stakeholders than smaller ones. For this reason, larger companies are expected to report more information on IC to build and maintain a good reputation. Also, they are more likely to have greater financial, organizational, and human resources to support voluntary disclosure (Oliveira et al., 2010). Branco et al. (2011) claim that a significant relationship exists between size and ICD and that the larger the company size, the higher the ICD index. Similarly, Duff (2018) argues that ICD positively relates to firm size, stating that smaller firms use ICD to disclose information regarding RC, while larger firms tend to disclose more information about HC proportionally. In this context, the following hypothesis can be developed.

***H1:** Firm size has a positive influence on the quality of ICD.*

Over the years, several authors have analyzed the impact of the board of directors on corporate social responsibility, considering characteristics that make up the board, such as the mandates and the size of the board, as well as its diversity, gender, age, ethnicity, nationality or educational background (Cucari et al., 2017). The same authors state that larger boards' greater control and monitoring capacity is expected to encourage the quality of IC disclosure in integrated reporting.

Likewise, Vitolla et al. (2020) suggest that board size is conducive to better disclosure quality of IC information.

***H2:** Board size has a positive influence on the quality of ICD.*

The composition of the board of directors is an emerging issue and one of the most discussed topics in modern organizations, specifically gender diversity (Rao and Tilt, 2015). The presence of women on company boards enhances management control and increases the independence of company boards, thereby improving the transparency and quality of company disclosures (Arayssi et al., 2016). Arayssi et al. (2016) further suggest that the higher the proportion of female board members, the greater the ability to disclose non-financial information. Additionally, the greater the representation of female elements on a company's board of directors, the more likely the company is to form alliances with sustainability themes (Cucari et al., 2017).

***H3:** The proportion of women on the board of directors has a positive influence on the quality of ICD.*

Finally, several approaches have been followed to understand the relationship between ICD and corporate performance (Duff, 2018). On the one hand, a positive relationship between ICD and corporate financial performance can be found, which suggests that companies tend to disclose more often when they obtain favorable earnings, i.e., financial performance can influence the disclosure level (see Oliveira et al., 2006; Clarke et al., 2011). Additionally, Oliveira et al. (2006) suggest that companies with better financial performance disclose IC information about their intangible assets in greater detail to justify their profit levels. On the other hand, and conversely, information quality can influence stakeholders' decisions, who may prefer to work with more transparent companies, resulting in increased turnover and improved financial performance (Salvi et al., 2020).

***H4:** Financial performance has a positive influence on the quality of ICD.*

3. Methodology

This study aims to create extent and quality ICD indexes for the companies pertaining to the Portuguese PSI stock exchange for the 2016-2020 period, and to assess the effect of the company’s size, the number of members of the board of directors, the proportion of women on the board of directors, and financial performance on the quality index.

3.1 Sample Selection and Data Collection

This paper considers a five-year period encompassing two important dates: the coming into effect, in 2018, of Directive 2014/95/EU transposed into Portuguese Law through Decree-Law No. 89/2017, and the COVID-19 crisis. First, 17 companies listed in the PSI index, a regulated market of *Euronext Lisbon*, were considered for the study between 2016 and 2020. Then, two companies were removed: “Pharol” for being considered an outlier, and “EDP Renewables”, which, being a subsidiary of the “EDP company”, has its information jointly disclosed with the parent company. Finally, since the data for the sample were collected through sustainability or integrated reports, only 12 companies presented these reports over the analyzed period. Therefore, the final sample comprises 60 reports.

3.2 Data Analysis

A content analysis was conducted to assess the extent and quality of disclosure of IC for the final sample. Based on Yi and Davey (2010) and Liao et al. (2013), the following indicators were adopted: Management Philosophy, Research and development, Information Systems and Technologies and Financial Relationships, to measure SC; Goodwill, Brand Recognition and Reputation, Market Share and Partnerships, to measure RC, and Employee satisfaction, Employee profile, Work-related knowledge, and Education and Training, to measure HC. To develop an Extent Index (EI), a score of 1 was given if an indicator was disclosed and 0 if not. To assess the disclosure quality, i.e. to calculate a Quality Index (QI), a four-point scale (from 0 to 3) adapted from Liao et al.’ (2013) study was adopted (see Table 1).

Table 1: Scoring scale

Quality Measure	Description	Content
0	The company does not disclose information	The report provides no information about the indicator
1	Information is presented in narrative form	There are some descriptive references to the indicator
2	Information is presented in numerical form	Information is based on numerical evidence
3	The company discloses information both quantitatively and qualitatively	The report provides detailed information on the indicator and presents numerical support.

Since it was verified that a monetary value cannot be attributed to the indicator "Management philosophy", we followed an extent orientation, i.e., it was assigned a value of 0 or 3. The QI for each company was calculated by adding the scores for each item and then dividing the total by the maximum possible score, i.e., 36. The Quality Index per year is the mean of the companies’ disclosure quality. Thus, the overall quality index is the mean of the annual QIs over the years.

Finally, a multiple linear regression model was used to test the relationship between the dependent and independent variables. Additionally, we had to consider whether the following assumptions regarding the residuals were met: homoscedasticity (constant variance of the errors), autocorrelation (absence of correlation between the residuals), normality (the residuals follow a normal distribution), and multicollinearity (validation of whether the independent variables are highly correlated).

4. Results and Discussion

4.1 Descriptive Statistics

The IC disclosure extent refers to the frequency of disclosure of the indicators that comprise IC and, consequently, each of its three dimensions. The results suggest an extent index of 76.39%, which can be considered good. Regarding the extent of disclosure for each IC dimension, HC and RC are deemed strong, in contrast to the disclosure index of SC, which can be considered reasonable (see Table 2).

Table 2: Annual IC Extent Indices between 2016 and 2020

Year	Extent Index			
	IC	HC	SC	RC
2016	70%	83%	45%	83%
2017	73%	85%	44%	90%
2018	78%	88%	50%	96%
2019	78%	79%	60%	94%
2020	82%	88%	65%	94%

Our results align with those of Abeysekera and Guthrie (2005), who, in their study, found similar results, namely that HC and RC were the IC dimensions most disclosed from an extent perspective. Furthermore, while authors such as Branco et al. (2011) suggest that the most disclosed dimension of IC is HC, our results follow Ferreira et al.'s (2012) study, in which RC presents the highest ICD extent index. Also, although Haji and Ghazali (2012) showed, in their study, that HC was the only dimension that significantly increased in disclosure over time, our results suggest an increase in all IC dimensions, namely SC. In fact, SC is the only IC dimension that, considering the years analyzed, does not present the highest level of disclosure in 2020 but rather in 2018.

The ICD quality index, when compared with the extent index, is not so good, considering an overall five-year index of 53.98%. While HC and RC have a five-year disclosure index that can be considered reasonable, at 65.56% and 59.72%, respectively, the disclosure quality of the SC dimension is poor, at 36.67%. These results align with the literature to the extent that authors such as Abeysekera and Guthrie (2005) reinforce the importance of disclosing indicators associated with the HC and RC. Furthermore, the results suggest an increase in the quality of IC disclosure over the years, which varies according to the analyzed dimension (see Table 3).

Table 3: Annual IC Quality Indices between 2016 and 2020

Year	Quality Index			
	IC	HC	SC	RC
2016	50%	67%	32%	53%
2017	50%	62%	28%	58%
2018	56%	71%	35%	63%
2019	54%	60%	40%	61%
2020	59%	69%	48%	62%

It is also important to stress that, regarding all IC dimensions, the disclosure quality was higher in 2018 and 2020, contrary to Agostini et al.'s (2022) study, which shows that there is a significant impact on the disclosure of non-financial information in the years before and after the implementation of the Directive 2014/95/EU, in 2018. Our findings suggest that, prior to 2018, the disclosure indexes, both in terms of extent and quality, were lower than those presented in 2018.

It should also be emphasized that HC and SC disclosure do not exhibit a significant difference in their extent and quality, unlike RC, which presents an excellent extent index (91.67%) but only a reasonable quality index (59.72%). Additionally, the results indicate that the implementation of Directive 2014/95/EU in 2018 had no significant impact on the extent and quality of IC. Regarding the impact of the COVID-19 pandemic crisis on the ICD, it is evident that COVID-19, which emerged in 2020, did not significantly affect the ICD of PSI companies, as the results indicate a minimal increase in disclosure between 2019 and 2020.

4.2 Multiple Linear Regression Model

To test the hypotheses developed above, we employed the multiple linear regression model (MRLM), which examines the existing relationship between the dependent variables and the ICD quality index. The following linear regression model was developed:

$$IQ_ICD = \beta_0 + \beta_1 DIM + \beta_2 MB + \beta_3 WB + \beta_4 PERF$$

In which:

IQ_ICD - ICD Quality Index;

DIM - Size of the company, represented by the total number of employees;

MB - Total number of members of the Board of Directors;

WB - The Proportion of women on the Board of Directors, calculated by the quotient between the total number of women on the Board and the total number of members;

PERF - Company *performance*, represented by total turnover.

The values associated with turnover were rounded to the nearest million to facilitate understanding. Given that the companies are listed on the PSI, the largest Portuguese stock market index, the number of employees and turnover are expected to be relatively high, as they represent the largest companies in Portugal.

First, the ANOVA (Analysis of Variance) test was performed to validate whether there is a difference in the distribution of a measure between three or more groups. We concluded that there are significant mean differences between at least one of the independent variables, with a *p-value* < 0.001 (see Table 4). Thus, we can proceed with analyzing and interpreting the proposed multiple linear regression model. Considering the *p-value* of approximately 0, we reject the null hypothesis.

Table 4: Analysis of variance (ANOVA Table)

	Sum of Squares	df	ANOVA ^a		
			Mean Square	Z	Sig.
Regression	4.328	4	1.082	9.123	<0.001 ^b
Residual	6.524	55	0.119		
Total	10.852	59			

(a) Dependent Variable: IQ_DCI

(b) Predictors (Constant). Number of employees, Number of members of the Board of Directors, Proportion of women on the Board of Directors, Turnover

The adjusted coefficient of determination R² is 0.355. This means that the regression model explains 35.5% of the dependent variable, already adjusted for the number of observations and variables. If we consider the unadjusted value, that is, the R², the model explains 39.9% of the dependent variable.

Through the results of the multiple linear regression (see Table 5), we can infer the impact of the independent variables on the quality index of ICD. First, we can observe that all VIF are between 1 and 1.2. Hence, we can consider that there is a moderate correlation, but not enough to invalidate the estimation of the model.

Table 5: Regression analysis

	Unstandardized beta	Standard Error	β	t	p-value	VIF
Constant	1.066	0.152		7.034	<0.001	
DIM	2.656E-6	0.000	0.186	1.715	0.092***	1.073
MB	0.026	0.009	0.289	2.731	0.008*	1.026
WB	0.313	0.401	0.083	0.782	0.438	1.024
PERF	2.903E-10	0.000	0.632	5.731	<0.001*	1.114

* *p-value* < 0.01; ** *p-value* < 0.05; *** *p-value* < 0.1

The results suggest that, regarding the independent variable DIM, there is a positive and significant impact on the ICD QI with a *p-value* < 0.1. The larger companies, in this case with a higher number of employees, tend to increase the quality index by 18.6%, represented by β. This premise is in line with the literature advocated by several authors, such as Duff (2018), who argue that company size is positively related to ICD, The positive relationship between size and ICD may be explained by the desire of companies to build and maintain their good reputation with information stakeholders, since it is assumed that the larger the company size, the greater its external exposure due to stakeholders' pressure and, therefore, they disclose more non-financial information (Oliveira et al., 2010). Regarding the variable MB, i.e. the number of elements that make up the board of directors, we can see that there is a positive and significant impact on the disclosure index, for a *p-value* < 0.1, which gives rise to an increase of 28.9% in the disclosure quality index, Vitolla et al. (2020) show that the size of the board of directors is conducive to better disclosure of information about the IC, Also Cucari et al. (2017) reinforce the same idea stating that it is expected that larger boards encourage a higher quality of disclosure of information about the IC.

Regarding the proportion of women on the board (WB), a positive effect was found, although not a significant one. In other words, although the presence of women is related to an improvement in the quality of the DCI, statistically, this effect was not robust in the studied context. That suggests that, in the Portuguese companies listed on the PSI, gender diversity on the board has not yet been strongly reflected in CI disclosure practices.

Finally, concerning the analysis of the independent variable PERF, represented by the company's total turnover, we perceived that *performance* has a positive and significant impact on the quality of information disclosed about the IC for a *p-value* < 0.001. The companies that comprise the sample with a higher turnover increase the quality of the disclosure index is 63.2%. Our results are thus in line with authors such as Oliveira et al. (2006) or Clarke et al. (2011) who suggest that companies tend to disclose more frequently and in greater detail when they obtain favorable returns. Companies with better performance have more incentives to disclose transparently and strengthen their image in the market. The results are summarized in Table 6.

Table 6: Results summary

Hypothesis	Result
H1: Firm size has a positive influence on the quality of ICD.	Confirmed
H2: Board size has a positive influence on the quality of ICD	Confirmed
H3: The proportion of women on the board of directors has a positive influence on the quality of ICD	Not confirmed
H4: Financial performance has a positive influence on the quality of ICD	Confirmed

5. Concluding Remarks

This study aimed to assess the extent and quality of ICD in stock market companies listed in the PSI, as well as to analyze the effect of certain variables on the quality index. Regarding the first aim, we obtained 76.39% and 53.98%, respectively. This discrepancy between the extent and quality suggests that companies may be disclosing a significant amount of information, but the quality of this information varies widely, with SC consistently showing the lowest disclosure quality compared to HC and RC. It was also found that there are no significant differences in the ICD of the PSI companies. Finally, we can also conclude that there is an increase, although not pronounced, in the extent and quality indexes at five years, as evidenced by increases of 12% and 9%, respectively. Regarding the second objective, certain variables were analyzed to understand their impact on the quality of information disclosed about the IC. We concluded that the number of board of directors' members, total turnover, and total number of employees have a positive and significant impact on the quality of information disclosed on the IC. In turn, although the proportion of women on the board of directors has a positive impact on the quality of the ICD, it is not considered statistically significant.

The present paper contributes to enriching the literature about ICD. Theoretically, this study enables us to conclude that there is a high level of disclosure in PSI-listed companies. However, the quality of the information disclosure is still below the extent index. Additionally, there were no significant changes in IC disclosure related to the 2018 implementation of Directive 2014/95/EU, suggesting that other factors may have a more profound impact on disclosure practices. This means that the Decree-Law can be seen as a catalyst but not a guarantee of more robust and consistent ICD practices. Although this decree obliges more non-financial information to be disclosed, it has not been enough to guarantee a high disclosure quality. Furthermore, analyzing the linear regression results, we conclude that the contribution of women on the boards of directors in Portuguese-listed companies to improving disclosure quality is insignificant.

Regarding the limitations encountered, the study focuses on companies listed on the PSI stock exchange index, which may not fully represent the broader market. Another limitation was the small sample size, which was a result of the characteristics of the Portuguese capital market. Finally, the analysis spans a five-year period (2016-2020), but the dynamics of IC disclosure may evolve in response to changes in market conditions or regulatory frameworks in the future.

For future research, analyzing other sources of information beyond sustainability or similar reports, such as news or institutional website disclosures, should be considered. Another suggestion would be to extend the research to include a wider range of companies, both listed and non-listed, to assess whether the findings are held across different market segments. Future studies could also investigate whether IC disclosure practices vary by industry, considering that some industries may be more reliant on certain IC dimensions (e.g., human capital in technology companies).

Ethics declaration: Ethical clearance was not required for the research.

AI declaration: Grammarly was used to refine the English language.

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