Does the readability of integrated reporting matter in fundraising and generating value?

Legibilidade do relato integrado importa na captação de recursos e na geração de valor?

¿Importa la legibilidad de los informes integrados a la hora de recaudar fondos y generar valor?

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Abstract
This research aimed to investigate the effect of the readability of the Integrated Report (IR) on fundraising and value generation in companies in the electric power sector in Brazil. Through linear regression models and Probit models with panel data structure, the research examined the relationship between the readability of the IR, measured by the Flesch index, and variables such as financial leverage (FL), credit ratings, public offerings (IPO and Follow-on), and the value of companies (using Tobin's Q as a proxy). The sample consisted of 23 companies listed on B3, covering a period of 10 years (2013 to 2022). The results indicate that, for the investigated sample, readability is not related to fundraising and value generation. We conjecture that these results may be related to specific factors of the analyzed scenario, such as country, sector, and period. This study contributes to the understanding of the assessment of IR content in the Brazilian market and contributes to the debate alongside international studies, highlighting readability as an aspect that diverges from previous studies, being disregarded by investors and creditors in the electric power sector in Brazil.
Keywords: Integrated reporting; Readability; Flesch Index; Electrical energy sector; Disclosure

Resumo
Esta pesquisa teve como objetivo investigar o efeito da legibilidade do Relato Integrado (RI) na captação de recursos e na geração de valor em empresas do setor de energia elétrica no Brasil. Por meio de modelos de regressão linear e modelos Probit com estrutura de dados em painel, a pesquisa examinou a relação entre a legibilidade do RI, medida pelo índice de Flesch e variáveis como grau de alavancagem financeira (GAF), ratings de crédito, oferta pública de ações (IPO e *Follow-on*) e o valor das empresas (com o Q de Tobin como *proxy*). A amostra consistiu em 23 empresas listadas na B3, abrangendo um período de 10 anos (2013 a 2022). Os resultados indicam que, para a amostra investigada, a legibilidade não está relacionada com a captação de recursos e geração de valor. Conjecturamos que esses resultados podem estar relacionados a fatores específicos do cenário analisado, como país, setor e período. Este estudo contribui para a compreensão da avaliação do conteúdo do RI no mercado brasileiro e contribui para o debate junto a estudos internacionais, destacando a legibilidade como um aspecto que diverge de estudos anteriores, sendo desconsiderado por investidores e credores no setor de energia elétrica no Brasil.
Palavras-chave: Relato integrado; Legibilidade; Índice Flesch; Setor de energia elétrica; Disclosure

Resumen

Esta investigación tuvo como objetivo investigar el efecto de la legibilidad del Informe Integrado (RI) en la captación de recursos y en la generación de valor en empresas del sector de energía eléctrica en Brasil. A través de modelos de regresión lineal y modelos Probit con estructura de datos en panel, la investigación examinó la relación entre la legibilidad del RI, medida por el índice de Flesch, y variables como el grado de apalancamiento financiero (GAF), calificaciones crediticias, ofertas públicas de acciones (IPO y *Follow-on*) y el valor de las empresas (con el Q de Tobin como proxy). La muestra consistió en 23 empresas listadas en la B3, abarcando un período de 10 años (2013 a 2022). Los resultados indican que, para la muestra investigada, la legibilidad no está relacionada con la captación de recursos y la generación de valor. Conjeturamos que estos resultados pueden estar relacionados con factores específicos del escenario analizado, como país, sector y período. Este estudio contribuye a la comprensión de la evaluación del contenido del RI en el mercado brasileño y contribuye al debate junto a estudios internacionales, destacando la legibilidad como un aspecto que diverge de estudios anteriores, siendo desconsiderado por inversores y acreedores en el sector de energía eléctrica en Brasil.

Palabras clave: Informes integrados; Legibilidad; Índice de Flesch; Sector de energía eléctrica; Divulgación

1 Introduction

Information asymmetry represents a challenge for companies, as it can impact the quality of investment, increasing the costs of raising funds in organizations. Therefore, the disclosure of higher quality information is an effective measure to reduce this asymmetry, and consequently, the cost of capital. However, organizations consider the costs related to the collection and disclosure of private information, favoring those with the greatest potential to reduce information asymmetry (Verrecchia, 2001; Salotti & Yamamoto, 2005).

While some financial statements are mandatory in nature, others are published on a discretionary basis, with companies evaluating the costs and benefits of disclosing certain information. In the Brazilian context, the voluntary disclosure of information related to sustainability can be seen as a means of reducing information asymmetry and increasing market confidence in the company (Pereira et al., 2018).

In this scenario, Integrated Reporting (IR)[i] emerges as a more cohesive and efficient approach, presenting financial and non-financial information to demonstrate to capital providers how an organization generates value over time (Mantovani et al. 2017). Research conducted in several markets corroborates the fact that the disclosure of socio-environmental information reduces information asymmetry, resulting in benefits from the point of view of the company and capital providers (Soschinski et al., 2020; Cortesi & Vena, 2019; Zhou et al., 2017; Lee & Yeo, 2016), being able to reduce information asymmetry between insiders and capital providers.

However, it must be considered that reporting more accurate, transparent and concise reports is always a challenging task (Devarapalli et al., 2024). Increasing the extent of corporate information disclosed (quantity) does not necessarily imply better disclosure (quality) of an organization's activities (Nishitani et al., 2021). Increasing the amount of disclosure may give the impression of a smokescreen for poor quality disclosure and, possibly, for poor company performance (Melloni et al., 2017).

High-quality reports are concise and objective, and do not lack important characteristics such as readability. In the context of financial statements, readability refers to the ease with which users of financial information (such as investors, creditors, regulators, and other stakeholders) can read, understand, and interpret the data presented (Sena et al., 2023). In other words, it is the clarity and accessibility of accounting information.

In the public utility sector, specifically in the electric power segment, the issue of disclosure of socio-environmental information is even more relevant, given its association with reputational risks and significant environmental impacts. This fact can be observed in ANEEL resolution no. 444 of 10/26/2001, which recommends that companies in the electric power sector present an annual report on socio-environmental and economic-financial responsibility. On the other hand, the complexity of financial markets raises concerns about the quantity and quality of information in Integrated Reports.

This research seeks to investigate whether the readability of Integrated Reports is related to value generation and fundraising in the Brazilian electric power sector. The choice of the sector is justified by its high adherence to voluntary disclosure and its regulatory and environmental relevance in Brazil (Santos, 2022; Fraga et al., 2021; Arantes et al., 2020; Pereira et al., 2018; Lima & Silva, 2017). Furthermore, the study takes advantage of a unique time window, in which IR was voluntarily disclosed in Brazil, from 2013 to 2022. With the approval of Resolution No. 193/2023 by the Brazilian *Comissão de Valores Mobiliários* (CVM), IR reporting became mandatory, which brings new implications for the analysis.

Although international studies have already addressed the quality of IR, including readability aspects (Du Toit, 2017; Melloni et al., 2017; Stone & Lodhia, 2019; Roman et al., 2019), no similar studies were found in Brazil. By applying readability metrics to the IR of Brazilian companies, this study aims to contribute to the field of Voluntary Disclosure theory (Verrecchia, 1983) and expand research related to IR, especially in a sector of high environmental and regulatory relevance. This gap is significant, as the Brazilian scenario presents

specific economic, regulatory and cultural characteristics, which can influence the way in which legibility impacts fundraising and value generation.

Therefore, we hope to contribute empirically by analyzing legibility and its practical implications in the Brazilian context. In addition, the theoretical contribution is based on expanding the discussion on the role of l of IR and readability in value generation and fundraising. As a practical contribution, the results may help managers improve the quality of reports, increasing their clarity and efficiency in communicating with the market.

2 Theoretical Framework
2.1 Integrated Reporting and the Theory of Voluntary Disclosure

Proposed by the International Integrated Reporting Council (IIRC), Integrated Reporting is a process that aims to harmonize financial practices and disclosures at a global level. It involves the acceptance of a set of standards and work practices that can improve the organization's holistic performance in the long term. Internal transformation can lead to significant changes in integrated thinking, as they incorporate ESG performance into their strategic and operational processes (Camilleri, 2018).

This process results in a report that has a combined emphasis on conciseness, strategic focus, future orientation, connectivity between information and capital, and their interdependencies. By presenting the organization's proposal for value creation in the short and long term, IR differs from conventional reports that present retroactive information (Jayasiri et al., 2022; CBARI, 2021; Jensen & Berg, 2012). The IR framework gathers information to explain how the organization interacts with the external environment and capital in the value creation process.

The preparation of IR is guided by the International Framework for Integrated Reporting, which establishes the general content of the report through Guiding Principles and Content Elements, demonstrating how an organization, in its external context, creates, preserves or destroys value in the short, medium and long term. This framework, introduced in 2013 and revised in 2021, adopts a principles-based approach in order to allow flexibility in its application and comparability between organizations (CBARI, 2021).

In Brazil, IR has been incorporated by organizations since the IIRC Pilot Project in 2013. As one of the pioneering countries, Brazil had the participation of 12 companies, from different sectors, listed on the Stock Exchange (Teixeira et al., 2021). Since then, discussions on IR have been promoted by companies, regulatory bodies, academics and investors (Novaki et al., 2022). The Brazilian Integrated Report Monitoring Committee (CBARI), formed in 2012, plays a fundamental role in promoting these discussions, bringing together professionals and academics to voluntarily contribute to the development and implementation of IR.

In the Brazilian context, important events also stand out, such as the enactment of Law No. 13,303/2016, which required public companies, mixed-capital companies and their subsidiaries to disclose an annual integrated or sustainability report. In 2019, the Federal Court of Auditors (TCU) adopted the Integrated Report for the presentation of its annual accounts, and began to require that all direct and indirect public administration entities must disclose the IR (Novaki et al., 2022, Santos, 2022). Technical Guidance CPC 9 (OCPC 9), approved in 2020, provided guidance to Brazilian companies on the preparation and disclosure of the IR. Resolution 14 of the CVM indicated that companies that disclose the Integrated Report must carry out assurance of the report through an external audit (CVM, 2023).

The launch of the inaugural standards of the International Sustainability Standard Board (ISSB), IFRS S1 and IFRS S2, in June 2023, followed by Resolution no. 193 of October 19, 2023 of the CVM and Resolution no. 1710 of the Federal Accounting Council, making IR mandatory for publicly-held companies, represent important milestones in the IR standardization process in Brazil. These events reflect the ongoing commitment to improving the quality and transparency in the disclosure of information related to sustainability and corporate performance.

As it's known, information asymmetry in the capital market directly impacts companies' cost of capital. To mitigate this effect, companies seek higher levels of disclosure in order to reduce information asymmetry among investors and, consequently, their costs of capital. Several theoretical studies reinforce the benefits of greater information disclosure, such as better economic results and lower capital costs (Arantes et al., 2020; He et al., 2019; Zago et al., 2018; Rover & Santos, 2014; Salotti & Yamamoto, 2005; Verrecchia, 2001).

Some research explores the relations between voluntary disclosure of information through IR and information asymmetry, indicating a negative association. For example, García-Sánchez and Noguera-Gámez (2017) point out that companies that report IR have a lower cost of capital. Lee and Yeo (2016) investigated the relation between IR and company valuation, finding evidence that disclosure of Integrated Reporting reduces information processing costs and improves the information environment in complex firms. They also indicate that IR has the potential to reduce information asymmetry between insiders and external capital providers, and that, on average, the benefits of IR outweigh its costs.

Research such as that by Soschinski et al. (2020), which analyzes Brazilian and American companies, shows that in the Brazilian context, business strategies related to social, economic and environmental issues are associated with information asymmetry. Cortesi and Vena (2019), when investigating a sample of 636 companies from 57 countries over a 15-year period, found results that support the view that IR enhances corporate disclosure and reduces information asymmetry. Also noteworthy is the observation by García-

Sánchez and Noguera-Gámez (2017) that it is the accuracy in the disclosure of integrated information that reduces information asymmetry and the cost of capital, and not the amount of information disclosed in different reports. Therefore, the effectiveness of IR depends on the quality of the report and how well the prescribed IR principles are followed (Zhou et al., 2017).

Regarding readability, several studies in the accounting field have used the Flesch Index as a metric to assess the quality of disclosure. Created in 1943 by Rudolf Flesch, the Flesch Index is a widely used measure to assess textual readability, being validated for texts in Portuguese and updated in accounting studies due to its applicability and comparability with studies in the field (Moreno & Casasola, 2016).

Therefore, textual readability measured by the Flesch Index has been a metric used in studies to assess the quality of IR disclosure (Du Toit, 2017; Melloni et al., 2017; Stone & Lodhia, 2019). Therefore, the choice of the Flesch index for the readability analyses of the Integrated Reports proposed in this study took into account the validation of the literature, its applicability to the Portuguese language and the greater possibility of comparability with other studies, considering that the index is most used in the accounting area because it is the measure most widely applied in the accounting literature in general and studies on the evolution of readability in particular (Moreno & Casasola, 2016).

2.2 Integrated Report, Fundraising and Value Generation

The literature reveals that a company can raise funds from internal and external sources, each with associated costs. The company's decision about the capital structure should consider minimizing the cost of capital and maximizing the company's value (Steffen & Zanini, 2014). The cost of capital is affected by information asymmetry (García-Sánchez & Noguera-Gámez, 2017). Disclosure of IR can reduce this asymmetry, facilitate decision-making and, consequently, reduce the cost of capital (Pirgaip & Rizvić, 2023).

Therefore, IR emerges as a tool to communicate information to stakeholders, possibly more effectively, resulting in a lower cost of capital (Maama & Marimuthu, 2021). The quality of IR has been associated with several indicators of economic and financial performance, such as financial performance, financial leverage and credit ratings (Melloni et al., 2017; Roman et al., 2019; Soriya & Rastogi, 2023).

Thus, considering the importance of the quality of the integrated report, notably the readability of the information expressed therein, as well as the possibilities of impact on capital costs (measured through financial leverage, credit ratings, public offering of shares and company value), the research hypotheses are established.

Financial Leverage occurs when a company raises funds from third parties at rates lower than the results that these funds can produce when applied to the venture. Profitability that exceeds operating return is added to profit, leveraging the partners' results (Martins et al., 2022). An indicator that analyzes the relation between the return provided by third-party capital in relation to equity is the Degree of Financial Leverage (GAF) (Assaf Neto, 2021). In order to analyze whether companies that disclose IR have a higher GAF, as indicated by Soriya and Rastogi (2023), hypothesis H1 was established:

H1: The Readability of IR is positively related to the Degree of Financial Leverage of companies in the Electric Energy Sector listed on B3.

The level of risk of companies influences their fundraising. Therefore, Credit Ratings are an assessment scale that reflects the issuer's ability to meet its financial commitments within the deadline. The determining factors of credit ratings can influence the composition of the investor portfolio (Lima et al., 2018). Credit risk assessment is carried out by credit agencies that use a methodology to calculate credit ratings. This analysis is done according to independent criteria that seek to demonstrate the ability of corporations to honor their commitments (Bacinello et al., 2020). In other words, companies with higher credit ratings are generally perceived as more reliable stable and lower risk for investors and creditors, which may occur due to higher levels of readability of their financial statements, including IR.

In order to understand whether the readability of the disclosed IR is related to credit ratings, hypothesis H2 was established:

H2: IR Readability is positively related to the credit ratings of companies in the Electric Power Sector listed on B3.

Another factor that may affect the cost of capital is the sources of access to resources available to companies. The Initial Public Offer (IPO) and Seasoned Equity Offerings (SEO) or follow-on are the procedures for offering shares on the market. The IPO is the first offering of shares made by the company upon entering the market. The follow-on are the subsequent offerings, made after the company has already made its first public offering of shares. Both procedures are carried out to raise funds (B3, 2023). One of the main motivations for companies to seek these resources from the market is to reduce the cost of capital (Steffen & Zanini, 2014).

Considering that the quality of IR disclosure is associated with a reduction in the cost of capital (García-Sánchez & Noguera-Gámez, 2017), it is expected that companies that disclose more readable IR will have an easier time raising funds through public offerings (IPO and follow-on), which is why hypothesis H3 was established:

H3: IR Readability is positively related to IPOs and follow-ons of companies in the Electric Power Sector listed on B3.

The IIRC indicates that adopting an Integrated Reporting approach improves the usefulness of financial information for investors (Albuquerque et al., 2017) and can potentially affect profitability and the expected level of future cash flows and, consequently, the value of the company (Salvi et al., 2020). Studies conducted in different contexts converge with this statement. Salvi et al. (2020) conducted a survey based on a sample of 110 international companies and indicated a significantly positive relation between IR disclosure and company value. Baboukardos and Rimmel (2016) conducted a study with 954 observations and indicated a sharp increase in the earnings assessment coefficient of companies listed on the Johannesburg Stock Exchange (JSE). Pavlopoulos et al. (2019) in a survey conducted with 82 companies worldwide demonstrated a positive association between IR quality and company value.

However, no studies were found that exclusively evaluated the relationship between readability and value. To verify whether this relationship is positive in the Brazilian electricity sector, we have hypothesis H4:

H4: IR Readability is positively related to the Market Value of companies in the Electricity Sector listed on B3.

In order to test the hypotheses established above, the methodological strategies presented below were used.

3 Methodological Strategies

A descriptive study was conducted, which, according to Marconi and Lakatos (2022), aims to discover the existence of associations among variables. As for the data collection methods, archival research and documentary analysis were applied. The archival research uses data from *Economática*, which has already been systematized and given a quantitative treatment. The documentary analysis is carried out based on the Integrated Reports disclosed by the companies, which are interpreted and analyzed to obtain the results of the study.

The sample selection was conducted by considering the companies in the Electric Energy sector listed on B3 that disclosed an Integrated Report (IR) between 2013 and 2022. Initially, 64 companies were identified. However, 24 of them were excluded because they were wholly-owned subsidiaries that did not disclose separate financial reports. Subsequently, the reports of the remaining 40 companies were analyzed to observe the methodology used in their preparation. It was found that only 23 of these companies reported having used the International Integrated Reporting Council (IIRC) framework to prepare the report. Consequently, only these 23 were retained to compose the sample.

Therefore, data regarding the financial reports of these companies were collected on the *Economática*® platform. This data enabled the calculation of the variables to be analyzed regarding the GAF and the value of the companies, as well as the control variables. In the Thomson Reuters database, information regarding the companies' credit ratings and IPO date was collected to identify which companies had an initial public offering in the proposed period. Information about Corporate Governance was verified on the websites of B3 and the companies. On the Infomoney website, information about share subscriptions, regarding the follow-on, was collected.

The data collected were tabulated in order to enable the calculation of dependent and control variables. Descriptive statistics were applied to analyze the data obtained, with the aim of describing the behavior of the variables addressed. Correlation tests were subsequently applied to verify the statistical relationship between variables. Finally, linear and logistic regression models were adjusted, with panel data structure, according to the characteristic of the dependent variable. Statistical analyses were implemented in the R Core Team (2024) and Gretl (2003) software.

In addition to the dependent variables GAF, credit ratings, IPO and follow-on, and value of companies in the Electric Power Sector, the readability variables (of interest) and control variables were used to provide greater robustness to the adjusted models. Figure 1 presents a detailed description of the variables used in the study.

Regarding Value of Companies (VC), the calculation was performed according to Tobin's Q metric. Several studies that relate IR to company value have used Tobin's Q as a metric for company value (Soriya & Rastogi, 2023; Wahl et al., 2020; Pavlopoulos et al., 2019; Barth et al., 2017; Lee & Yeo, 2016). As defined by Wahl et al. (2020), Tobin's Q is a value measure that compares the market value of an asset with its replacement cost.

Considering that market value incorporates certain aspects of intellectual and human capital that are not computed in the balance sheet, Tobin's Q is a suitable alternative for calculating company value. Furthermore, the RI incorporates aspects beyond the traditional reporting, such as those mentioned above (Wahl et al., 2020; Barth et al., 2017).

The Flesch index (variable of interest) uses the length of the word to indicate reading difficulty. Its range is from 0 to 100, and the result indicates that the higher the score, the greater the textual readability. It differs from other measures that consider the complexity of words and the languages used, since it is independent of a dictionary and can be used for texts in Portuguese (Gomes et al., 2019).

Variable	Description	Measurement	Reference
LEG	Readability (independent variable)	Readability level according to Flesch Index	Du Toit (2017) Melloni et al. (2017) Stone & Lodhia (2019)
GAF	Degree of Financial Leverage (dependent variable)	$GAF = \dfrac{ROE}{ROI}$	Lemos et al. (2023)
RC	Credit Ratings (dependent variable)	0 – for investment grade ratings 1 – for speculative grade ratings	Lima et al. (2022) Lima et al. (2018)
IPO-SPO	IPO and Follow-on (dependent variable)	0 – for companies that did not carry out an initial or subsequent share offering. 1 – for companies that carried out an initial or subsequent share offering	Lemos et al. (2023)
VM	Value of company (dependent variable)	$QTOBIN = \dfrac{Market\ value\ PL + \dfrac{Book\ value}{PT}}{Total\ Asset}$	Soriya e Rastogi (2023) Pavlopoulos et al. (2019) Barth et al. (2017) Lee e Yeo (2016)
ROA	Return on Assets (control variable)	$ROA = \dfrac{Net\ Profit}{Total\ Asset}$	Lin et al. (2014) Marschner et al. (2019)
MB	Market-to-Book (control variable)	$MB = \dfrac{Market\ Value\ PL}{Book\ Value\ PL}$	Lin et al. (2014) Leite e Mendes (2020)
LTAM	Company Size (control variable)	$LTAM = Ln(Total\ Assets_{ij})$	Lin et al. (2014) Marschner et al. (2019) Leite e Mendes (2020)
Level of Financial Leverage (LFL)	LFL can influence organizational practices (control variable)	0 – for companies that are not classified in special governance levels 1 – for companies classified in special governance levels	Albuquerque et al., (2017)
NAF	Financial leverage level (control variable)	$NAF = \dfrac{Net\ Income}{Operating\ Profit}$	Lima et al. (2022) Lima et al. (2018)
ROI	Profitability expressed by Return on Investment (control variable)	$ROI = \dfrac{NOPAT}{Investiment}$	Lima et al. (2022)
DEBT/ EBITDA	Ability to pay debts expressed by Liabilities divided by EBITDA (control variable)	$P/\ EBITDA = \dfrac{Liabilities}{EBITDA}$	Lima et al. (2022)
RISCO PAÍS	Brazil Risk	Assaf Neto Institute (2023)	Lima et al. (2022)
GL	General Liquidity (control variable)	$LG = \dfrac{Current\ Assets + Long-term\ Recivables}{Current\ Liabilities + Non-Current\ Liabilities}$	Campos (2022)
END	Indebtedness (control variable)	$End = \dfrac{Capital\ Third\ Parties}{Equity}$	Albuquerque et al., (2017) Caixe e Krauter (2013)
SELIC	Base interest rate (control variable)	Assaf Neto Institute (2023)	Paredes e Oliveira (2017)

Figure 1 - Variables defined for analysis of the hypotheses

The Flesch index will be calculated according to the formula adapted for use in the Portuguese language, which Martins et al. (1996) explain as follows:

$$FLESCH = 248{,}835 - (84{,}6\ x\ ASL) - (1{,}015\ x\ ASW) \qquad (1)$$

Whrere:
FLF = Reading ease measure measured by the Flesch index;
ASL = Average number of syllables per word;
ASW = Average number of words per sentence.
Source: Adapted form Lemos (2023); Telles and Salotti (2021).

The preparation of the RI for calculating the Flesch index involved the exclusion of graphs, figures and tables; only the texts of the reports were kept. Next, the Wordcount tool was used, with which it was possible to calculate the numerical quantity of words, syllables and sentences. Finally, the formula proposed by Martins

et al. (1996) was applied to texts in Portuguese. When applying the formula, coefficients are generated; to interpret these results, the scale shown in Figure 2 is used.

Score	Difficulty level
0-25	Very difficult
25-50	Reasonably difficult
50-75	Easy
75-100	Very easy

Figure 2 - Scale for analyzing the results of the Flesch index
Source: Adapted from Lemos (2023); Telles and Salotti (2021).

As for the tests, the panel data analysis technique was used, which consists of adjusting regression models whose data are collected over time (longitudinal data) (Wooldridge, 2002). Regression models with panel data are also called combined data, as they aggregate a combination of time series and cross-sectional observations multiplied by T time periods. For linear models: (i) the estimation of fixed effects coefficients was performed using the ordinary least squares method; (ii) the estimation of random effects coefficients was performed using the generalized least squares method. As for binary response models (probit and logit), that is, non-linear models, the estimation of coefficients was performed using the maximum likelihood method.

Regarding the continuous dependent variables Degree of Leverage (GAF) and Enterprise Value (MV), linear regression models were adjusted that offer the possibility of analyzing the relationship between one or more explanatory variables, which are presented in linear form (Fávero & Belfiore, 2022). In linear regression models with a panel data structure, temporal evolution is considered, in order to allow the investigation of the individual reasons that may lead each of the observations to present behaviors different from the dependent variable. In this way, it is possible to observe changes that occurred over time, both for the dependent variable and for the control variables (Fávero & Belfiore, 2022). On the other hand, the panel data model may present problems related to selection bias, that is, errors resulting from the selection of data that do not form a random sample. Thus, issues such as self-selectivity (truncated samples) and lack of response or attrition can be considered as unobserved effects.

There are two possibilities for modeling unobserved effects: fixed effects and random effects. In the fixed effects model, it is assumed that the specific intercept of each individual (company) may be correlated with one or more kind of regression. As for the random effects model, it is assumed that the intercept is random, that is, each company has an intercept (Wooldrige, 2002).

It is important to highlight that, assuming the assumption that the unobserved effect is random, this does not mean the random effect would be the best estimation to be adopted. In this case, considering that the variables are not correlated, the random effects method is the most appropriate. On the other hand, if the unobserved effects are correlated with some explanatory variable, the fixed effects estimation would be the most appropriate. Therefore, to identify which linear model is most appropriate, the following tests were applied: (i) Test between pooled and fixed effects, that is, F test for individual effects. The statistical hypotheses are: H0 - effects of individuals (firms) are not significant, therefore pooled is the best model versus H1 - effects of individuals are significant (model with fixed effects is the best); (ii) Test between pooled and random effects, i.e. Lagrange Multiplier Test (Breusch-Pagan). The statistical hypotheses are: H0 - panel effect is not significant (pooled is the best model) versus H1 - panel effect is significant (model with random effects is the best); (iii) Test between fixed and random effects, i.e. Hausman test. The statistical hypotheses are: H0 - the difference between the coefficients is not systematic (random effects is better) versus H1 - the difference between the coefficients is systematic (fixed effects is better (Baltagi, 2001, Hsiao, 2003).

Regarding the binary dependent variables Credit Ratings (RC, IPO and Follow-on (IPO-SPO)), binary logistic regression models were adjusted considering the probit and logit link functions (non-linear models). These models aim to study the probability of an event Y occurring, with Y represented by 1 in the case of the event occurring and 0 in the case of non-occurrence (Fávero & Belfiore, 2022). The variable Credit Ratings (RC) was classified according to the study by Lima et al. (2018), which presents the equivalence of the agencies' ratings and the level of credit risk in investment grade or speculative grade ratings. The choice of the most appropriate non-linear model was made by through the Akaike Information Criterion (AIC). The decision rule based on the AIC criterion consists in that the lower the value of the information criterion, the better the model. The best model based on the AIC was the Probit model for the two variables (Credit Ratings (CR), IPO and Follow-on (IPO-SPO)).

The models for each variable are presented below, according to the established hypotheses:

To test hypothesis H1, which investigates whether IR Readability is positively related to the GAF of companies in the Electric Energy Sector listed on B3, the fixed effect linear model, model 1 (Equation no. 2), was proposed:

$$GAF_{it} = \alpha_i + \beta_1 LEG_{it} + \beta_2 ROA_{it} + \beta_3 MB_{it} + \beta_4 TAM_{it} + \beta_5 NG_{it} + \varepsilon_{it}. \quad (2)$$

To test hypothesis H2, which investigates whether IR Readability is positively related to the CR of companies in the Electric Energy Sector listed on B3, the adjusted logistic longitudinal model, model 2 (Equation no. 3), was proposed:

$$ln(chance_{Y_{it}=1}) = \alpha_i + \beta_1 LEG_{it} + \beta_2 NAF_{it} + \beta_3 ROI_{it} + \beta_4 P\_EBITDA_{it} + \beta_5 TAM_{it} + \beta_5 RISCO_{it}. \quad (3)$$

Whose probability of occurrence of the event of interest (RC = 1) is presented by model 2.1 (Equation no. 4)

$$p_{it} = \frac{exp(\alpha_i + \beta_1 LEG_{it} + \beta_2 NAF_{it} + \beta_3 ROI_{it} + \beta_4 P\_EBITDA_{it} + \beta_5 TAM_{it} + \beta_5 RISCO_{it})}{1 + exp(\alpha_i + \beta_1 LEG_{it} + \beta_2 NAF_{it} + \beta_3 ROI_{it} + \beta_4 P\_EBITDA_{it} + \beta_5 TAM_{it} + \beta_5 RISCO_{it})} \quad (4)$$

To test hypothesis H3, which investigates whether IR Readability is positively related to the IPO-SPO of companies in the Electric Energy Sector listed on B3, the adjusted logistic longitudinal model was proposed, model 3 (Equation no. 5):

$$ln(chance_{Y_{it}=1}) = \alpha_i + \beta_1 LEG_{it} + \beta_2 MB_{it} + \beta_3 TAM_{it} + \beta_4 NG_{it}. \quad (5)$$

Whose probability of occurrence of the event of interest (IPO-SPO = 1) is presented by model 3.1 (Equation no. 6):

$$p_{it} = \frac{exp(\alpha_i + \beta_1 LEG_{it} + \beta_2 MB_{it} + \beta_3 TAM_{it} + \beta_4 NG_{it})}{1 + exp(\alpha_i + \beta_1 LEG_{it} + \beta_2 MB_{it} + \beta_3 TAM_{it} + \beta_4 NG_{it})} \quad (6)$$

To test hypothesis H4, which investigates whether IR Readability is positively related to the VM of companies in the Electric Energy Sector listed on B3, the fixed effect linear model, model 4 (Equation no. 7), was proposed:

$$VM_{it} = \alpha_i + \beta_1 LG_i + \beta_2 ROA_{it} + \beta_3 TAM_{it} + \beta_4 NG_{it} + \beta_5 END_{it} + \beta_5 SELIC_{it} + \varepsilon_{it}. \quad (7)$$

Where, αi represents the intercepts to be estimated, one for each company. Since the response parameters do not vary between companies or over the period, all differences in behavior among companies should be captured by the intercept.

4 Results
4.1 Descriptive analysis

The sample analyzed is made up of 23 companies from the Public Utility sector, Electric Energy segment, listed on B3. All selected companies released an integrated report within the period analyzed. Table 1 presents the descriptive statistics (by year) of the variables: number of companies that presented IR; Average Flesch index value; Number of companies that carried out IPO/Follow-on; Number of companies that presented Investment Grade credit ratings; Average GAF; Average company value.

Table 1
Descriptive analysis

Anos	Number of companies that presented IR	Average Flesch index value	Number of companies that carried out IPO/Follow-on	Number of companies that presented Credit Ratings with Investment Grade	Average GAF	Average company value
2013	1	25,42	-	-	0,2796	0,7746
2014	5	27,35	-	1	1,1854	1,1638
2015	8	29,38	-	2	0,3007	0,9866
2016	10	29,43	1	2	0,2003	1,0990
2017	14	25,92	1	5	0,3188	1,0627
2018	13	25,35	1	2	0,4658	1,1356
2019	13	23,37	-	3	0,6284	1,2432
2020	23	22,42	3	1	0,6769	1,3629
2021	22	22,19	3	1	0,5047	1,2360
2022	20	19,81	4	3	0,3831	1,2442

Over the 10 years analyzed, the number of companies that reported IR increased, with only a slight decline between 2021 and 2022. This behavior shows a gradual adherence of companies in the electric power sector to the disclosure of IR. The average values obtained in the Flesch Index show that the readability of the reports is classified as very difficult (0-25) in the years 2013 to 2018 or reasonably difficult (25-50) in the years 2019 to 2022. This result converges with Stone and Lodhia (2019) who demonstrate that in general the IR disclosed has low readability and, over the years, the results do not indicate improvements. Regarding the IPO

and Follow-on variables, it is notable that almost 77% of the values were concentrated in the years 2020 to 2022.

The number of companies that presented investment grade credit ratings was higher in 2017, followed by 2019 and 2022. The average GAF was below 1 in almost all years, except 2014. This indicates that, in 9 of the 10 years analyzed, companies in the electric power sector presented a return on third-party capital below the fundraising rate. As a result, the shareholders' result has been eroded to compensate for this difference between the fundraising rate and the operating result provided by third-party capital. In other words, these are indications that the management of third-party resources in favor of shareholders is not effective.

Regarding the value of company, represented by Tobin's Q, it is possible to observe results above 1 in most years, only in 2013 and 2015 the results were lower. Results above 1 indicate that the company has a higher valuation of its net equity by the market in relation to its book value. The average results obtained demonstrate that the companies are more valued by the market in 8 of the 10 years analyzed.

Table 2 indicates the percentages obtained according to the level of readability of the analyzed reports of the companies by analyzed variable and also the number of observations analyzed in each variable.

Table 2
IR Readability according to the Degree of Financial Leverage, Credit Ratings, Public Offering of Shares and Market Value of companies in the Electric Energy sector

Readability	GAF		RC		IPO/ Follow-on		VM	
	122 observations		26 observations		129 observations		119 observations	
	< 1	≥ 1	0	1	0	1	< 1	≥ 1
Very difficult	56,56%	4,92%	34,61%	-	34,11%	6,20%	22,69%	39,50%
Reasonably difficult	37,70%	0,82%	30,76%	34,61%	55,81%	3,88%	21,85%	15,97%
Easy	--	--	--	--	--	--	--	--
Very easy	--	--	--	--	--	--	--	--

Note: GAF = Degree of Financial Leverage, RC = credit ratings, IPO/Follow-on = Public offering of shares (initial and secondary), VM = Market value

According to Table 2, it is possible to observe that all reports analyzed were classified in only two levels of readability: "very difficult" and "reasonably difficult". This observation reinforces that, in general, the Integrated Reports disclosed by companies in the electric energy sector present low readability. These percentages are in line with studies that indicate a high level of difficulty in readability in accounting reports (Voigt et al. 2020; Holtz & Santos, 2020; Borges & Rech, 2019).

The analysis of readability, when considering the GAF variable, shows a greater concentration of reports in companies that presented GAF less than 1 (94.26%), with 56.56% being classified as very difficult and 37.70% reasonably difficult.

Readability, when analyzed together with the credit ratings variable, allows us to infer that 65.37% of cases do not have investment grade. However, companies that have investment grade credit ratings (34.61%), according to Lima et. al. (2018), also present reports in the reasonably difficult category. This demonstrates greater readability in the reports of these companies, than in the others.

It can be observed that only 10.08% of the companies had a public offering of shares (IPO/Follow-on) in the period, and most of them (6.20%) were classified as very difficult to read. Among the companies that did not offer shares in the period investigated (89.92%), the majority (55.81%) were classified as reasonably difficult to read. We can therefore observe that the companies that did not offer shares have greater readability, according to the metric used, when compared to those that did.

It can also be observed that 44.54% of the companies presented a Tobin's Q metric lower than 1, that is, with a market value lower than the accounting value. The percentages of these companies with very difficult and reasonably difficult readability were similar, around 22%. On the other hand, companies with a higher market value (Tobin's Q above 1) surprisingly presented numerically lower readability, 39.50% very difficult and 15.97% reasonably difficult. This result suggests that most of the companies surveyed, which are better evaluated by the market, present less readable reports.

4.2 Multivariate Data Analysis
4.2.1 Degree of Financial Leverage (GAF)

In order to analyze the Degree of Leverage (GAF), a correlation analysis of the variables was first performed. Subsequently, three linear regression models with a panel data structure (pooled, fixed effects and random effects) were adjusted. Based on the F-tests for individual effects, Breusch-Pagan and Hausman tests, the most appropriate model was the fixed effects model. Below, in Table 3, the statistics relating to the adjustment of the linear regression model with panel data structure for the GAF variable are presented.

According to the results presented in Table 3, it is possible to observe that the variable representing readability (LEG) does not present a statistically significant relation with the degree of financial leverage. Thus,

hypothesis H1 was refuted, since the readability of IR was not related to the Degree of Financial Leverage of companies in the Electric Power Sector.

Table 3
Statistics of the linear regression model with fixed effects for the GAF variable, model (1)

Coefficient	Estimate	Standard Error	t	p-value
ROA	-0,1089372	0,4613009	-0,2362	0,8138
MB	0,0941636	0,0690130	13,644	0,1758
LTAM	0,2635738	0,3599207	0,7323	0,4658
LEG	-0,0044341	0,0059433	-0,7461	0,4575

This result differs from the work carried out by Soriya and Rastogi (2023) who analyzed the relation between the quality of IR disclosure and the financial performance provided by third-party capital and found a significant and positive correlation between financial leverage and IR. However, it should be noted that the metric used to define the quality of the reports was different from that study.

Another divergence identified refers to the use of financial leverage to obtain resources with a lower cost of capital. Some studies state that IR can reduce the cost of third-party capital (Gerwanski, 2020; Muttakin et al., 2020; Raimo et al., 2022). According to these studies, financial leverage would be a viable option for companies that disclose IR. However, the results found in this research do not converge with this statement.

4.2.2 Credit Ratings (CR)

For the analysis of Credit Ratings (CR), two logistic regression models were adjusted, considering the probit and logit link functions. The comparison between the models was made using the Akaike Information Criterion (AIC). The decision rule based on the AIC criterion consists of the lower the value of the information criterion, the better the model. Therefore, according to the AIC (25.9692), the Probit model is the most appropriate. The results found are presented in Table 4:

Table 4
Statistics of the binary logistic regression model considering the probit link function (Probit Model) for Credit Ratings, with 24 observations, model (2)

Coefficient	Estimate	Standard Error	z	p-value
Intercepto	−111,869	97,9952	−1,142	0,2536
NAF	−12,5800	13,2242	−0,9513	0,3415
ROI	1,84554	3,76405	0,4903	0,6239
P_EBITDA	−2,20531	2,13208	−1,034	0,3010
LTAM	12,0828	10,4849	1,152	0,2492
RISCO	−182,112	289,906	−0,6282	0,5299
LEG	0,186874	0,187082	0,9989	0,3178

Note: Global test p-value (Chi-square) = 0.1395, H0: $\beta_1 = \beta_2 = ... = \beta_k = 0$ vs H1: there is at least one $\beta_j \neq 0$.

Based on the results shown in Table 4, it is possible to state that the LEG variable does not present a statistically significant value that establishes a relation with the Credit Ratings variable. Therefore, hypothesis H2 was refuted, since the readability of the IR was not related to the credit ratings of companies in the Electric Power Sector.

According to Bacinello et al. (2020), credit risk assessment is carried out by credit agencies according to a methodology that considers criteria that seek to demonstrate the ability of corporations to honor their commitments. According to the result found, it is possible to infer that the readability measured by the Flesch index, for the sample investigated, is not associated with the attributes used for credit ratings.

4.2.3 IPO and Follow-on (IPO-SPO)

For the variables related to IPO and Follow-on (IPO-SPO), two logistic regression models were adjusted, considering the probit and logit link functions. The comparison between the models was performed using the Akaike Information Criterion (AIC). Therefore, the Probit model is the most appropriate because it presents the lowest AIC value (80.3697). The regression results are presented in Table 5:

Based on the results in Table 5, the proposed hypothesis H3 was analyzed: IR Readability is positively related to IPOs and Follow-on of companies in the Electric Power Sector. The values presented in the last column show that there is no statistically significant relation that supports hypothesis H3, therefore it was refuted. No variable in the model showed a relationship with the dependent variables.

4.2.4 Value of Company (VM through Tobin's Q)

Tobin's Q was used as a proxy for value of company, as it addresses aspects that are portrayed by IR (Soriya & Rastogi, 2023). Tobin's Q is calculated by the ratio between accounting liabilities and market equity

and accounting assets. Thus, a Tobin's Q value greater than 1 indicates that the company is more valued by the market.

Table 5
Statistics of the binary logistic regression model considering the probit link function (Probit Model) for IPO and Follow-on, with 119 observations, model (3)

Coefficient	Estimate	Standard Error	z	p-value
Intercepto	−2,77695	3,48425	−0,7970	0,4254
MB	−0,106292	0,207042	−0,5134	0,6077
LTAM	0,162536	0,312648	0,5199	0,6032
LEG	−0,00330635	0,0222652	−0,1485	0,8819

Note: Global test p-value (Chi-square) = 0.8091, H0: $\beta_1 = \beta_2 = ... = \beta_k = 0$ vs H1: there is at least one $\beta_j \neq 0$.

First, a correlation analysis of the variables was performed. Subsequently, three linear regression models with panel data structure (pooled, fixed effects and random effects) were adjusted. Based on the F test for individual effects, Breusch-Pagan test and Hausman test, the most appropriate model was the fixed effects model. Table 6 presents the statistics regarding the adjustment of the linear regression model with panel data structure for the variable Value of companies (VC).

Table 6
Statistics of the linear regression model with fixed effects for the variable Value of Company, model (4)

Coefficient	Estimate	Standart Error	t	p-value
LG	-0.13123863	0.05236493	-25.062	0.0139991 *
ROA	-0.08209095	0.26531879	-0.3094	0.7577287
LTAM	-0.70170459	0.24962865	-28.110	0.0060606 **
END	0.05166913	0.03660888	14.114	0.1615797
SELIC	-161.807.253	0.45373553	-35.661	0.0005828 ***
LEG	-0.00072806	0.00330406	-0.2204	0.8260939

Note: Significant to: 0 '***' 0.001 '**' 0.01 '*'

The results in Table 6 indicate that there is a significant relation between the variables General Liquidity, Size and Selic and the variable Company Value. However, the independent variable analyzed (LEG) did not present a statistically significant relation with the Company Value (Tobin's Q). This result indicates that the level of readability of the IRs that were reported does not affect the company value. Thus, hypothesis H4 was also refuted.

The results found differ from the studies by Baboukardos and Rimmel (2016) and Pavlopoulos et al. (2019), which indicated that the quality of the IR has a positive association with the Value of campany.

5 Final Considerations

This research aimed to evaluate the relations among the readability of Integrated Reports (IRs), value generation and fundraising by companies in the electric power sector in Brazil. The sample consisted of 23 companies listed on B3, which published financial statements and IRs in the years analyzed.

In order to analyze fundraising, the variables Credit Ratings and IPO and Follow-on were considered. For value generation, the variables Degree of Financial Leverage and Company Value, represented by Tobin's Q proxy, were used. Data collection involved several sources, such as Económática®, Thomson Reuters, B3, company websites and Infomoney, and the analysis was conducted using Linear Regression and Binary Logistic Regression.

The results revealed that, in general, the IRs analyzed had low readability, in line with other studies that also point to the difficulty of reading accounting reports (Voigt et al. 2020; Holtz & Santos, 2020; Borges & Rech, 2019). However, contrary to expectations, no significant relationship was identified between the independent variable Readability (measured by the Flesch index) and the variables investigated: GAF, Credit Ratings, IPO and Follow-on and Company Value. One possible explanation for the low values observed in readability is the presence of technical terms specific to the electricity sector, which impact the calculation of the Flesch index.

The research shows that the readability of the Integrated Report (IR) of companies in the electricity sector, measured by the Flesch index, is not associated with raising funds from third parties under more favorable conditions, as evidenced by the lack of correlation between readability and the degree of financial leverage (GAF). This suggests that companies in the electricity sector that obtain funds from third parties at rates lower than the remuneration of equity do not necessarily benefit from a more readable IR.

In addition, the research found no evidence that readability is specifically related to credit ratings, indicating that the clarity of the IR does not significantly influence the market's perception of risk. By challenging

this assumption, the research advances knowledge in the area, broadening the debate on the relevance of readability for risk perception.

The results differ from previous studies that suggested an association between IR quality and a reduction in the cost of capital, both third-party and own. This includes studies such as those by García-Sánchez and Noguera-Gámez (2017), Salvi et al. (2020), and Vitolla et al. (2020), which associated IR disclosure with a reduction in the cost of capital. This study contributes by providing evidence that this association may not apply to the electric power sector in Brazil. It also contributes by inserting Brazil into the international discussion, which addresses the quality of IRs using readability as a metric.

The divergence in results can be explained by contextual differences, such as the atypical period of analysis, which includes the pandemic, and the specificity of the sample, focused on a regulated sector in a developing country. In contrast, previous studies have included companies from different countries and sectors, such as those by García-Sánchez & Noguera-Gámez (2017), Salvi et al. (2020), and Vitolla et al. (2020). These different contexts suggest that differentiated reporting practices may vary with the readability of reports.

The research questions the premise that greater IR readability would be associated with a greater valuation of companies in the market (Tobin's Q greater than 1). The lack of significant correlation suggests that the market does not necessarily value companies with more readable IR more, contributing to a more critical understanding of the impact of IR on the perception of value.

Another relevant contribution to be highlighted is the analysis focused on the electric power sector in Brazil, distinguishing itself from the generic approach applied by many previous studies. In addition, the use of an instrument to assess the textual readability of the Integrated Report (Flesch index) offers a different perspective in relation to studies that focus on the content of the framework.

Among the implications of the results of this research highlight the need to use clearer vocabulary in published IRs, given the low levels of readability shown by the study, especially today, when IRs have become mandatory in the Brazilian context. In addition, it is essential to evaluate other aspects related to the quality of the information disclosed, in order to show which attributes impact fundraising and the generation of results.

Important practical implications can also be highlighted. Initially, the importance of rethinking the way IRs are written is highlighted, as the need for greater clarity is evident. This becomes even more relevant given the recent mandatory disclosure of IRs in Brazil, in accordance with CVM Resolution No. 193. Companies should consider improving the readability of their reports to meet stakeholder expectations and adapt to new regulatory requirements. The lack of observation between readability and financial variables indicates that other aspects of IR quality should be analyzed to better understand the impact of these reports on fundraising and value generation. Given that Integrated Reporting is becoming a regulated practice in Brazil, the results of this research can provide support for regulators on the effectiveness of the IR requirement, indicating the need for policies that encourage improvements not only in readability, but also in the substance and relevance of the information disclosed.

Finally, despite the relevance of readability, this research suggests that users interpret information in different ways, and other aspects of IR quality may be more valued, especially in a context of voluntary disclosure. In this sense, new research can explore additional dimensions, such as the materiality of information and specific content criteria, to better understand the impact of IR. It is also recommended to investigate whether the relevance of readability has increased with the mandatory adoption of IR in Brazil, in accordance with CVM Resolution No. 193 of October 2023. Additional analyses, including different sectors and new quality criteria, could enrich the understanding of the effects of readability on the market.

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NOTES

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[i] Integrated Reporting is a process whose product is the Integrated Report. However, due to the hegemony in the literature, this research also refers to the product resulting from the process as Integrated Reporting (IR) (Albuquerque et al., 2017; Novaki et al., 2022; Paredes et al., 2022; Santos, 2022).