MINISTRY OF NATIONAL EDUCATION

“1 DECEMBER 1918” UNIVERSITY OF ALBA IULIA

Doctoral School of Accounting

DOCTORAL THESIS

ABSTRACT

PhD Supervisor:

Prof. univ. dr. Dănescu Tatiana

Ph. D. Candidate:

Matei Radu Bogdan

Alba Iulia

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RECONFIGURING ACCOUNTING CONNECTIVITY IN THE CONTEXT OF ESG REPORTING: MULTIDIMENSIONAL APPROACHES AND INTERDEPENDENCIES IN NON-FINANCIAL COMPLIANCE

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Prof. univ. dr. Dănescu Tatiana

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Keywords

Sustainability, durability, non-financial, corporate governance, ESG, BVB, NFRD Directive, CSRD Directive, transparency, key performance indicators, financial indicators, econometric analysis, compliance level, non-financial performance, panel data.

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Introduction

Given the globalized economy and the accelerated pace of digitalization across all sectors, the issue of data connectivity in decision-making processes and ensuring an adequate level of financial transparency has emerged. With technological advancements, requirements regarding social responsibility and sustainability have become increasingly stringent, highlighting the need for a comprehensive reporting framework that enables comparisons across companies and industries. Thus, optimizing accounting processes plays a significant role in improving sustainability reporting and aligning with international standards in this field.

This transition from a traditional reporting model to one that incorporates financial aspects and ESG criteria presents challenges for many companies. On the one hand, there is the need to harmonize sustainability reporting standards so that information remains relevant, comparable, understandable, and easily accessible to all categories of stakeholders. On the other hand, digitalization in accounting and the emergence of technologies such as blockchain, Big Data, and artificial intelligence offers substantial improvements to operational workflows and help increase operational efficiency.

In this context, this research sets out to identify solutions for the effective integration of sustainability reporting and the impact of digitalization on accounting connectivity. Companies must be aware of technological advancements and adapt to evolving market requirements.

Given the complex nature of today's global challenges - including climate change, lack of education, poverty, various forms of inequality, corruption, and unemployment—a multi-level governance framework and inter-institutional collaboration are required. To overcome these obstacles, collaboration is needed among various stakeholders who must work together to achieve the Sustainable Development Goals.

To support this scientific endeavor, it is essential to clarify the specialized terminology to ensure the rigor of the presentation by aligning with international reporting standards. In the specialized literature, I have encountered both "nefinanciar" and "non-financiar," which are often used as synonyms in this context. The term "nefinanciar" is the one established by Directive 2014/95/EU and subsequently used in other official European documents. The term "non-financiar" is a translation from English ("non-financial") and is found in translations or international literature; however, its use is considered less appropriate for academic works presented in Romanian.

Furthermore, a distinction must be made between sustainability and durability, as these terms are often used interchangeably but have different semantic nuances. Sustainability is a borrowed term with predominantly economic and managerial connotations. Associated with the concept of the "triple bottom line" (the 3 Ps: profit, people, planet), it refers to an organization's ability to conduct activities without compromising the ability of future generations to use resources. This concept is derived from international standards and is used globally to describe general strategies and efficient, transparent business models. Etymologically and semantically, the term "sustainability" was initially associated with the durability of materials, later evolving into its current context and gaining wider recognition with the introduction of the CSRD Directive and the ESRS Standards. It should be noted that the two aspects mentioned above apply only on European level and have been brought up much more recently. Currently, the most commonly found term in the specialized literature and companies' non-financial reports is "sustainability," but it is possible that in the future, "durability" will take on greater importance in this field. It should be noted that global standardization is desired, which is precisely the objective of the ESRSs to ensure comparability among companies across all sectors of activity, with potential for international development.

In this study, the two terms were used interchangeably to describe non-financial information, considering their specific nuances, with the common thread being the integration of the three dimensions: economic, social, and environmental.

General Context

In today's economic landscape, we are witnessing a reconfiguration of the foundations of organizational success. The shift from a linear economic model-based exclusively on short-term profit maximization—toward a responsible economy that incorporates elements of circularity has brought about a fundamental paradigm shift. Sustainability should no longer be viewed as an optional element of corporate image; it has become a prerequisite for resilience and competitiveness. This evolution is inextricably linked to the fourth and fifth industrial revolutions, with digitalization being perceived as a catalyst for efficiency and transparency.

Corporate sustainability is a topic of current interest, both locally and especially globally, and is viewed as a new approach to improving business operations and maximizing profits. Along with digitalization, it represents a paradigm shift in the business world, with both having a significant impact on society and companies. The positive impact expected by stakeholders can manifest in several ways. For shareholders, the impact can be quantified in terms of profit, while the population needs secure jobs, and customers and suppliers need innovation and the creation of shared value.

Current research lies at the intersection of two transformative elements, recognized by the European Commission as the "Twin Transition." Driven by climate and social imperatives, the standardization of non-financial reporting has become essential, with ESG criteria serving as performance indicators and being accorded the same weight and rigor as financial ones. Digitalization, using emerging technologies such as artificial intelligence, the ability to manage large volumes of data through Big Data, and the emergence of structured reporting languages like the XBRL model, provides the infrastructure needed to make non-financial data comparable and auditable.

Given this paradigm shift, we find a profession that plays a central and significant role. Economic specialists are undergoing a period of ontological redefinition, transitioning from the processing of traditional financial information to a strategic role within the organization. The role

of the accounting professional is evolving from an operational function to a strategic one, centered on the integration of complex information systems, becoming responsible for capturing and interpreting hybrid information that combines financial capital with natural, human, and intellectual capital.

The challenge that economic experts must address is based on the principle of double materiality. The company's operations must be viewed from two perspectives: how sustainability affects the company's value (outside-in), with the added benefit coming from how the company's operations affect the environment and society (inside-out). To achieve this, the digitization of integrated processes is necessary because it generates a volume of non-monetary information.

This study examined the transition from CSR to ESG, highlighting the extent to which companies listed on the Bucharest Stock Exchange have implemented sustainability reporting. Through an empirical approach, we offer insights into how companies and economic experts can adapt to new challenges and opportunities, noting that an integrated approach and adequate preparation in all respects are necessary for the transition to a sustainable and digitalized economy.

Motivation and relevance of the research topic

The motivation behind choosing this research topic stems from several factors. Primarily, as an employee of a multinational corporation involved in this research, I was involved to some extent in the process of gathering non-financial information, which was subsequently used in the sustainability report. Additionally, sustainable development was the subject of my bachelor's and master's theses, so my experience in this field has been enhanced, giving me the opportunity to offer certain personal recommendations that stakeholders might consider in the future. I conducted research between 2016 and 2024, a period considered sufficient to track the evolution of this type of reporting among listed companies. The research covers companies from various sectors, thereby meeting the requirements of comprehensiveness and comparability.

The current landscape is characterized by a series of strict regulations and growing concern about corporate impact on ESG issues, with listed companies needing to adapt quickly to new reporting requirements by providing useful and transparent information. Digitalization is

fundamentally transforming the accounting profession and offers remarkable opportunities for process automation, the use of artificial intelligence, and emerging technologies that can be useful in preparing non-financial reports. The main concerns relate to the need for the skills required for economic specialists to adapt to change, and swift measures are needed to address these issues.

Research objectives

The main objective of this thesis is to establish and validate a multidimensional methodological framework for assessing the level of compliance of ESG reporting, with a view to analyzing its determinants on performance and market reaction, in the context of the transformations brought about by digitalization and sustainability regulations. To support this research endeavor, I deemed it appropriate to set the following specific objectives, in accordance with the structure of the five chapters:

- **Subsection 1.1 –** Conceptual foundation of the pillars of sustainability: identifying interdependencies and synergies within non-financial reporting;
- **Subsection 1.2 –** Assessing the trends in academic discourse regarding the economic paradigms of sustainability and digitalization by evaluating the volume of international publications that refer to them;
- **Chapter 2 –** Assessing perceptions regarding the digitization of the accounting profession and analyzing how emerging technologies are reshaping the mindset of financial professionals to facilitate the integration of sustainability into corporate governance strategy;
- **Subsection 3.1 –** Structural determinants of the scope of non-financial reporting, through the integration of ESG criteria, and its role in facilitating access to sustainability information;
- **Subsection 3.2 –** Identifying useful tools for ensuring transparency and comparability in digital ESG reporting;
- **Subsection 4.1 –** Identifying common elements in sustainability reporting standards and requirements under European and national regulations to establish key points for defining a methodological framework;

- **Subsection 4.2 –** Developing a useful methodological framework for ESG reporting and testing it on Romanian companies listed on the Bucharest Stock Exchange;
- **Subsection 5.1 –** Identifying the interdependencies between corporate governance variables and the degree of ESG compliance;
- **Subsection 5.2 –** Determining the impact of the ESG score, based on the degree of compliance, on eight financial indicators;
- **Subsection 5.3 –** Determining the impact of non-financial report publication on stock prices.

Research Methodology

This doctoral dissertation adopts a sequential methodological approach, beginning with a theoretical analysis of the concepts of sustainability and digitalization, investigating the perceptions of economic specialists, and developing a proprietary methodological framework aimed at empirical quantitative validation of companies listed on the Romanian Stock Exchange.

In the first chapter, we conducted a theoretical and exploratory study to review the relevant literature, culminating in a bibliometric analysis that compared sustainability and digitalization, both considered challenges in the economic sector. The theoretical review of the main concepts of social responsibility, integrated reporting, and sustainability, conducted through a qualitative, conceptually evolutionary analysis, was integrated, via a mixed-methods approach, with quantitative bibliometric data.

Chapter Two examines economic experts' perceptions of the paradigms of sustainability and digitalization, serving as a bridge between the theoretical and empirical aspects. We conducted a quantitative analysis using a sociological survey as our method, with the questionnaire administered to specialists in this field serving as our instrument. The primary objective was to identify the knowledge and skills of these individuals, which have a direct impact on redefining the role of economists in a business environment.

In Chapter Three, we highlighted the ESG dimensions by directly referencing the new digital reporting system supported by EFRAG, specifically the XBRL model. We applied the model to OMV Petrom, thereby conducting applied research with a focus on modeling and practical implementation.

Chapter Four provides a brief overview of the main sustainability indicators found in the literature, which are used by companies in the preparation of sustainability reports. This is the core element of the research, which has been distilled into a „best-practices guide". Based on this guide, we developed a sustainability reporting scoring model, using a proprietary methodology to create a non-financial ranking based on ESG scores. This methodology begins with qualitative research during the developmental phase and becomes quantitative during the application phase described in the following chapter. The approach is predominantly qualitative and methodological in nature, useful in the process of selecting, developing, and structuring ESG criteria, which are subsequently applied for evaluation purposes through quantitative and comparable research on companies listed on the AeRO market or the regulated market of the Bucharest Stock Exchange.

In the final chapter, we conducted three empirical studies in which we examined the sustainability reports and financial statements of the companies included in the study, created rankings, and subsequently analyzed, from an econometric perspective, the influence of corporate governance factors and financial performance on ESG scores. Additionally, we conducted an event study to observe the market's reaction to the publication of companies' non-financial reports. The research was quantitative, designed to study the evolution of non-financial reporting for the 37 listed companies over a 9-year period (2016–2024), applying the proprietary methodology described in the previous chapter. The financial analysis was conducted to construct a comprehensive performance indicator by aggregating profitability ratios, liquidity indicators, debt ratios, and indicators related to the number and value of shares. We used econometric models to study the influence on the ESG score through linear regression analyses and correlations, with the goal of testing the causal relationships that underpin the research hypotheses.

Each study conducted in the described sections includes its own methodology section, which builds upon the approach outlined in this summary. Furthermore, in those sections, we have outlined the operational objectives, hypotheses, or research questions, as well as the methods used to conduct the research. In Table 1.1, we have summarized the core methodology, the type of research, the approach, the methods, and the utilized data.

Table 1.1: Overview of the research methodology

Chapter	Type of Research	Approach	Method	Data
I	Theoretical	Mixed (qualitative + quantitative)	Literature review + Bibliometric analysis	Documentation
II	Exploratory, explanatory	Mixed (qualitative + quantitative)	Theoretical analysis + Questionnaire survey	Primary + secondary data
III	Applied	Applied qualitative (OMV Petrom model)	Documentation, modeling, and implementation (XBRL)	Structured secondary data
IV	Normative–methodological	Normative qualitative	Methodological design + proprietary model	Secondary data + Indicator construction
V	Empirical	Quantitative	Report analysis + regression + event study	Panel data

Source: own projection.

Summary of content and research directions

The first chapter, "**The Transition from CSR to ESG – Conceptualization in the Current Economic Context,**" serves as the theoretical foundation for identifying interdependencies and synergies in non-financial reporting. To establish the conceptual foundation of corporate social responsibility in conjunction with integrated reporting and ESG criteria, as well as to identify the interdependencies between these and global trends, we conducted extensive research on the specialized literature and a bibliometric analysis. Through the transition of normative benchmarks from the 1987 Brundtland Report to the complex architecture of the 2030 Agenda, sustainability has evolved from voluntary philanthropic actions toward an integrated management model based on the SDGs.

To validate academic trends, we conducted a bibliometric analysis on a sample consisting of 436 documents indexed in the Web of Science Core Collection database. Using VOSviewer software, we mapped co-authorship networks and keyword co-occurrence, confirming an exponential increase in interest in the intersection of sustainability and digitalization, reaching a peak in productivity in 2024.

Chapter Two, "**Integrating Sustainability Reporting and Digitalization into Accounting**," examines the practical aspects of the transformation of the accounting profession under the influence of sustainability and digitalization paradigms. In the first part, the research explored the evolution of the profession from the perspective of the Industrial Revolutions, with an emphasis on the transition to Industry 5.0. Digitalization through emerging technologies is not merely a factor in streamlining repetitive tasks; it has become a pillar of sustainability. In the

second part, the research was based on a structured questionnaire to which 78 respondents from the economic sector responded affirmatively. Through this research tool, we aimed to identify the level of familiarity with the main reporting standards, perceptions regarding the costs and benefits of implementing ESG reporting, as well as openness to new digital technologies. Over 80% of respondents consider sustainability essential for corporate transparency, although 45% view it as only a secondary priority compared to financial indicators. A proportion of 75% view non-financial reporting as a tool for green washing, effectively highlighting the need for external auditing of the data presented in reports to ensure accuracy**.**

The findings highlight openness among accounting professionals toward the sustainability paradigm, but underscore the need for standardized tools to mitigate the risks of green washing. The general perception confirms that comparable standards and adequate digital infrastructure are needed to integrate ESG reporting into governance strategy. The research continues with the transition from individual perception to systemic standardization, exploring the tools through which digitalization becomes the operational arm of sustainability. In this context, the analysis focuses on the EU Taxonomy and the XBRL model as digital solutions for non-financial reporting.

Chapter Three, "**The Architecture of ESG Reporting: Dimensions and Digital Tools**," offers an analytical exploration of the technical mechanisms underpinning modern sustainability reporting governance, marking the transition from voluntary reporting to digital compliance. The research begins with a multidimensional examination of the ESG (Environment, Social, and Governance) pillars, recalibrating business resilience and ethics. The environmental sphere underscores the transition from sporadic initiatives to rigorous management of natural resources, while the social dimension addresses human capital and stakeholder theory. The governance pillar plays a predominant role, demonstrating that management adaptability and the digitization of certain functions serve as the catalyst for integrating sustainability into corporate strategy. In the following section, we have dedicated a section to the EU Taxonomy, a classification system for sustainable activities designed to reduce information asymmetries and prevent the risk of green washing. The element of originality and practical contribution is achieved through the development of a digital reporting model in XBRL format. The creation of a prototype applied to real data from OMV Petrom S.A. demonstrated the interoperability of the data. Through the

proposed model, the digital tagging of key non-financial performance indicators facilitates the analysis, comparability, and preparation of data for processing by algorithms using artificial intelligence.

The ESG pillars, taxonomy mechanisms, and XBRL digital architecture constitute the technical infrastructure necessary for implementing non-financial reporting. Their effectiveness depends on the rigor of the standards; thus, their mere existence does not guarantee compliance without a comparable assessment model. The transition from technological tools to verifying the substance of reporting is the focus of the next chapter, with the analysis grounded in the evolution of international regulations and the proposal of a framework for assessing the degree of non-financial compliance.

Chapter Four, "**Synergies in Sustainability Reporting: Developing a Methodological Compliance Framework in the Era of Digitalization and CSRD Regulations**," forms the core of the thesis, providing a tool for evaluating the ESG reporting practices of companies listed on the Bucharest Stock Exchange. In the first part, I conducted a comparative analysis of the main international reporting standards (GRI, SASB, IFRS S1 and S2, ESRS) to highlight the global convergence toward interoperability and digitalization. As the most recent and advanced in terms of regulatory requirements, the ESRSs have mandated the use of the double materiality principle. The original contribution lies in the development and implementation of a hybrid methodological framework for investigating the compliance of non-financial reporting. We proposed a weighted scoring system (0–1 scale) across four sections (general, environmental, social, and governance information). Through this tool, non-financial data were transformed into inputs for econometric modeling, thereby facilitating the ranking of companies and monitoring their evolution over time. Furthermore, the digital dimension of reporting was explored by proposing an integrated platform for the collection and comparison of ESG data.

The development of a methodological framework for assessing the degree of non-financial compliance forms the foundation of this research, and the definition of a set of clear indicators and validation criteria enables the transition from theoretical discussions of compliance to empirical testing in the real-world context of companies listed on the Bucharest Stock Exchange. The subsequent chapter is dedicated to the application of this framework to the 37 companies analyzed to determine their level of alignment with ESG requirements. After

ranking these ESG scores, the research proceeds to an econometric analysis to explore the interdependencies between the degree of compliance, governance variables, and financial indicators.

Chapter Five, "**Dimensions and Perspectives on Non-Financial Reporting by Companies Listed on the Bucharest Stock Exchange**," represents the final stage of the research, marking the transition from a purely theoretical foundation to empirical validation, using a proprietary tool for measuring non-financial compliance. This tool was tested on a sample of 37 companies listed on the BSE (regulated market and AeRO segments), revealing a significant improvement in information transparency during the analysis period (2016–2024). Using multiple linear regression models, the analysis demonstrated that the board's governance structure directly influences the quality of ESG reporting. This validated the finding that gender diversity is the strongest predictor of ESG compliance, confirming stakeholder theory and resource dependence theory. In contrast, the duality of leadership roles (chair of the board and CEO) and the proportion of non-executive members did not show robust statistical significance in the analyzed context.

The econometric results indicate a statistically neutral relationship between the ESG score and ROA. This finding suggests that, in Romania's emerging capital market, investments in sustainable policies are treated as operational costs and are not perceived as factors that optimize profitability. Liquidity is the primary determinant of financial success, with ESG policies ranking second in investors' decision-making hierarchy.

From the perspective of the impact on the capital market, we analyzed the reaction of stock prices to the publication of companies' non-financial reports and found weak informational efficiency, with a balanced reaction, suggesting that ESG information is either already priced into stock prices or is viewed with skepticism.

Conclusions, original contributions, limitations, and future research directions

Final Conclusions and Original Contributions

The primary objective of this doctoral dissertation was to establish and validate a multidimensional methodological framework for assessing the compliance of ESG reporting,

while also examining how compliance influences financial performance and capital market reactions, in the context of the paradigms of digitalization and sustainability, driven by the rigor imposed by the new CSRD regulations.

Through the various stages of our research, we have demonstrated that non-financial reporting has evolved from a voluntary, reputation-driven approach to a model of digital governance integrated into corporate strategy. The results obtained lead to the following summary conclusions regarding the main objective:

- **Validation of the multidimensional methodological framework**: we made the transition from the theoretical-conceptual dimension to the operational dimension by developing a tool to assess the degree of non-financial compliance across four pillars (general, environmental, social, and corporate governance); Testing on a sample of 37 companies listed on the Bucharest Stock Exchange (BVB) yielded a high degree of compliance;
- **Digital synergy** (**XBRL** reporting model): the digitization and adaptability of the accounting profession, as well as the adoption of a digital reporting format, are viable solutions for eliminating green washing; the transition to Industry 5.0 and the integration of artificial intelligence can transform ESG into a strategic asset;
- **Determinants of corporate governance**: Through econometric testing, we have confirmed that the structure of the board of directors directly influences the quality of non-financial reporting; gender diversity is the strongest predictor of ESG compliance for the model analyzed, thus confirming stakeholder theory and resource dependence theory;
- **Impact on performance and the capital market**: by using ESG as a driver of transparency, the research achieved statistical neutrality with respect to short-term ROA in the emerging market of the Bucharest Stock Exchange (BVB); The market's reaction to the publication of non-financial reports remains balanced, with a period of adjustment observed in asset valuation mechanisms in light of sustainability signals.

Next, we will reiterate the specific and operational objectives established in the design section of the research methodology, while presenting the specific conclusions drawn from testing them. Through this analytical framework, we highlight how we have navigated all stages

of the scientific process: beginning with the theoretical foundation and literature review through bibliometric analysis, using a questionnaire to gauge the perspectives of economic specialists, and concluding with econometric modeling and the event study.

To establish the conceptual foundation for the pillars of non-financial reporting, we conducted a rigorous review of the relevant literature, a process that revealed that corporate social responsibility, integrated reporting, and the implementation of ESG criteria are successive stages in the evolution of this new type of reporting. From the perspective of industrial trends, the transition has occurred gradually, with voluntary initiatives—which primarily had a reputational impact—evolving into well-regulated, coherent frameworks integrated into companies' decision-making processes. Corporate social responsibility is the cornerstone of the development of non-financial reporting, generally associated with philanthropic initiatives. We highlight a new model of strategy and governance, in which sustainability, business ethics, and informational transparency are considered essential criteria for overall performance. The emergence of ESG criteria represents the maturation of the non-financial reporting process, grounded in the interdependence of the three sides of the "sustainability triangle": the environment, social inclusion, and corporate governance. Although the concept is integrated into companies' business strategies, it often fails to transcend its role as a marketing tool. This phenomenon is associated with green washing, as companies may selectively disclose non-financial information or claim improved overall performance without clear evidence (Os 1).

Through the bibliometric analysis conducted in subsection 1.1, we sought to examine the dynamics of the academic discourse on sustainability and digitalization, thereby identifying the stage of development of these two economic paradigms. Our results confirm that the two economic paradigms studied represent mature and emerging research directions, with a significant contribution to the academic community. We observed a steady and significant increase in interest in the scientific discourse, as evidenced by the volume of international publications; thus, over 80% of all published documents fall within the 2021–2024 period. Another indicator of maturity can be considered the international visibility of publications on sustainability and digitalization—frequently cited works that establish models and methodologies, moving beyond the exploration phase. As the field has matured, distinct research subfields have emerged, such as the circular economy, digital technologies, and sustainability,

and through interdisciplinary integration, their research domain has been consolidated. Although both paradigms are self-contained and mature, the intersection between the two is at an emerging stage. Through the intersection of sustainability and digitalization, a new model for digital reporting of non-financial information is emerging, proposed by EFRAG and developed in the subsequent chapter (Os 2).

With regard to assessing perceptions of the digitization of the accounting profession and the way in which emerging technologies influence the thinking of economic specialists regarding the integration of sustainability into corporate strategy, we have found that we are in the fifth era of industrial revolutions, on the cusp of synergies that integrate human emotional behaviors into interactions with robotics.

Digitalization is no longer merely a competitive advantage; it has essentially become a prerequisite for the survival and sustainable development of organizations. Industry 5.0 marks the transition from strictly technological automation to a model centered on people and technology. The economic model proposed by Industry 5.0 is based on a solid technological infrastructure, with digitization serving as the transformative element of economic processes. The difference from the previous model lies in the integration of the following dimensions: a focus on the human factor supported by technology, sustainability, and the resilience of economic systems. The human dimension becomes the central focus, receiving support for the development of creativity and decision-making capacity through emerging technologies such as Big Data, AI, and IoT, which contribute to the interconnection of systems and enable the analysis of large volumes of data.

Thanks to digitization and automation, social changes will occur that create a need for new skills in the labor market, in social relations, and for accessing public services. This transformation requires the development of interdisciplinary skills, with digital, analytical, and strategic skills among the most important, enabling individuals to interpret large volumes of information to support future managerial decisions.

It is within this context that the role of the accounting profession is being redefined within the new economic paradigms, marking a shift from the traditional focus on data entry and the production of financial information toward a strategic role in governance, in understanding

sustainability, and in implementing ESG criteria. Economic specialists play an essential role in producing and monitoring non-financial performance indicators, as they are involved in corporate governance processes, effectively becoming essential partners in the sustainable development of companies (Os 3).

Based on the results of the survey conducted among economic experts, the varying weights assigned to ESG criteria point to future directions that regulators and other stakeholders should focus on a collaboration to raise corporate leaders' awareness regarding the development of initiatives across all three dimensions of sustainability.

With the aim of establishing structural guidelines for the scope of non-financial reporting, we conducted an analysis of how the integration of ESG criteria reshapes the current business model. The premise underlying this objective positions sustainability as a central pillar of governance strategy. The redefinition of corporate responsibility in a holistic manner, at the level of European standards and norms, was achieved by integrating the three ESG dimensions (environmental, social, and governance), thereby shaping a structural framework in the form of a "sustainability triangle." Under the proposed new model, a company's performance is no longer viewed strictly from a financial perspective; instead, a balance is achieved among the three dimensions, making it an operational tool through which non-financial reporting is structured.

The requirements set forth by the Sustainability Directive and the European Green Deal demand corporate engagement that goes beyond the narrow financial focus of measuring performance solely by profit. By shifting from a shareholder-centric model to one oriented toward multiple stakeholders, companies must focus their attention on the overall impact generated (Os 4).

Through a proactive and regulated approach, sustainability becomes a pillar of performance, providing access to standardized, comparable, and relevant information for future decisions. Demonstrating a firm commitment to sustainability requires companies to continuously adapt their management practices to legislative requirements, thereby ensuring the credibility of non-financial reporting. The process is constantly evolving; a failure to adapt leads to merely formal reporting, which will directly undermine stakeholder trust. Genuine commitment is reflected not only through non-financial statements but also through the integration of regulatory requirements (Os 4).

In identifying useful tools for ensuring transparency and comparability in digital reporting of ESG criteria, we have found that the ESRS and GRI standards, the EU Taxonomy's classification systems for sustainable activities, and XBRL digital reporting technology make a fundamental contribution to the development of this field. Early adoption of these tools goes beyond mere compliance, offering a real and competitive advantage in capital markets. By providing accurate and verifiable non-financial information, grounded in the rigor of traditional financial statements, companies facilitate a transparent dialogue with investors.

The effectiveness of digital ESG reporting can be enhanced by integrating artificial intelligence algorithms. We have observed that, without a digital reporting model, data remains unstructured and difficult to process automatically. By reporting data in XBRL format, artificial intelligence will be able to perform predictive analyses and audits automatically, transforming non-financial reporting from an administrative burden into a key resource. By conducting a test/model on OMV Petrom S.A. for presenting non-financial information in XBRL format, we made the transition from the conceptual to the operational level. The research proposes an operational model for structured reporting, underpinning the convergence between corporate governance and digital transformation, and ensuring the integrity of non-financial data. We consider it appropriate to expand the XBRL digital model globally, given its ability to promote interoperability among the reporting systems used, bringing benefits to the automated analysis of certain reported ESG data. The model draws on features previously tested for financial reporting, frequently used by listed companies, operating on an architecture similar to e-invoicing, as both utilize digitally structured data, with the difference lying in the timing and purpose of the reporting (Os 5).

To identify commonalities, we conducted a content analysis of the main sustainability reporting standards and the requirements set forth in European and national regulations, using them in the following section as key points for defining the methodological framework for assessing the degree of non-financial compliance.

From the perspective of commonalities, all the standards used in the analysis are primarily aimed at increasing the transparency of non-financial information, utilizing ESG criteria, with the central element being the materiality matrix developed through stakeholder engagement. We noted a trend toward alignment with digital reporting through the standards'

compatibility with the XBRL model. From the perspective of common elements, we identified aspects of governance, risk management, and key performance indicators, thereby fostering consistency. The differences between standards stem from the target audience they serve. Standards such as GRI or IR are used by multiple stakeholders, while SASB and IFRS S1 and S2 focus more on investor needs, providing a financial perspective on ESG information. The major difference lies in the approach to materiality, ranging from impact-based to financial-based, with some cases applying the principle of dual materiality, such as the ESRS standards developed by EFRAG. The level of standardization varies, and the degree of mandatory application leads to significant divergences, with ESRS standards becoming mandatory in the EU and being linked to the Sustainability Directive. The trend toward convergence is present and supported by harmonization at the macro level; however, at present, the ESG reporting ecosystem is characterized by diverse approaches, reflecting the different needs of stakeholders.

An analysis of European sustainability directives has revealed a clear framework regarding the non-financial information required of corporations. The focus is on presenting environmental policies, risk management, key non-financial performance indicators, and double materiality, forming a coherent framework for assessing sustainability. The content of the reports becomes a strategic focus, moving beyond a theoretical, descriptive approach and aiming to integrate sustainability into the decision-making process. The transition from NFRD to CSRD marks the shift from a limited, flexible framework to a comprehensive and rigorous one. CSRD introduces new requirements regarding the consistency, comparability, and comprehensiveness of the information presented in published reports. Expanding the content to stakeholders throughout the supply chain and aligning strategy with sustainability objectives represents added value with long-term impact. This directive has introduced the requirement to audit the non-financial information published by companies in statements or reports, thereby enhancing credibility. The content of reports must be adapted to digital requirements, marked by the development, implementation, and testing of the XBRL digital reporting model by EFRAG (Os 6).

Regarding the differences between the CSRD Directive and O.M.F.P. No. 85/2024, these relate to the level of reporting, the degree of standardization, and the approach to sustainability reporting. The CSRD mandates a high level of standardization using ESRS standards, with

national transposition incorporating key aspects, yet it maintains flexibility in reporting methods, thereby creating the fundamental issue of a lack of comparability across companies and sectors. The CSRD introduced dual materiality, which serves as a central element in the new reporting model, requiring companies to focus both on the impact of ESG criteria on financial performance and on the impact of their activities on society and the environment. Under the O.M.F.P., this approach is general in nature, without detailed methodological elaboration. The provisions of the CSRD regarding mandatory auditing and the use of digital reporting formats are currently being aligned with national legislation, though the process has not yet reached a high degree of maturity.

Given the current international geopolitical challenges, and to reduce the administrative burden and streamline compliance processes, it was decided to implement a new deferral directive. EU Directive 2025/794 was adopted to simplify sustainability rules. Its role is not to cancel the objectives, but rather to adjust the implementation timeline. In practice, through this "Omnibus" package of measures, the deadline for adopting the ESRS standards has been postponed by two years. Given the regulatory burden, concerns have been raised about driving investment away from the EU, causing it to fall behind the U.S. and China, which have more permissive rules regarding ESG criteria.

The central contribution of this research lies in the development of a methodological framework for assessing the degree of non-financial compliance and testing it on companies listed on the Bucharest Stock Exchange (BVB). The methodological framework developed for assessing the degree of ESG compliance is based on a content analysis of the main sustainability reporting standards and relevant European directives. By leveraging the identified convergences, we integrated the relevant elements in a way that allows adaptation to the company's specific context, with the goal of achieving cross-sectoral information comparability. The central element is the principle of double materiality mandated by the ESRS standards and the CSRD Directive, using ESG criteria to develop a methodological tool tested on companies listed on the BVB (Os 7).

We proposed a clear set of indicators, grouped into four sections based on ESG criteria, each with a specific weighting: general criteria (10%), and environmental, social, and corporate governance criteria, each accounting for 30%. Although environmental criteria accounted for

over 40% of respondents' interest in the survey addressing experts' perceptions, we chose equal weightings for the three criteria, reflecting the ESRS approach, by leveraging the interdependence of the pillars. Without a solid level of governance and an ethical, stable workforce, environmental performance is not sustainable in the long term. The general criteria act as a trust multiplier, serving as the foundation for informational transparency. Through the proposed symmetry, we eliminated sectoral subjectivity, as we risked the model becoming a tool for analyzing ecological performance, whereas the goal was to ensure consistency in non-financial reporting as a whole.

To achieve the operational objective of ranking companies listed on the Bucharest Stock Exchange (BVB) based on their level of compliance with sustainability reporting requirements, we conducted an empirical study of 37 companies on the AeRO and regulated markets, thereby testing and validating the methodological framework proposed in the previous chapter.

Through our longitudinal study of how the companies included in the analysis present their non-financial information, we have demonstrated a significant increase in the number of sustainability reports between 2016 and 2024. In 2024, 86% of the analyzed companies published non-financial information (27% in the form of non-financial statements and 59% in the form of a sustainability reports), compared to 37.84% in 2017. The year 2024 marks a record in terms of the number of companies that chose to publish non-financial information in the form of a sustainability report, with 20 of the 37 analyzed companies opting for this format. OMV Petrom S.A. and Rompetrol Rafinare S.A. are the only companies that voluntarily published non-financial information prior to the 2017 requirement. On the OMV Petrom S.A. website, the first voluntary report was published for the year 2012. This trend toward voluntary adoption contributes significantly to the implementation of the sustainability strategy, as these are also the companies that achieved the highest level of non-financial compliance. Progressive adoption is based primarily on the emergence of regulations, European directives, and national legislation, which are useful for the compliance of companies listed on the BVB (Op 7).

The sector analysis confirms that OMV Petrom S.A., Rompetrol Rafinare S.A., and Romgaz S.A. rank among the top performers in terms of sustainability reporting compliance, due to the influence of environmental factors and strict regulations, thus companies in industrial

sectors achieve a higher degree of non-financial compliance than those in fields of activity with a lower environmental impact.

By correlating with the operational objective of highlighting the degree of ESG compliance at the level of the two market categories analyzed in this research, the results we obtained confirm the existence of significant differences from a structural point of view between the regulated and AeRO markets. The objective is achieved because we demonstrated that the level of compliance is considerably higher for companies on the regulated market, the AeRO segment being characterized by a low degree of alignment with non-financial reporting standards, with a single exception determined by consolidated reporting at group level. This finding validated the fact that legislative pressure, transparency requirements and the maturity of large companies directly influence non-financial reporting behavior. This objective substantiates the need for concrete interventions to support small and medium-sized companies on the AeRO market, the conclusions being considered as future actions that reduce the gaps between the two market segments, facilitating convergence towards uniform and comparable practices at the capital market level (Op 8).

The most important part of the empirical research is econometric testing to find the interdependence relationships between corporate governance variables and the degree of ESG compliance. The chosen econometric model considers the following variables:

$$ESG_{Scorei} = \beta_0 + \beta_1 ¿ \beta ¿_2 Duality + \beta_3 Diversity + \beta_4 Non-executive + \beta_5 \ln Employees + \beta_6 Seniority + \mu_i + \tau_i + \varepsilon$$

.

Through the chosen econometric model, we identified a significant interdependence relationship, thus, 69% of the variation in the degree of ESG compliance is explained by the corporate governance and control variables used (R^2= 0,691). Corporate governance architecture and company size are robust predictors for sustainability reporting on the Romanian capital market (Op 9).

Gender diversity proved to be the most influential governance variable used. The regression coefficient suggests that the ESG score increases by approximately 4.8 points with an increase in the share of women on the board. This is also supported by the moderate correlation

between the two variables of 0.372, thus, diverse boards make more responsible decisions in terms of sustainability reporting (Op 9).

The correlation between the size of the board, measured by the number of members, and the ESG score of the companies is strong (r=0.665), with the regression model also having an effect. Adding a member to the board generates an increase in the ESG score by 0.8 points. The significance threshold for this analysis is 10%, as other internal company resources are also needed to correlate the size of the board and achieve a robust impact (Op 9).

A predominant role in the analysis is played by the control variable, the number of employees of the company, expressed by natural logarithm. This variable has the highest coefficient (B = 6.737, p <0.001) and a strong correlation (r = 0.727). An increase of one logarithmic unit in the number of employees leads to an increase of approximately 6 points in the ESG score, thus demonstrating that the superiority of resources at the disposal of a company is critical for sustainability reporting (Op 9).

Through the analysis performed, we disproved the direct influence of the duality of management functions and the share of non-executive members in reflecting the degree of ESG compliance. Considering the statistical significance intervals (p = 0.354, respectively p = 0.817), these variables do not have an influence based on the sample of 37 companies listed on the BVB (Op 9).

Regarding determining the influence of the ESG score built based on the degree of compliance on 8 financial indicators, we used the following econometric model:

$$ROA_i = \beta_0 + \beta_1 Sco\Re_{ESG} + \beta_2 LEV + \beta_3 LG + \beta_4 \ln Total\ Assets + \beta_5 \ln Employee + + \mu_i + \tau_i + \varepsilon \ .$$

The leaders of the financial ranking based on the standardized total Z score for the period 2016-2024 are as follows: in first place we find Hidroelectrica S.A. with a score of 12.46 points, followed by Conpet S.A. with 8.91 and Aerostar S.A with 7.35. They obtained values above the average of the sample studied based on the 8 financial indicators. The only company on the AeRO market that obtained a positive total Z Score is Arobs Transilvania Software S.A with 5.17 points, managing to exceed the average of companies on the regulated market. This aspect supports the fact that the size of total assets held by a company is not a mandatory condition for

financial efficiency. A particularity of the sample is represented by the performance of the companies OMV Petrom S.A and Digi Communications, where the size of assets tempers the rates of return, in the presence of a high ESG score. The size of assets and the number of employees can temper a company's profitability rates. On the last positions of the financial ranking, we find Romaero S.A. with -9 points and ArcelorMittal Hunedoara S.A. with -6. Negative values indicate a significant distance from the average of the sample companies analyzed from the perspective of profitability and liquidity. The method of standardizing the 8 indicators created the possibility of reflecting the overall performance of the company, providing the framework for testing the influence of economic profitability on the degree of ESG compliance, the analysis being developed in the next stage of the research.

To determine the influence of the ESG score on financial indicators, we tested an econometric model of multiple linear regressions, the results of the researched sample indicating a statistical independence between the degree of compliance and ROA. Although the model explains 20% of the variation in the rate of return, at the level of the companies analyzed on the BVB, the independent and control variables do not form a predictive model because they do not fall within the range of statistical significance (F = 1.621).

Through the regression analysis performed, compliance with ESG standards is not currently a factor determining economic profitability. Liquidity is the only predictor with a statistically significant impact on the degree of non-financial compliance measured by the ESG score. Financial success is dictated by the efficient management of cash flows, with sustainability policies being secondary to the short-term stability of companies. Although large companies tend to obtain higher ESG scores, their size does not directly guarantee superior financial efficiency. Through the regression analysis, we found that the size of assets does not directly translate into higher profitability, thus disproving the advantage of large companies compared to the average obtained on the market (Op 10).

To achieve the operational objective regarding the influence of the publication of non-financial reports on the share price, we applied the event study method to companies on the regulated market; the used window being 21 days. We investigated the immediate market reaction by comparing the average price of the last 10 days before the event and the price on day

0 when the companies' non-financial report was published. This analysis was continued for another 10 days, in order to observe subsequent market reactions.

In terms of the immediate market reaction, 46% of companies registered price variations above the 1% significance threshold, but their direction is perfectly balanced, with 50% being increases and 50% decreases in share prices on the day of publication. The BVB market currently does not perceive the publication of sustainability reports as unambiguously positive signals, as they are secondary information, already incorporated into the share price (Op 11).

Looking at the 10 days following the event, there is a tendency for share prices to increase for 53% of issuers, but volatility is high. Looking at the top 5 companies in terms of ESG scores, it is surprising that 4 of them experience share price declines after the publication of non-financial reports. This suggests that investors perceive complex reporting requirements as a cost burden or that the market had too high expectations (Op 11).

Personal contributions:

- Given that 75% of the respondents to the questionnaire consider the reporting of non-financial aspects as a marketing tool, but which generates a low level of trust regarding the authenticity and veracity of the environmental and social actions of companies. The responses submitted show that currently economic specialists have a limited involvement in the preparation of the reporting of non-financial information from the explanatory notes to the financial statements, preferring in the future to outsource this information (Chapter 2.2 – Op 5).
- Development of a methodological framework for assessing the degree of compliance of ESG reporting based on an exhaustive analysis of international sustainability reporting standards (GRI, SASB, TCFD, IR, ESRS, IFRS S1 and S2) by aligning with the requirements introduced by the CSRD Directive. The innovative nature of the methodological framework derives from the integrative approach, using each of the strengths of the aforementioned standards, adapting them in a coherent and applicable form at the level of companies listed on the BVB. Operationalization is defined by general and structural criteria of the environmental, social and governance dimensions, then using the scoring method. The use of a system of weights and importance coefficients was necessary to demonstrate and quantify the degree of compliance of ESG

reporting, allowing comparative analyses between companies and sectors of activity (Chapter 4.2.1 – Os 7).

- Identifying the need for a European platform to centralize essential non-financial data and sustainability reports using the XBRL digital model. This platform facilitates access to ESG information, improves comparability between companies and sectors, and becomes a support for stakeholders (Chapter 4.2.3 – Os 7).
- Testing and validating the methodological framework for assessing the degree of ESG compliance of the 37 companies listed on the BVB (Chapter 5.1 – Op 7).
- Gender diversity of board members has a positive effect on the ESG score. Increasing the percentage of women in a company's management structures generates a higher degree of receptivity to the stakeholder materiality matrix. The results can be directly correlated with 2 theories. Stakeholder theory: diverse management structures tend to be more receptive to stakeholder interests. Resource dependency theory: gender diversity in the management of a company results in varied skills and perspectives, the result being materialized through improved strategic decisions (Chapter 5.1 – Op 9).
- Identifying a trend towards increasing ESG compliance by increasing the number of members on a company's board. Board size has marginal effects and is conditioned by other factors such as the structure and independence of members. The relationship between the number of members and ESG score is not purely linear, so the impact of each member is not constant (Chapter 5.1 – Op 9).
- The effect of company size on the degree of ESG compliance. Through the proposed econometric model, company size (natural logarithm of number of employees) obtained the highest value of the standard coefficient, being the best predictor of compliance. Although, small companies on the AeRO market do not avoid sustainability reporting, they do not have the necessary, scalable resources. Thus, the stringent need for simplified non-financial standards for small and medium-sized companies appears (Chapter 5.1 – Op 9).
- Creating a financial ranking of the analyzed companies using the total Z score of the 8 indicators, reflecting the degree of ESG compliance and financial performance to obtain a global picture (Chapter 5.2 – Op 10).

- Investments in environmental, social or governance policies are neutral in terms of short-term profitability. Given the research in an emerging market, the transmission of the value of ESG criteria to profitability is in its infancy. Profitability is still dictated by classical financial factors such as overall liquidity. Increasing liquidity by one unit generates an increase in ROA by approximately 1.8 units. Given that liquidity is the only significant variable in the econometric model tested, financial survival is so critical that it eclipses the strategic benefits of sustainability reporting (Chapter 5.2 – Op 10).
- Using ESG reporting as a legislative compliance tool and reputation technique on the emerging BVB market. By identifying extremely strong correlations between the degree of ESG compliance and company size (0.777 for total assets and 0.727 for the number of employees, both values being expressed as natural logarithms) we demonstrated that this reporting practice is not strictly based on an efficiency strategy, being rather an attribute of large companies. They have the financial possibilities and resources necessary to implement complex processes of collecting and publishing non-financial information in a transparent manner. The added value in this research is dictated by the neutrality of profit through regression analysis, demonstrating the absence of the influence of the ESG score on ROA. A high ESG score signals responsibility and compliance with legislative requirements (legitimacy theory), thus, the sustainability report is not used as a performance vector, being rather an image asset (Chapter 2.2 and Chapter 5.2 – Op 10).

- The results of empirical research on companies listed on the Romanian capital market reveal that sustainability reporting has a secondary role compared to classic financial reporting. Investors do not perceive the degree of ESG compliance as an asset generating immediate added value or stock market capitalization, being more of an exercise in compliance and responsibility (Chapter 5.3 – Op 11).

Research limitations and future research opportunities

The research has some limitations that need to be considered. First, the analysis was based exclusively on the Web of Science database, which, while ensuring a high quality of the sources included, may result in the omission of relevant works from other databases such as Google Scholar, Scopus or Dimensions. Also, the use of the term “sustainability” as a reference

point may influence the results, given that future research may give greater importance to the term “sustainability”.

The quantitative methodology used provides an objective perspective on ESG reporting, but does not capture the qualitative dimension, such as the perceptions or opinions of managers and decision-makers. At the same time, the impact of major external factors, such as economic crises, pandemics or geopolitical conflicts, which can significantly influence sustainability and non-financial reporting, was not analyzed.

The sustainability reporting awareness questionnaire has several significant limitations. First, the small sample size (78 respondents) may affect the representativeness of the results and influence the general perception of a sector. Including categories such as managers, entrepreneurs, investors or CSR/ESG specialists could improve the validation of the conclusions.

Future research will explore the integration of ESG criteria into investment strategies, analyzing their impact on financial performance and investor behavior. A comparison of ESG fund returns with traditional funds will be conducted to identify the determinants of investment success.

Although the scientific approach has provided a comprehensive picture of ESG compliance on the Romanian capital market, the complexity of this phenomenon and the dynamics of regulations open significant opportunities for academic exploration. Thus, we consider a priority direction to expand the methodological framework by conducting a comparative study between the emerging market in our country and a market with a high degree of maturity and an existing tradition in sustainability.

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