

A SYSTEMATIC REVIEW OF THE IMPACT OF DIGITAL TECHNOLOGIES ON ESG PERFORMANCE AND CORPORATE SUSTAINABILITY REPORTING**Marius-Sorin CIUBOTARIU***Stefan cel Mare University of Suceava, 720229, Romania**marius.ciubotariu@usm.ro*

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Abstract

As social, environmental and governance issues continue to be some of the most debated topics globally, the pressure on companies to report information on corporate social responsibility has been intensifying. At the same time, the rapid development of digital technologies and the deep integration of digital information networks in most of the processes related to global economic development have led to a rethinking of the corporate reporting process. Thus, an increasing number of regulatory bodies have proposed corporate reporting frameworks based on digital standards that use technologies such as XBRL (eXtensible Business Reporting Language) or other types of digital innovations that contribute to the automation of the reporting process. The purpose of this paper is to highlight the impact of digital technologies on ESG (Environmental, Social, and Governance) performance, how the use of digital technologies in the reporting process influences the quality of business sustainability reporting, as well as the advantages and challenges of digitizing corporate reporting. In this regard, the research is based on a systematic and structured analysis of the specialized literature aimed at identifying the main digital technologies used in corporate activity and how they contribute to improving ESG performance and the quality of sustainability reports. Therefore, the most relevant articles addressing digitalization in the context of ESG performance and sustainability reporting over the past 10 years were retrieved from Google Scholar. The results of the study may be useful to companies that report non-financial information, as the paper provides a concise and systematic overview of how digital technologies can facilitate the process of collecting information and preparing sustainability reports, as well as the main advantages and challenges associated with their implementation.

Keywords: corporate social responsibility; digital technology; non-financial reporting; stakeholders**JEL Classification:** M41**INTRODUCTION**

Sustainability and corporate digitalization, as key drivers of economic and social transformation, have attracted increased attention recently. Thus, in an effort to align productivity levels with evolving market needs, and having the investment capacity to do so, market leaders are introducing innovations that revolutionize conventional business models. This has a particular influence on the digital transformation across companies, which are beginning to adopt advanced technologies that would allow them to take advantage of new market opportunities, as well as a better adaptation to the consumers' constantly changing expectations in terms of digitalization (Kostić, 2021).

At the beginning of 2020, however, the entire world was forced to undergo an abrupt transition. The outbreak of the COVID-19 pandemic led to the implementation of a series of lockdown measures that accelerated digital transformation worldwide. Such measures greatly increased society's dependence on digital systems, with internet traffic rising by up to 60%. At the business level, such an accelerated digitalization became the new imperative to ensure business continuity, both in terms of growing operations and surviving on the market (Liakh, 2021). Thus, the COVID-19 crisis has highlighted the need for new business strategies that provide long-term benefits, with aspects such as competitiveness and sustainability becoming increasingly important dimensions for companies and society (Lichtenthaler, 2021).

In this context, the integration of digital technologies into business processes was one of the main factors that contributed to the possibility of continuing activity for most companies. Maintaining contractual relationships with business partners, the possibility of fulfilling remote work commitments, and fulfilling declarative obligations are just some of the activities facilitated by integrating digital innovations into the business processes necessary for companies to overcome the COVID-19 crisis. The easing of restrictive measures imposed by the COVID-19

pandemic did not, however, represent a return to old business practices, but rather the beginning of a new era in corporate activity. Thus, more and more companies have found that the integration of digital technologies into business activities represents a potential factor for increasing operational efficiency and facilitating resource optimization and have chosen to preserve and develop digital innovations within the entity (Cui, 2025). At the same time, the digitalization of various corporate activities has contributed to increasing labor productivity, improving the quality of products and services, and reducing costs, thus making companies more competitive (Cernovschi et. al., 2025).

Against the backdrop of political, social, and economic crises that have led companies to rethink their business models, the issue of business sustainability and the promotion of transparency regarding social responsibility, environmental performance and governance practices has been a major concern for both companies and regulatory bodies (Ciubotariu & Sandulachi, 2021). In this context, new reporting frameworks based on digital technologies have been proposed, which have the potential to revolutionize conventional reporting models.

I. RESEARCH METHODOLOGY

The research strategy involves a systematic review of the specialized literature aimed at identifying the main digital technologies and their impact on ESG and sustainability reporting. Accordingly, a number of articles were selected and analyzed that examined the impact of digital technologies on ESG performance, as well as their influence on the business sustainability reporting process. In this regard, the most relevant articles addressing digitalization in the context of ESG performance and sustainability reporting over the past 10 years were retrieved from Google Scholar.

The documentary material underlying this research was identified by entering the following keywords into the Google Scholar database: corporate social responsibility, digital technology, non-financial reporting, Corporate Sustainability Reporting Directive, Non-Financial Reporting Directive. Only articles whose primary objective was to examine the impact of adopting digital technologies on the reporting process or on ESG performance were selected.

Thus, through fundamental research methods such as content analysis and documentary research, both the main opportunities and the key challenges or concerns related to the implementation of digital technologies in business processes were identified. At the same time, the main digital technologies or innovations used by companies were identified and analyzed, highlighting how they contribute to improving the reporting process and ESG performance.

II. LITERATURE REVIEW

The accelerated development of digital technologies and the need to implement various digital innovations in business processes have led to major transformations in the way companies operate and maintain their competitiveness in a market where competition is increasingly fierce (Cernovschi et. al., 2025). The integration of digital technologies into business activities has generated unprecedented opportunities, stimulating innovation, efficiency, resilience and long-term sustainability among companies, but also a series of challenges regarding their systematic alignment with the strategy and objectives of the entities (Abbes, 2025). The impact that digitalization has on company performance, and especially on ESG performance and the corporate reporting process, is a topic of interest for both economic actors and researchers. Thus, as social, environmental, and governance issues intensify and reporting requirements tighten, compelling companies to disclose transparent information regarding their ESG performance, a significant number of researchers have examined how factors such as corporate culture, governance frameworks or technological innovation influence the potential of companies to meet ESG obligations (Lyu et al., 2025).

The literature review reveals that most studies examining the digitalization of business processes emphasize the positive impact of digital technologies on ESG performance and business sustainability reporting. Thus, the integration of cutting-edge technologies into the entity's strategy is seen as a driving force that allows companies to strengthen their competitiveness and improve ESG performance through better use of the resources and capabilities available to the enterprise, by facilitating the dissemination of information within the company, but also outside it, and implicitly ensuring the transparency of reported information, as well as by optimizing strategic decisions (Liao et al., 2024).

In other words, viewed through the lens of the three areas characteristic of ESG performance, digital innovation can contribute to the reduction of the negative impact on the environment by decreasing the amount of waste, optimizing energy consumption and minimizing carbon emissions with the help of advanced monitoring and control technologies. Also, by using digital platforms, companies can promote ethical business practices, ensure transparency in the supply chain and facilitate stakeholder engagement; these aspects contribute to improving social and governance performance (Cui, 2025).

Regarding the impact of digital technologies on the business sustainability reporting process, the specialized literature reveals that digitalization can have both a direct and indirect positive influence on corporate communication. Thus, on the one hand, the improvement of ESG performance as a result of the integration of digital technologies into business processes stimulates companies to prepare sustainability reports in which they present environmental, social and governance aspects, and on the other hand, the integration of digital technologies into the business sustainability reporting process can contribute to reducing information asymmetry, standardizing reporting, and implicitly to reporting more transparent, comparable and verifiable information (Wang et al., 2025).

Although it is relatively well known that digital innovations have generated countless opportunities for companies, substantially reshaping the way they operate, there are studies in specialized literature that highlight potential negative effects of digitalization on business sustainability. In this regard, several researchers have highlighted the fact that business digitalization can have negative effects on ESG performance; privacy and security risks, job losses due to automation, the impact of digital infrastructure on the environment, and the digital divide are just a few of the concerns of researchers who have examined the impact of digital technologies on business sustainability (Lindgreen et al., 2018).

Another factor that could negatively influence ESG performance relates to the hidden costs specific to the uncertainties inherent in digital transformation. Thus, researchers such as Zhang (2024) and Wang & Hou (2024) suggest that the rapid evolution of digital innovations comes with a high degree of uncertainty, and the implementation of new technologies, lack of experience, rapid changes in the structure and strategy of organizations, generate a series of costs that are difficult to anticipate. Although not included in official budgets, these invisible costs significantly affect the ESG performance and sustainability of digital projects.

Another concern of researchers regarding the negative impact of digital technologies on sustainability concerns the rebound effect of excessive digitalization or the term "digital backlash", as it is conceptualized in international literature. In other words, when a product or service becomes more attractive and accessible due to digital innovations, its use increases considerably, which leads to higher resource consumption and, implicitly, a higher degree of pollution (Ahmadova et al., 2022). Therefore, excessive and unbalanced use of digital technologies can generate unwanted counter-effects that diminish or even cancel out the initial positive impact (Coroamă & Mattern, 2019).

Regarding the negative impact of digitalization on the sustainability reporting process, researchers highlighted that although standardization of corporate communication has a significant contribution to improving business sustainability reporting, promoting isomorphic reporting models through template-based disclosures, unintentionally prioritizes compliance over creativity, leading to a high degree of similarity between reports at the expense of unique disclosures. (Wang et al., 2025).

These mixed approaches highlight that the relationship between digitalization and the impact that digital technologies have on business sustainability has multiple valences, emphasizing the complexity of the topic addressed and the need for rigorous empirical research.

III. ESG PERFORMANCE AND CORPORATE SUSTAINABILITY REPORTING IN THE DIGITAL ERA

In recent years, the international business landscape has been marked by the proliferation of new forms of regulation that require companies to report sustainability information on a mandatory basis. This paradigm shift has been driven by the growing awareness of the essential role of the private sector within the strategies outlined in the United Nations' 2030 Agenda for Sustainable Development. In this regard, an important contribution to the development of new reporting frameworks was provided by the European Commission, the European context representing one of the main jurisdictions affected by this paradigm shift. Thus, as a result of the numerous criticisms concerning the lack of standardization attributed to the Non-Financial Reporting Directive (NFRD), the European Commission introduced the new Corporate Sustainability Reporting Directive (CSRD) which establishes a set of European sustainability reporting standards and aims to ensure that sustainability information is reported through the European Single Electronic Format (ESEF) (Baumüller & Sopp, 2021).

Therefore, European companies listed on EU regulated markets will replace classic sustainability reports in PDF format with reports issued in digital XHTML format, and consolidated financial statements prepared according to IFRS will be labeled according to the XBRL taxonomy made available by ESMA (European Securities and Markets Authority). The use of this reporting system allows the structured incorporation of data, facilitating automated data processing and analysis.

The process of preparing a report in XHTML digital format involves going through successive stages and using certain digital technologies or applications so that the final report is correctly validated. The main steps to be followed to prepare a report in ESEF format are summarized in *Figure 1*.

STEP 1: Preparation of the annual report in PDF/WORD/InDesign format*Preparing financial statements, explanatory notes and other reports and statements that are annexed to them***STEP 2: Converting the annual report into digital XHTML format***Using dedicated ESEF software (UBPartner, PomeLo, ParsePort, Workiva, Amana XBRL Auditor, etc.) to convert the report into XHTML format or outsourcing the conversion service***STEP 3: Labeling according to XBRL taxonomy***Correlating each element in the financial statements with the corresponding label in the XBRL taxonomy using software systems (ParsePort, Amana, Altova, IRIS CARBON, etc.)***STEP 4: Validation of reports in ESEF format***Using software (Arelle, UBPartner, Workiva, Amana, ParsePort, etc.) to verify the XHTML structure, the taxonomy used, the way the labeling was performed, the calculations and correlations, as well as compliance with ESMA rules***STEP 5: Signing and submitting the report***Digitally signing the report and publishing it on the companies' own website, submitting it to the stock exchange and the local supervisory authority***Figure 1.** The process of preparing reports in XHTML format

Source: Adapted from ESMA (2025)

The need to standardize sustainability information, namely the preparation of reports according to the requirements contained in the CSRD, has favored the development of new reporting tools, with many companies already adopting dedicated software systems to facilitate the preparation of reports in ESEF format (Pizzi et. al., 2023).

The introduction by the European Commission of new requirements for the digitization of sustainability reporting represents a relevant innovation in the context of their standardization. The main factors that led the European Commission to include mandatory requirements for the digitalization of sustainability reporting are represented by the need for more reliable and verifiable information (Haji et al., 2022). Integrating digital tools into sustainability reporting processes should be an effective way to avoid the main problems identified by practitioners and policymakers regarding the lack of comparability and reliability of information (Leitner-Hanetseder & Lehner, 2022). Therefore, due to the impact of their activities on the environment and society, companies must make significant changes in the way they report on sustainability (Ciubotariu & Sandulachi, 2023). In achieving these goals, companies have at their disposal a wide range of modern digital technologies capable of increasing transparency and also improving ESG performance by identifying risks and opportunities for long-term business development (Mehedintu & Soava, 2023). The characteristics of such digital technologies are exemplified in Table 1.

Table 1. Modern digital technologies for improving ESG performance and sustainability reporting

<i>Technologies for improving the environmental dimension</i>	
IoT (Internet of Things)	IoT represents a network of digital devices connected to the internet that transmit data to one another (sensors, smart energy meters, smart surveillance cameras, etc.), contributing to improving environmental performance through real-time monitoring of energy, water and gas consumption, reducing emissions by optimizing industrial processes or detecting losses in infrastructures. (Memic et al., 2022).
AI and Machine Learning	AI and Machine Learning contribute to improving environmental performance by automatically optimizing resource consumption based on external environmental conditions. Thus, AI and Machine Learning analyze data received from IoT sensors and adjust consumption in real time, diminishing losses and reducing pollution (Castellanos-Nieves & Garcia-Forte, 2023).
Blockchain	Blockchain is a distributed digital ledger that records transactions and data in cryptographically linked blocks. In the context of environmental performance, Blockchain allows monitoring of resources from source to final product, thus ensuring transparency, immutability and traceability of data and transactions, and implicitly motivating companies to adopt sustainable practices and increasing trust in sustainability reports (Alnogaidan, 2024).
Digital Twins	Digital Twins allow the creation of an exact digital replica of physical systems, processes or objects to monitor and simulate their behavior without affecting the physical object, system or process. This digital tool enables decision-making based on accurate simulations and data and offers the possibility of testing the impact of certain activities

	on the environment in real time. Digital Twins can also anticipate the effect of pollution or climate change by modeling ecosystems or infrastructure (Ali et al., 2025).
<i>Technologies for improving the social dimension</i>	
HR Analytics Platforms	HR Analytics platforms are software systems that support strategic HR decisions by collecting, integrating, and analyzing employee data. This tool helps improve workforce performance and retention, reducing subjectivity in HR decisions (Sanaullah et al., 2025).
Chatbots and AI for employee support	Chatbots are software programs that provide employees with personalized, real-time assistance. With this tool, employees can receive information related to benefits, leave, internal policies, or be guided through onboarding processes (Tharini et al., 2025).
Occupational safety monitoring systems	Occupational safety monitoring systems are represented by technologies such as smart cameras, IoT sensors, platforms and analysis software that can detect risks, working conditions and risky employee behaviors, stimulating an organizational culture oriented towards prevention and responsibility within companies (Flor-Unda et al., 2023).
<i>Technologies for improving the governance dimension</i>	
ESG reporting platforms	ESG reporting platforms are software systems that simplify reporting processes by automatically collecting, managing, analyzing, and publishing ESG performance data. These platforms allow for the integration of data from various departments of entities and monitor their compliance with reporting requirements, thus contributing to improving the reporting process by increasing accountability, transparency, and compliance of reports (Ab Aziz et al., 2023).
Blockchain for transparency and auditing	In the context of governance and reporting, Blockchain is an extremely useful tool, providing a solid framework for transparency, control, traceability and immutability. The use of this technology contributes to improving ethics and integrity in the reporting process. Thus, once recorded, data can only be modified based on management approvals, and each approved change is recorded and traceable, thus discouraging intentions to manipulate reports (Ogedengbe, & Adelotutan, 2025).
RPA (Robotic Process Automation)	RPA (Robotic Process Automation) refers to the use of software to automate repetitive processes based on rules and procedures. Most often, this tool is used in audit, internal control and risk management, as it can detect the risk of non-compliance generated by human errors. Through robust internal control based on the consistent running of the same procedures, RPA contributes to improving governance by increasing transparency, reducing errors and the risk of fraud (Eulerich et al., 2025).

Source: Author's own projection

Overall, digital innovations offer unprecedented opportunities, having a strong potential to optimize environmental, social and governance performance, while also reshaping the business sustainability reporting process (Buboi & Cosmulese, 2023). Thus, the integration of modern digital technologies into corporate activity significantly contributes to reducing the negative impact on the environment by increasing the efficiency of resource consumption, optimizing social processes by stimulating ethical behavior and ensuring protection in the workplace, supporting informed and sustainable decisions based on predictive analysis and simulations, as well as increasing corporate responsibility and stakeholder trust by ensuring transparency and auditability in the reporting process (Münch et al., 2025). These digital technologies either optimize existing IT solutions or introduce new functions, such as accessibility and interactivity or the possibility of collecting and transmitting data in real time. In addition to the large amount of data collected and processed in real time, accessibility and transparency features have significantly contributed to the development of sustainability reporting. At the same time, reducing operating costs and the time required to obtain the information necessary for sustainability reporting increases the efficiency and effectiveness of sustainability reporting activities (Värzaru, 2022). However, the adoption of modern digital technologies also entails a series of challenges related to the cost of implementation, sophisticated infrastructure, data security and confidentiality, ethical and legal risks, and especially the dependence on the quality of input data. Thus, improper management of digital technologies by providing erroneous data can raise issues of discrimination, lack of accountability and transparency.

The next few years will be characterized by the widespread adoption of digital devices in accounting and sustainability, and the introduction of new requirements for sustainability reporting will generate disruptive effects on financial markets due to the need to increase the transparency of ESG information (Ciubotariu, 2019). In the context of sustainable development, digital transformation outlines a new vision for collecting, sharing, storing, using and organizing information resources to ensure the preparation of sustainability reports by companies. Most sustainability reporting operations can be translated into a controlled digital environment accessible from any location, and countries that promote digital transformation at a strategic level will experience a sustained pace of economic growth and sustainable development.

IV. CONCLUSION AND PERSPECTIVES

In the context of an uncertain economic environment and emerging markets, the main concern of companies has become maintaining their market position and creating value for investors. In this regard, meeting the information needs of stakeholders, who have recently insisted on the need to improve ESG performance and the corporate reporting process by providing transparent and comparable information, has become a concern for an increasing number of companies. Thus, a first step in this direction was taken by the European Union, which at the end of 2022 introduced the CSRD, which addresses the main deficiencies of the NFRD and aims to improve

the quantity, quality, consistency and availability of information on the sustainability of companies by introducing a set of standards to govern the reporting process.

Initiatives to standardize business sustainability reporting are an important tool in the process of integrating sustainable reporting principles and practices at the entity level; this process involves making changes to organizational structures to ensure their compatibility with the entity's strategy. At the same time, in the context of political, social and climate crises and the devastating effects that these developments have on society, the need for companies to adopt sustainable practices has become imperative. Thus, the main challenge for companies is to minimize the negative impact generated by the conduct of activities and at the same time ensure increased performance and shareholder value. In this regard, adopting sustainable development practices and voluntarily preparing sustainability reports represents a useful tool both for creating a positive corporate image in an attempt to protect legitimacy, and in the process of identifying strategies that contribute to improving performance.

Although the usefulness of business sustainability reporting in improving companies' reputation and increasing their performance is supported by countless studies and examples of good practices, there are also companies that, although aware of the benefits and necessity of business sustainability reporting, refuse to voluntarily prepare sustainability reports, considering that adopting such practices is difficult and costly. In this context, the development of modern digital technologies capable of facilitating the collection, sharing, storage, use and organization of information resources could positively influence the voluntary adoption of sustainability reporting among companies.

Thus, a balanced approach to the digitalization of business activities by investing in both technology and the development of the necessary governance structures can amplify the potential of digital innovations to improve companies' ESG performance and increase the accuracy and transparency of reported data. At the same time, in an economic environment where corporate social responsibility is an essential criterion for ensuring resilience and long-term success, the potential of digital technologies to simplify data collection and analysis processes, to enhance transparency through reporting standardization tools and especially through the possibility of involving stakeholders in the corporate communication process, can positively influence the voluntary adoption of business sustainability reporting practices among companies.

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