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**ESG Reporting:
analysis of the role of technology in
supporting the compliance**

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Introduction

The previous decades have brought corporate sustainability as one of the most considered topics for a company, fostered by the increasing concern towards the climate change that we are living with. Nowadays, clients, shareholders and stakeholders require their companies to behave responsibly and become promoters of sustainable development.

Environmental, Social and Governance (ESG) issues induce companies to communicate which are their sustainable goals and how they want to assess them through their daily operations. This promoted the development of sustainable accounting in the late 90s (Burrity and Christ, 2016). The challenge for companies has been to adopt a holistic approach towards corporate management, considering not only the intrinsic economic values of operations but also their impacts on the external environment, which comprehends the environment, employees, and local communities (PwC, 2022). Therefore, companies have also changed their disclosure to combine financial data with non-financial data and several companies started to disclose non-financial information in their annual reports (Camilleri, 2019). Non-financial reports have become a case-study and the most relevant tool for promoting sustainability (Sulkowski and Jebe, 2022).

The main differences between financial and non-financial reports are the type of information disclosed and the guidelines which define the structure and the content of the reports. Generally, financial disclosure is associated with mandatory disclosure, which requires structured legislation and principles to comply with, meanwhile, for several years non-financial disclosure has been produced on a voluntary base by the companies. For the need for general rules for a coherent and comprehensive disclosure, the ESG report's regulation has become a complex ecosystem which comprehends different actors, composed of several ESG standard setters and, recently, by governments with the development of country legislations, like the EU Directive 95/2014 on non-financial reports (Sulkowski and Jebe, 2022). The result is that the ESG report's regulation is fragmented and presents several gaps, limiting the usefulness of sustainable reports. The lack of common metrics limits the comparability of the ESG data and determines the low reliability of the data collected (Burrity and Christ, 2016). The wide range of ESG frameworks reduces the efficiency of producing non-financial disclosures and makes it times consuming. Another aspect is the lack of appropriate technology to collect data, simplifying the process of non-financial disclosure.

The last point introduces the second topic of the study, which regards technology and its use for corporate reporting. Digitalization has affected several aspects of our life and it had several impacts also on companies. With regards to corporate disclosure, the introduction of the internet has developed faster and in-time communication, changing, therefore, the information shared. Corporates reports have become available online and more interactive, evolving stakeholders' engagement. The adoption of analytical tools has changed internal procedures for disclosure too. Companies have available real-time data, always updated and personnel collaborate on the cloud, making the accounting process more direct and smoother (Al-Htaybat and von Alberti-Alhtaybat, 2017). These aspects have changed accounting practices and professions. Indeed, for financial accounting, transparency and stakeholder decision-making processes have improved and technological developments have facilitated the refinement of accounting standards and the evolution of these in real-time.

An effective aspect to develop is whether technology could be a tool for improving ESG disclosure and be a response to the correlated issues. According to Burritt and Christ (2016), the possible benefits of technology adoption for sustainable disclosure could be several:

- Improvement of data quality, which results in more reliable and easier to compare.
- Reduction of management discretion regarding what to disclose.
- Limitation of possible errors during the consolidation process.

The purpose of the thesis is to study in a comprehensive way how technology would be implemented, the possible outcomes for non-financial disclosure and verify compliance with the regulation. Based on a real-case study on the adoption of a cloud-system for ESG reporting, it will highlight the pioneers of the transition towards a technology-based tool and the effective advantages and obstacles that will be encountered. These issues are also analyzed with interviews with sustainability experts, who provide firsthand insights into how companies are moving to meet emerging sustainability demands. The contribute to the literature is to identify how technology integration should be performed and to verify if technology could respond to the actual issues in the ESG context by simplifying the regulation, automating data collection, improving the credibility of sustainable reports, and reducing individual discretion. On the other hand, the analysis denotes the possible drawbacks of this technological transition. Companies could not already have the required know-how and the acquisition of this could be time- and cost-consuming. Licenses can be expensive and not feasible for small corporates. Another possible outcome is the need for better regulation of data privacy handling.

The paper defines the background for the implementation of environmental accounting tools, the initial requirements, the benefits generated, and the possible complication and requirements for the ESG regulation. In the first chapter, the actual context of non-financial disclosure is analyzed, exploring the reasons and theories which encourage voluntary environmental disclosure and the various frameworks which provide guidelines for the reporting process. In the second chapter, the analysis concerns the introduction of mandatory disclosure within the European regulation context. In light of this, the focus is at first on the Non-Financial Reporting Directive, followed by the relative evolution of the Corporate Sustainability Reporting Directive (CSRD). In the third chapter, the use of technology for corporate reporting is investigated with the analysis of the current literature, starting from the financial reporting process, and developing relative implications for the sustainability reporting process. The second part of the thesis develops the analysis of the previous literature review. The fourth chapter converges to the actual-case study and interviews by defining the methodology of research and setting the proposition object of the research. The findings chapter reports the evidence that emerged from the analysis, evidencing drivers of digital implementation and the key steps for defining an implementation process, the potential outcomes of a well-defined integration process, and finally technology impact over non-financial disclosure regulation compliance. The discussion section relates the results to the extent of the literature review and addresses the verification of the stated propositions. Concluding, the study will provide insights into enabling technology for sustainable reporting issues and determine the implications for further studies.

Chapter 1. Exploring voluntary non-financial reporting: insights, governance, and integration

Non-financial reporting, better known as sustainable reporting, has become a prerogative for firms. Considering the elements subject of the ESG disclosure, they are:

- E, *Environmental* criteria require companies to communicate their impact on the environment, considering, for example, the waste generated, the origin of the resources, the energy used and the relative emissions.
- S, *Social* criteria which comprehends external engagement with the local communities and the relation with the internal labour force. In this case, are under observation the diversity and inclusion policies, the reward and payment systems and the health and safety management of a company.
- G, *Governance* criteria which regards the internal procedures of a company for undertaking effective decisions and for complying with the law and external requirements. Within the company, for instance, how the Board is nominated, and how the annual compensation has been planned meanwhile for external relations, analyze the presence of antitrust behaviours or corruption episodes.

Non-financial reporting involves many stakeholders, such as regulators, employees, customers, suppliers, communities, and shareholders (Business roundtable, 2019). Sustainability reporting has become a ‘megatrend’ (Sulkowski and Jebe, 2022) thanks to the increasing concern of consumers regarding ethical aspects and the interest of investors. A transparent non-financial disclosure is recognized has a booster of financial performance (Arvidsson and Dumay, 2021) and it is connected to higher equity returns, low default risk and better credit ratings (McKinsey & Company, 2019). The extent behind this is that a transparent and efficient disclosure improves stakeholder relations and reduces information asymmetries which may arise (Villiers and van Staden, 2011; Camilleri, 2019; Pigatto *et al.*, 2022; Sulkowski and Jebe, 2022).

The accelerating non-financial disclosure demand has raised the need for guidelines for legitimate the information disclosed and for providing companies frameworks to follow. For instance, several standard setters have developed and published their frameworks which are not mandatory embedding and companies may choose among them on a voluntary basis (Climate and company, 2022; Darnall *et al.*, 2022). Nowadays, there are multiplied standard setters, even if companies rely more on five of them, which are the Global Reporting Initiative (GRI), the

Sustainability Accounting Standards Board (SASB), the Carbon Disclosure Project (CDP), the International Integrated Reporting Council (IIRC), and the Carbon Disclosure Standards Board (CDSB) (KPMG US, 2021). Among these, there are differences but at the same time, many overlaps can be found, which increase confusion for companies, losing their initial orienting goal (Darnall *et al.*, 2022).

Several governments, with the aim to harmonize the regulation landscape, have legislated laws for sustainable reporting, turning it into mandatory disclosure. The main bodies are the European Commission (EC) for the European Union and the Securities and Exchange Commission (SEC) for the US. However, among the various jurisdictions, there is no common agreement about how to measure performance beyond its financials and the regulation landscape keeps on demanding new harmonized standards and laws.

The growing interest in sustainability has not only created the need for transparent communication by companies on their social commitment and environmental impact but has also led to the development of different types of reporting. Many entities started disclosing sustainability reports, which are distinct from financial reports, and focus only on the ESG criteria (Camilleri, 2019). In general, this type of disclosure has been mainly voluntary, and the principal guidelines used by companies are provided by the GRI standard (De Villiers *et al.*, 2016; Camilleri, 2019). On the other side, several companies started to integrate their non-financial information within the financial reporting, disclosing therefore one single report defined as integrated reporting (Camilleri, 2019). The principal reason behind this is that financial and non-financial aspects are interrelated (Jensen and Berg, 2011). An integrated reporting framework is provided by the IIRC and several regulator authorities are converging to this type of reporting (Camilleri, 2019).

After having analyzed the importance of non-financial reporting and the prerogatives which have encouraged its advancements, the chapter elaborates on the reasons behind the sustainable disclosure, providing practical and theoretical support behind the need to have sustainable disclosure and it follows presenting an overview of the ESG standard setters established during the last decades, as above reported. These two aspects are after analyzed with the two types of available reports, to highlight possible common denominators and evidence of the different aspects. This chapter focuses on the analysis of voluntary disclosure meanwhile in the second one it is analyzed mandatory non-financial reporting regulation, its impacts and possible evolution required for overcoming the issues and concerns related to sustainability reports.

1.1 Theoretical and practical insights on voluntary non-financial reporting

ESG reporting has gained matter through the years and, if done well, it is a competitive advantage for the company, by reducing risk and creating new opportunities. This is given by better transparency, which is associated with the company and improve stakeholder relationship. According to McKinsey & Company (2019), there are several opportunities for ESG disclosure to become an important driver of value creation. It emerges that companies with strong ESG positions are more able to:

- Guarantee growth attracting new customers demanding and sustainability conscious.
- Reduce general costs thanks to better use of energy and other needed resources.
- Improve the engagement and well-being of employees, therefore increasing productiveness.
- Enhance better investments, considering a more long-term view.

The PwC's Global investor survey (2021) confirms with the response of 325 investors, that the focus is on the ESG issues. 79% of investors have replied that sustainability is an important factor to consider when investing since it has become critical and according to the feedback, 82% agree on the fact that companies should incorporate ESG directly in the strategy. A particular point that emerges is that corporate reporting is called to respond to the needs of investors, who find the 34% non-financial disclosure of poor quality.

Therefore, even though sustainability has become a prerogative for companies, it seems that stakeholders are seeking information on companies' plans for social and environmental commitment. In the following, the analysis provides some literature extent that puts the grounds for voluntary disclosure and defines what are the possible opportunities.

1.1.1 The stakeholder theory

The literature extent has linked the non-financial disclosure towards shareholder capitalism, with the final aim of improving financial returns (Camilleri, 2019). In the related accounting literature, shareholders are key for value creation and clear disclosure is connected to higher share price and an increase in price-to-book ratio (Farvaque *et al.*, 2011). In the case of sustainability disclosure, the stakeholders' theory arises because companies must meet stakeholders' expectations and respond to their demands, which goes beyond financial capital (Singhania and Saini, 2021).

Another aspect linked to stakeholder wealth is that proper communication helps in reducing agency problems and information asymmetries (Farvaque *et al.*, 2011; Camilleri, 2019; Singhania and Saini, 2021; Pigatto *et al.*, 2022). The stream beyond this is that managers (agents) have broader information about the company and may use their power to manipulate communication to make the company appear profitable (Jensen and Meckling, 1976; Camilleri, 2019). In the case of voluntary ESG reporting, the increased disclosure will lead to the reduction of information asymmetries, and since its orientation towards the external parties, will limit agency problems (Camilleri, 2019; Singhania and Saini, 2021).

1.1.2 The stewardship theory

The stewardship theory can be considered as opposite to the agency theory in normative terms (Singhania and Saini, 2021). According to Davis *et al.* (1997), managers' needs of achievement and goals may be accomplished not at an individual level, but within the company. The theory emphasized therefore that managers who recognize organizational values are more inclined to behave in organizational interest, giving value to collectivism and cooperation, which derive from the culture of the organization (Davis *et al.*, 1997; Camilleri, 2019; Chevroliier *et al.*, 2020). Using this theory for the purpose of ESG disclosure, the management of the company orientates the strategic orientation towards current stakeholders but at the same time considers the impact of future generations and on the environment (Chevroliier *et al.*, 2020). This theory finds evidence also in the IIRC framework, which promotes the handling of multiple capitals, like financial, intellectual, human, social and environmental capital (Camilleri, 2019).

1.1.3 The legitimacy theory

The previous theories centralize the need for voluntary disclosure for improving stakeholder relations with the company, leading towards an informed making-decision process (Pigatto *et al.*, 2022). Beyond the need for incremental information, arises the need for legitimacy for a company. According to Suchman (1995), "legitimacy is a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed systems of norms, values, beliefs and definitions". This theory involves therefore the external environment, which influences and directs the company's management. Under this view, voluntary reporting can be a tool for acquiring, maintaining, or repairing legitimacy and responding to external needs (Camilleri, 2019; Pigatto *et al.*, 2022). Previous studies have linked non-financial reporting to the legitimacy theory, justifying the need of reaching the

expectation of the external community (Tilling, 2004; Lokuwaduge and Heenetigala, 2016) by adapting corporate disclosure (Hahn and Lülfs, 2013) to the broader number of stakeholders, considering also non-capital related ones (Lokuwaduge and Heenetigala, 2016). This theory does not provide the actions needed to respond to social and environmental issues but suggests to the management to consider the interconnections with external actors and inform them properly, otherwise failing to satisfy the expectations may translate into obstacles to the normal operations of the company, limiting, for example, the demand of its products or restricting the access to the resources (Lokuwaduge and Heenetigala, 2016; Camilleri, 2019).

1.1.4 The institutional theory

As the previous theory, the institutional theory relates the company to the external environment and provides a base for voluntary disclosure (Singhania and Saini, 2021).

According to this theory, a company should complain about regulatory authorities' requirements, which usually can be represented by governments. However, for non-financial disclosure, the state is not the only influencing party. There can be industries or institutions, which produce their own regulations or standards for companies (Campbell, 2007). According to Scoot (2001), there are three different ways in the institutional environment for influencing corporate behaviours:

- Regulative way, which provides formal rules and relative incentives or sanctions.
- Normative way, which adopts informal rules connected to values and common sense.
- Cognitive way, which is more abstract and taken for granted by external parties.

These three pillars are interconnected and shape the decisions of a company on how to behave (Galbreath, 2012; Singhania and Saini, 2021). An example made by Galbreath (2012) for representing them in the sustainability landscape is the legislation on carbon emissions (regulatory pillar), which may create business knowledge on this aspect (normative pillar) and create expectations on sustainable development (normative pillar). Linking these prerogatives to the legitimacy theory, companies that complain about the institutions' requirements gain consent and legitimacy from the stakeholders (Camilleri, 2019). According to Campbell (2007), companies related to states with strong regulations for sustainability are more likely to do good and at the same time have regulatory bodies that oversee them. Considering these aspects, non-financial disclosure differs also for country characteristics, causing in this way heterogeneity among the reporting standards (Singhania and Saini, 2021).

1.2 The governance ecosystem of non-financial reporting

Among the reasons that encourage companies to develop their sustainability strategy, when coming to the report to be published, as for the financial one, it is necessary to have regulation that provides standards. For the ESG disclosure, the regulatory environment results in polycentric (Sulkowski and Jebe, 2022), with private standard setters and the governments' jurisdictions. As previously settled, the focus in this chapter is on voluntary disclosure, therefore the analysis is on the development of ESG standards, as an answer to a legislative gap, which has only recently been reinforced.

1.2.1 ESG frameworks and reporting standards

The sustainability landscape presents private organizations that publish standards or issue frameworks. According to GRI (2022), a standard “can be thought of as containing specific and detailed criteria or metrics of ‘what’ should be reported on each topic” and usually presents public interest, independence, and public consultation. On the other side, GRI defines frameworks as a tool used when there are no well-defined standards, which provide more flexibility. The range of influence is narrower than standards since frameworks provide only general guidance and not a strict obligation. To be effective, standards setters should apply due process, which is based on formal procedures and requires constant monitoring, control, and assurance.

Among the most used standards, there is the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), the International Integrated Reporting Council (IIRC), and recently the IFRS Foundation has established the International Sustainability Standards Boards (ISSB).

The GRI remains the most used standard for sustainable reporting, with 67% of companies that have adopted it (KPMG US, 2021). It has been founded in 1997 to ensure accountability mechanics to companies and establish a systematic reporting procedure (GRI, 2022). The GRI provides a list of standards, which defines what needs to be disclosed and define a guideline for the data collection and its reporting (FEE, 2016). The approach of the standards is multi-stakeholder, and this has influenced its worldwide adoption (GRI, 2022).

Another relevant standard-setter is IIRC, which promotes Integrated Reporting (IR). As previously said, the IR links non-financial disclosure with financial reports. Therefore, the management of a company is embedded to also consider the sustainable aspects, promoting a

long-term view of the operations (FEE, 2016). This aspect is confirmed by the categories of capital adopted by the IIRC, which are financial, manufactured, intellectual, human, social and relationship, and natural capital (IIRC, 2021). The final audience in this case is the providers of financial assets (Sulkowski and Jebe, 2022).

The SASB has been established in 2011 and its characteristic is to incorporate sustainability and financial materiality, meaning that the key addressee is the investors (Sulkowski and Jebe, 2022). A particularity, in that the standards tend to be coherent with the US financial regulation, enhancing the integration of sustainability KPIs in the annual reports (FEE, 2016).

A recent introduction has been the ISSB, a board created by the IFRS with the aim to provide sustainability-related standards for financial reports, delivering sustainability disclosure capable of satisfying market requirements (PwC, 2022). The strategy adopted is to consolidate the already available sustainability reporting frameworks, enhancing transparency and comparability (IFRS, 2022). Under this view, the GRI and ISSB have an ongoing collaboration to harmonize the standards used, by unifying the different pillars of the two actors, which are respectively the stakeholder-focused pillar and the investor-focused pillar (PwC, 2022).

Among the frameworks, the Carbon Disclosure Project (CDP) and the Task Force on Climate-Related Financial Disclosures (TCFD) are the ones most used by companies for their disclosure (Center for Sustainability and Excellence, 2021).

The CDP provides a guideline for companies for disclosing their greenhouse gas emissions. It provides three questionnaires on climate change, water security and forests, including general questions and the answers are accredited a score (IBM, 2022). Questionnaires are sectors-specific but the restriction on only environmental aspects determines CDP has not a comprehensive framework (Sulkowski and Jebe, 2022).

The TCFD is another framework focused on climate-related disclosure and it is a task force of 31 members developed by the adoption of the Paris Agreement on Climate. Under the TCFD recommendations, the percentage of companies that have disclosed has increased during the years since 2017, and it has enforced the availability and quality of data related to climate information (Financial Stability Board, 2022). The TCFD classifies the risk related to climate change into physical risk (acute physical risk, chronic physical risk) and transition risk (market risk, technology risk, reputation risk, policy, and legal risk). These guidelines are intended to be applied by the companies in the G20.

The table below gives a brief view of the frameworks and standards, identifying the audience, and the type of ESG report.

Table I. *Overview of ESG standards and frameworks. Based on La Torre et al. (2018) and Darnall. et al. (2022).*

Frameworks	Audience	Description	Form of disclosure	Format
GRI	Multistakeholder focus	The goal is to provide a standard applicable to several industries, by harmonizing the information to disclose	Sustainability report	Standard
SASB	Industry-specific approach	The aim is to provide standards consistent with financial regulation and focused on a small number of topics per industry	Sustainability report	Standard
IRRC	Capital providers focus	It provides a guide for integrating non-financial data in annual reports	Integrated report	Standard
ISSB	Investors focus and enterprise value	The goal is to develop high-level ESG reports, with articulated and clear principles which guarantee quality, and understandability and are globally accepted	Sustainability report	Standard
TCFD	Investors, lenders and insurance underwriters	The focus is on how the climate impacts the financial performance of a company	Sustainability report	Framework
CDP	Investors, lenders and insurance underwriters	It defines guidelines for climate-related data disclosure. It is not restricted to a specific industry or sector	CDP questionnaire	Framework

1.2.2 *The rationale behind the adoption of framework and standards*

A possible question in the previous overview of the standards and frameworks of private organizations is what are the prerogatives that influence companies to choose to disclose under the guideline of one of them, instead of others (La Torre *et al.*, 2018). According to Brown *et al.* (2009), the presence of various standards setters, which may present different guidelines but at the same time consistent overlaps, creates confusion among companies.

The GRI has been the first standard to be developed, and thanks to its approach towards multiple stakeholders are able to guarantee guidelines for enhancing legitimacy and visibility (Brown *et al.*, 2009). As previously stated, sustainability disclosure started to align the external environment of the corporate commitments towards the environment and local communities, with the benefit of gaining legitimacy and improving the image of the company. GRI standards have answered these needs and by the increase of its use, the GRI has become the best practice for ESG reporting (La Torre *et al.*, 2018).

Following the principle of gain legitimacy, another rationale for choosing a particular framework are the market best practices, guided by the decisions undertaken by the peer group (La Torre *et al.*, 2018). Therefore, choosing the framework to follow can be a tool to gain a competitive advantage (Buhr *et al.*, 2014).

A critical point that emerged from several studies is that even though the massive adoption of GRI has made it possible to start talking about ESG sustainability reporting, this is not related to companies' understanding of their potential impact on the environment and local communities (La Torre *et al.*, 2018). Therefore, the adoption of a particular standard does not provide a direct connection with a company's sustainable performance (Belkhir *et al.*, 2017).

Another prerogative for choosing a particular framework is the final audience of the disclosure. In this case, after the GRI, IIRC's standards have been used for the creation of integrated reporting, which is directed more towards investors and capital markets. This has created a new practice in the market, by promoting a "simplified" sustainable report (La Torre *et al.*, 2018).

Concluding, frameworks and standards adoption influence several factors (La Torre *et al.*, 2018):

- The change of corporate culture.
- The development of more concrete behaviours towards sustainability.
- The definition of guidelines and best practices for sustainability reporting.

However, as previously underlined, these regulations have not promoted a comprehensive change in corporate behaviour towards sustainability. The competition among standards and frameworks setter has been harmful and has not promoted real sustainable development and a "coherent infrastructure for corporate accountability" (La Torre *et al.*, 2018).

1.3 Analysis of integrated reporting and sustainability reporting

After having analyzed the prerogatives that stand behind the need for a company to disclose non-financial information and which are the guidelines to be followed, the focus moves to where management chooses to disclose. Companies generally communicate with their annual reports, and websites, including sustainability reports or social activities (De Villiers *et al.*, 2016). Other most frequently used sources of non-financial disclosure are investor presentations, third-party data providers and press releases (PwC, 2021).

The increasing interest in the disclosure of companies' commitment towards ESG targets has been addressed by the GRI standards, which have promoted the development of sustainable

reports. In this case, the report is separated from the financial one and has a voluntary character, compared to mandatory annual reports. The GRI, as previously stated, as like audience of the various stakeholders of the company and requires disclosing three Universal Standards (Global reporting, 2022):

- GRI 1, *Foundation*, which exposes the guidelines for applying the GRI standards.
- GRI 2, *General Disclosure*, which requires general information on the disclosed company, like the organization's structure, reporting practices, governance system, strategy, policies, and practices.
- GRI 3, *Material Topics*, defines a guide useful for a management company to understand which are the most relevant topics under the ESG perspective, defined as *Material Topics*. This standard requires also to explain how material topics have been defined and how they are managed.

In addition, the GRI also provides standards for specific sectors or specific material topics, such as water, waste, gender diversity and inclusion (Global reporting, 2022).

The steps defined by the GRI report process are to:

- Identify the material topics, therefore define which activities have a consistent impact on one of the three pillars of sustainability. In this case, it is important to also consider the context in which the company is driven, which can have a substantial influence on the significance and range of impacts of a company.
- Determine the material topics to disclose, by assessing their significance and understanding how comprehensive their communication needs to be.
- Gather information and data on the material topics defined, to develop the sustainable report. The structure for the disclosing is given by GRI 2 and GRI 3.

Even if the GRI has promoted the development of sustainable reports, it has encountered several critics for its broad focus and not a clear connection of environmental and social aspects with the financial information of the company. This limited investors to understanding which is real sustainability and financial performance (Adams, 2015). In response to this, the Prince of Wales's Accounting for Sustainability Project together with the International Federation of Accountants has established the IIRC (International Integrated Reporting Council) (De Villiers *et al.*, 2016). As previously stated, the IIRC standards have answered the shortcomings of the capital consideration, by including seven types of capital (Camilleri, 2019). The long-term vision of IRRC has been the development of integrated thinking, by enhancing a more efficient

capital allocation and forcing sustainable development through better corporate disclosure. The council has aimed to create a common practice for companies to create a single report, which is defined as “a concise communication about how an organization’s strategy, governance, performance and prospects, in the context of its external environment, lead to the creation, preservation or erosion of value over the short, medium and long term” (Integrated Reporting, 2021). Therefore, the purpose of integrated reporting is not only to inform external stakeholders as the GRI standards aim, but it tries to inform capital providers on how a company is creating value and integrating this with the benefits generated by the daily activities.

The IIRC presents seven guiding principles which influence the development of an integrated report (Integrated Reporting, 2021):

- Strategic focus and future orientation, by analyzing in which way the several capitals considered are creating value in a long-term view, is usually the first fundamental step towards sustainable development.
- Connectivity of information, by proving information about capital and how they are interrelated.
- Stakeholder relationship, by defining the specific interested stakeholder and responding to their needs.
- Materiality, as for the GRI, defines what are the effective topics to be disclosed.
- Conciseness, therefore, provides information more effectively.
- Reliability and completeness, which require to include in the materiality of both positive and negative aspects.
- Consistency over time and comparability in relation with other organizations.

In addition, the IIRC defines the content elements to be disclosed, which are an organizational overview and external environment, governance, business model, risk and opportunities, strategy and resource allocation, performance, outlook, and the basis of presentation (Integrated Reporting, 2021).

However, the IIRC has also received several critiques. In academic literature, it has emerged that the IIRC’s standards should be reduced in complexity for their application and addressability (Rensburg and Botha, 2014). Indeed, if the company aims to publish a single report, with financial information and voluntary disclosure, managers should be able to produce clear communication. Another critique regards the final audience of the integrated report, is the excessive focus on capital providers which limits information on sustainability issues for other

stakeholders of the company (Brown and Dillard, 2014; De Villiers *et al.*, 2016). A possibility to reduce this extent is to adopt different socio-political perspectives (Brown and Dillard, 2014). According to Camilleri (2019), despite the critiques, companies are required to adopt a holistic approach, by integrating with non-financial aspects of their disclosed reporting, inducing integrated thinking.

The decision of a company to disclose in a sustainability report or integrated report is usually based on the goal to reach and on the audience of the disclosure. Companies that have several stakeholders and are required to disclose a great amount of information on sustainability-related topics, may not have the option to disclose in integrated reports (De Villiers *et al.*, 2016). In this case, corporate website pages have gained recent great development for communicating directly and faster with the interested parts engaged in ESG-related activities.

De Villiers *et al.* (2016) have found in their analysis of where firms are likely to voluntarily disclose, that the decision may be based also on the status of the environmental performance of the company. The study highlights that bad environmental performers usually disclose non-financial information in annual reports, to reduce information asymmetries with the investors. On the contrary, a company facing an environmental crisis is more likely to communicate on the company's website. An environmental crisis may emerge, for example, by a political action that claims the attention of a particular ESG-related topic. In this case, communication should be rapid and effective, to explain the actions of the company to reduce negative constraints and contain awareness.

The implication for investors, regulators other stakeholders interested in non-financial information, is to consider complementary the information disclosed by the companies, whether on integrated reports or sustainability reports, with the information published on their websites.

Chapter 2. Mandatory disclosure: EU regulation and its evolution with the Corporate Sustainability Reporting Directive

The focus of the analysis in this chapter is the shift from voluntary disclosure towards mandatory disclosure of non-financial information. As previously stated, ESG has become a priority for most companies. In this view corporate reporting represents the ideal tool to communicate with stakeholders, to provide them with a view on the business performance and the relative risks associated. According to the PwC global investor survey of 2021, 79% of investors agree on the consideration of ESG risk and opportunities during the investment decision-making process and 76% define potential investment options by ESG criteria. At the same time, the survey highlights the difficulties of investors in gaining appropriate information regarding the environmental and social programs of companies and in understanding which are the fundamental ESG factors functional to the business model of a company. This is transposed in a clear demand for standardization and comparability of sustainable reports. From an investor perspective, the actual setting limits the comparison among securities. From a government view, on the other side, it results complex to verify the effective commitment of companies in achieving the goals appointed for environmental sustainability, the reduction of emissions and the engagement with welfare policies, both for the employees and for external communities. Beyond this, the confusion is caused by the lack of agreement on how to measure non-financial data. The focus is mainly on financial metrics, which are used for defining the strategy of the company, the business model, and what matters most to stakeholders. The prerogatives for this are that many companies do not know how to provide a broader definition of firms' performance and have an inadequate globally aligned set of reporting standards to ensure the information needs of investors and stakeholders.

A first attempt for harmonizing the regulatory landscape of sustainability disclosure has been made by the European Parliament in 2014, with Non-Financial Reporting Directive (NFRD). With this regulation, there has been a shift from voluntary towards mandatory disclosure. The principal aim of the legislation is to guarantee consistency and comparability, pointing out the principal conditions for fostering sustainable development and transparency in non-financial reporting (Mussera *et al.*, 2020). The directive requires large public interest companies to publish a non-financial statement, explaining information related to environmental matters, social and employee-related matters, respect for human rights, anti-corruption, and bribery matters (European Union, 2014).

The directive has been incorporated by the member states' legislations, but with the transposition have emerged diverse reporting requirements. For instance, a few countries did not comply with all the requirements defined and others have adapted some aspects to comply with. In addition, the European Directive does not provide specific standards for preparing disclosure, leaving the critical choice to firms of which standards or frameworks to follow (Doni *et al.*, 2019).

Disclosure on sustainability has become a focus in the accounting literature, which studied for years the effects of the introduction of mandatory regulation. Some relevant literature highlights positive outcomes, such as a better amount of information disclosed (Cicchello *et al.*, 2022). On the other hand, different studies evidence the increase in quantity has not been followed in the quality of data, therefore the disclosure has not improved and still lacks in response to the stakeholders' requirements (Cordazzo *et al.*, 2020).

The effectiveness of the Directive has been limited by several drawbacks. The influence of managers who still have discretionary power when preparing and assuring reports. The lack of a proper definition of what to include in the disclosure as non-financial information. The complexity of this type of information, which is mostly unstructured and laborious to quantify, impedes the development of clear standards such as the ones for financial accounting (Cicchello *et al.*, 2022). These peculiarities have questioned the outcomes of the European Directive in guaranteeing comparability and standardization of non-financial information.

In 2020, the European Commission, in response to these inadequacies, requested the revision of the NFRD, by mandating the European Financial Reporting Advisory Group (EFRAG). The project has planned a reform of the Directive and the introduction of European non-financial reporting standards (EFRAG). In 2021, the EU Commission published a proposal for the Corporate Sustainability Reporting Directive (CSRD), which amends the requirements of the NFRD Directive. In November 2022, the EFRAG settled the first draft set of standards for EU sustainability reporting and in December the legislation on corporate sustainability reporting has been published in the Official Journal (European Union, 2022). The Directive is now going to be implemented by the member States and companies should start to comply with it in 2024, according to the reports published in 2025. The CSRD has broadened the number of companies that are required to comply with and ensures new rules to meet the needs of investors and stakeholders. To guarantee the consistency of the non-financial information disclosed, the Directive mandate audit assurance for companies. Another aspect is the introduction of the

digitalization of sustainability information, by requiring a digital “tag” which makes the report readable by machines, aligning this aspect with the requirements for the financial reports.

The following chapter starts with an analysis of the NFRD, studying the literature for understanding the effective outcomes of the introduction of mandatory disclosure and identify the shortcomings, which have fostered the creation of the CSRD. The second focus is the new Directive, the definition of the new requirements and an investigation into the possible effects on companies. The predictions are based on the outcomes of the first directive for sustainable reporting and the highlight of the contrasting requirements, to define the achievable effectiveness of the Corporate Sustainability Reporting Directive.

2.1 The EU Non-Financial Reporting Directive: requirements and effects of the introduction of mandatory disclosure

The interest of Europe in sustainability has a great past, which begins in the early 1990s with the signing of the “Towards Sustainability”¹ treaty to guarantee the development of a system which respects and protects the integrity of the environment and human rights. With this treaty, it has begun the vision of seeking equitable development for the present and future generations. On the sustainability level, it requires States to collaborate to pursue the goals defined. The European Union started to question whether traditional reporting may contain information on non-financial performance (Climate and company, 2022). As a result, the European Commission with a released communication has made public its intent on promoting sustainable development, embracing a long term-vision, and requiring urgent action from the political leadership, the policymakers, and the member states (European Commission, 2001). The EU Commission has defined the strategy to overcome the challenges towards sustainable development:

- Define proposals and recommendations for guaranteeing the effectiveness and efficiency of the law.
- Establish the priority in the objectives.
- Communicate the steps for implementing this strategy.

¹https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf

Within this strategy, the European Commission has published a recommendation on the recognition, measurement, and disclosure of environmental issues in the annual accounts and annual reports of companies (European Commission, 2001).

In the early 2000s, corporate governance has been a central topic in companies' strategies. For many years, the regulator bodies tried to define the term and within this trend, the European Commission has disclosed in Directive 2003/51 on the annual and consolidated account of certain types of companies, that if relevant, they should disclose data about the environment and employee for fostering the relationship with the external stakeholders (Climate and company, 2022).

The milestone in European Regulations has been the Directive on Non-Financial Reporting (NFRD) of 2014. It has been implemented by the member State in 2016 and is applicable for the fiscal year of 2017 (Doni *et al.*, 2019). The legislation has introduced mandatory regulation for public-interest entities, for example, listed companies, banks, insurance companies, and other companies designated by national authorities, which present for the fiscal year considered 500 employees or more on average.

The directive requires these predicted companies to disclose a non-financial report "containing information to the extent necessary for an understanding of the group's development, performance, position and impact of its activity, relating to, as a minimum, environmental, social and employee matters, respect for human rights, anti-corruption and bribery matters" (European Union, 2014). In addition to this, is required:

- A description of the business model.
- A description of the policies undertaken by the company and the outcomes of these, with the due diligence process activated.
- The principal risks considering the nature of the group and considering whether these are relevant, are likely to have adverse impacts and how the company manages these risks.
- Non-financial indicators that can be relevant to the company.

The principal objective of the NFRD is to harmonize the regulation through the EU Member States and a great amount of information disclosed, by increasing relevance, consistency, and comparability at the Union level.

The European Commission has also published two guidelines, to help organizations with their non-financial disclosure. The first set distributed in 2017 has the purpose to improve the quality, relevance, and usefulness of the disclosed information with non-binding guidelines, which regard the key principles of the Directive and the content considered, which is reported in the table below. The guideline also touches on the reporting frameworks topic, but it does not provide one reference, leaving the decision towards companies or sectors (European Commission, 2017).

Table II. *Requirements for Non-Financial Statements. Based on the “Guidelines on non-financial reporting.”, European Commission (2017).*

Thematic aspect	Detailed aspect guideline
Environmental matters	<ul style="list-style-type: none"> • Material disclosures on pollution prevention and control • Environmental impact of the use of energy • Direct and indirect atmospheric emissions • Use and protection of natural resources • Waste management • Transportation environmental impacts • Development of sustainable products and/or services
Social matters	<ul style="list-style-type: none"> • Trade union relationships • Consumer relations • Impact on vulnerable consumers • Responsible marketing and research • Dialogue with local communities
Employee matters	<ul style="list-style-type: none"> • Gender diversity policies and equal treatment in employee and occupation • Consultation and/or participation of employee • Working conditions • Human capital management • Health and Safety at work
Respect for Human Rights	<ul style="list-style-type: none"> • Respect for human rights • Process and arrangements implemented to prevent human rights abuses
Anti-corruption and bribery matters	<ul style="list-style-type: none"> • Management instruments and resources allocated to fight corruption and bribery • Actions to prevent or mitigate adverse impacts

The set of guidelines released in 2019 related to climate-related information, and as the general rules of 2017, are non-binding. The guidelines should be considered as a supplement to the NFRD since it is an integration of the commitments undertaken by the European Union with the Paris Agreement on Climate Change (2015) and the United Nations’ Sustainable Development Goals (2018) for the reduction of Greenhouse Gas (GHG) emissions (European Commission, 2019).

2.1.1 The rationale behind mandatory disclosure

In general, in accounting literature, the case for mandatory disclosure is sustained by public interest theory. In this view, markets are subject to failures, and it is necessary for the role of the government.

In the case of regulation on reporting practices, it is important to consider the concept of (Michelon, 2020):

- *What* should be included in the disclosure.
- *How much discretion* is left to managers of companies.
- The *costs* for the implementation, which can be besides the cost of identifying, verifying, and distributing information, the indirect cost of sharing information in capital markets, and therefore with competitors too.
- The implementation of an *enforcement regime*, therefore an authority which monitors compliance and provides sanctions in the needed case.

In addition, should be considered the effects and outcomes of the introduction of a mandatory reporting regime, which regards two aspects: the economic and the regulatory. The main economic impact, according to Leuz and Wysocki (2016), is in the reduction of adverse selection, thanks to better disclosure, which increases market liquidity and its functioning. On the other side, regulation should have effective impacts on corporate behaviour, by changing it and adapting to stakeholder pressure (Christensen *et al.*, 2017).

Even though, the literature is still debating on the efficiency and effectiveness of voluntary and mandatory reporting (Doni *et al.*, 2019). The major hurdle is the definition of the right detail of mandatory information to report because a low level of these can lead to inadequate disclosure and lack of comparability. Instead, in case of high detailed regulation is contested the role of the management and its limited discretion.

Considering these prerogatives in the specific case of the European Directive on Non-Financial Disclosure, it is possible to understand the reasons that pushed the introduction of regulation and the effect of this.

The initial goals of the Directive have been to change the company's behaviour towards sustainability and improve the level of disclosure on related topics. The first issue which has prescribed the need for regulation could be mandated from the lack of a proper definition of

non-financial information, which was limiting the comparability of the reports, leaving to heterogeneity (Doni *et al.*, 2019). On this aspect, the Directive has been particularly discussed in terms of efficiency. It has been criticized because it does not provide specific standards to follow or detailed rules, providing only a limited set of information that should be disclosed and therefore leaving too much discretion to companies (La Torre *et al.*, 2018; Papa *et al.*, 2022). Since the Directive has been released by supranational regulators, it has been transposed into the legislation of the single member states. Under this view, the Directive has given great flexibility to this process, and consequently, state-specific requirements differ from each other, raising questions about the effectiveness of the Directive in harmonizing non-financial disclosure (La Torre *et al.*, 2018).

In addition, the Directive has been questioned regarding its efficiency in enhancing transparency and accountability, limiting the interaction with stakeholders and their engagement in the capital markets (Papa *et al.*, 2022).

These aspects have been largely discussed and have forced the European Commission to redefine the regulation and the introduction of the CSRD.

2.1.2 Mandatory non-financial disclosure outcomes

Several research have studied the previous statements to find the real impact of the European Directive on Non-Financial Reporting on companies' behaviour.

An outcome sustained by several studies is that the introduction of mandatory reporting has increased the amount of information available. According to Chiecchiello *et al.* (2022), there is evidence that higher regulatory pressure increases the quantity of information disclosed and the willingness of companies to publish reports. At the same time, legislative pressure may not have a significant effect on the quality of information disclosed (Venturelli *et al.*, 2017). Therefore, the Directive may have increased the number of companies disclosing non-financial information, but it has not influenced the behaviour of companies and directed it towards more sustainability-related decisions.

Since the Directive has not provided the frameworks to follow for reporting on ESG information, there has been a general increase in adherence towards GRI standards. In the Italian context, Papa *et al.* (2022) have found evidence, in terms of quality of information, that companies have improved the information related to climate, governance and ESG-related

practices, meanwhile, for the standards related to general disclosure of the GRI, the quality has not changed after the introduction of the Directive. On the other hand, in terms of the type of information disclosed, it emerges that the number of companies reporting non-financial information has increased, observing at the same time an increment in disclosing general statements about environmental performance. This suggests that new companies start disclosing only to adapt to new trends and follow the best practices. Therefore, this evidences that also the managers' initiative has influenced the ESG reporting, within the introduction of the Directive, and the great discretion allowed has left room for opportunistic behaviours.

Considering the types of information disclosed, the study of Venturelli *et al.* (2017), finds out that Italian companies are more focused on the disclosure of information related to their business model, instead, they result more reluctant towards themes like diversity, sustainability risk and performance indicators. This highlights that companies still have more interested in the shareholders instead of other stakeholders even after the introduction of the Directive.

Studies evidence also that compliance with the non-financial reporting regulation depends also on the industry in which the company operates. There are some sensitive industries which have a major impact on social and economic aspects, like the sectors of energy, including gas and oil, chemicals, transportation, and utilities (Garcia *et al.*, 2018; Papa *et al.*, 2022). Several studies have highlighted that these Environmentally Sensitive Industries (ESI) are subject to higher pressure from their stakeholders regarding their environmental performance and non-financial disclosure (Radhouane *et al.*, 2020). Therefore, when analyzing the effects of the introduction of the NFRD, it emerges that the quantity of information disclosed by companies of ESI exceeds the information disclosed by other industries (Sierra-Garcia *et al.*, 2017; Papa *et al.*, 2022).

Another aspect to consider is that the European Directive has been implemented by the various Member States in different contexts with national regulation, which present a heterogenic context behind them and have introduced some novelties in the applied law. The NFRD has left countries the possibility to define different requirements in implementing the instrument (Accountancy Europe, 2017):

- The definition of the largeness of the entities to consider.
- The attributes that define Public Interest Entities (PIE).
- The verification of reports by independent auditors.

- The development of a system of penalties.

For a better understanding of this point, the table below represents the different ways of Italy, France, Germany, Spain, and the UK in implementing the regulation. Most national laws differ in the definition of Public Interest Entities (PIE), but all the countries in the object have introduced mandatory auditing for non-financial disclosure. Considering other elements not directly mentioned by the NFRD or left to State-Specific requirements, all the considered countries promote the integrated report as the report format and three out of four accept the separate report too. On the other side, the main discrepancies regard:

- The reporting framework to use. Some countries require specific standards meanwhile others follow common practices, as in the case of Italy.
- The system of sanctions, which are articulated at different levels.

Table III. *The implementation of the Non-Financial Reporting Directive across selected Member States. Based on Papa et al. (2022).*

Country	Companies in scope	Reporting Framework	Reporting Format	Auditor's involvement	Noncompliance
Italy	Same as the directive but with a different definition of PIE.	Free to choose. GRI is a common practice.	Integrated report & Separate report	Statutory auditor. Check the report as part of the financial statement.	Omission of relevant information, noncompliance or failure requires a fine.
France	Same as the directive but with a different definition of PIE. Unlisted companies with a net turnover of over €100m and more than 500 employees.	Free to choose.	Integrated report	Statutory auditor. Check the report as part of the financial statement.	Fines are imposed only if third parties require information, and it is not available.
Germany	Same as the directive but with a different definition of PIE.	Free to choose.	Integrated report & Separate report	Statutory auditor.	Fines amount related to the total annual turnover.
Spain	Same as the directive but with a different definition of PIE. Companies that during two consecutive years have a net turnover of over 2bn and more than 4,000 employees.	The law requires specific standards: EMAS, UNGC, UNGP, OCD, and GRI.	Integrated report & Separate report	Statutory auditor.	Fines: not specified.
UK	Same as the directive.	Free to choose.	Integrated report	Statutory auditor. Check the report as part of the financial statement.	Fines: determined on a case-by-case.

Under these last considerations, in the last few years, the focus of empirical studies has been to understand the effectiveness of national law to enforce compliance with the European Directive. The methodology used in this case is to compare the level and quality of information between the two scenarios, previously and after the regulation (Papa *et al.*, 2022).

The evidence provides various results and most of the negative responses underline that, as its first attempt, the Directive failed in promoting accountability and transparency. Several studies confirm the lack of compliance in the case of ESG regulation and a possible argument for this is the difference in the details of national laws, as previously discussed. On the other side, a case is made by the maturity of acknowledgement of a State on the theme of sustainability and related disclosure. This is confirmed by the study of Venturelli *et al.* (2018), which has found evidence that the UK, thanks to the introduction of mandatory disclosure in advance concerning Italy, have higher adherence to the law and better compliance within the different fields required to fulfil the sustainability reports.

Table IV. *Overview of the studies analyzed. Personal elaboration.*

Author	Sample period	Outcomes
Cicchiello <i>et al.</i> , 2022	European Companies, 2015-2020	Increment of ESG disclosure in Europe after the NFRD is reflected in an increase in corporate sustainability performance.
Papa <i>et al.</i> , 2022	Italian listed companies, 2016-2018	Italian firms disclosed with GRI standards. The directive has produced a greater amount of information but not better quality.
Sierra-Garcia <i>et al.</i> , 2017	Spanish listed companies, 2016-2018	The sector is an important factor which influences non-financial disclosure.
Venturelli <i>et al.</i> , 2017	Italian large companies, 2015	Companies are more oriented towards disclosing to shareholders. The quality of voluntary information is higher than that of mandatory one.
Venturelli <i>et al.</i> , 2018	Italian and British large companies, 2016	English companies are more compliant in all fields than Italian ones.

The outcomes analyzed find evidence that mandatory regulation can be a good instrument to increase awareness toward sustainability but, at the same time, the Non-Financial Reporting Directive has failed its initial goals of increase credibility and comparability of ESG reports and improving the harmonization in the field of standards used to disclose. Some studies argued that the complexity of non-financial data is the major problem, which limits the definition of what to measure and how to compare.

Based on these considerations, the next paragraph analyzes the European Commission's initiative for the introduction of the Corporate Sustainability Reporting Directive, and its new requirements and exposes some possible outcomes for companies.

2.2 The introduction of CSRD: what does change in the sustainability reporting landscape, and what are the possible impacts for companies

The introduction of the CSRD, in response to the deficiency of previous regulation, has begun in 2020 with the review of the Non-Financial Reporting Directive. This consultation has involved several companies and the principal aim was to strengthen the strategy towards sustainable development and investments, directly collecting stakeholders’ opinions.

The principal problem pointed out by the “users” of non-financial data is the inadequacy of comparability (71% of respondents), and the insufficient reliability and relevance of the data disclosed (respectively 60% and 57% of respondents) (European Commission, 2020). On the other side, for the “preparers” of non-financial reports, 64% of those who have responded to the questionnaire, have highlighted the difficulty of satisfying the several variable requirements posed by the various standards or rating agencies. Another acclaimed aspect is the need for a common standard, which may reduce the time and effort to produce sustainable reports. The table below is a summary of the questions posed to the respondents.

Table V. Summary of responses to the Public Consultation on the Reviews of the Non-Financial Reporting Directive. Based on European Commission (2020).

Question’s theme	Summary of response
Quality and scope of non-financial reporting	<ul style="list-style-type: none"> • A more specific definition of what should be disclosed in terms of non-financial information is required. • Need for a more specific description of each category (environment, social and employee issues, human rights, bribery, and corruption). • Harmonize between states the requirements, therefore companies do not face always newly requested information. • Legislation regards the reports should be aligned.
Standardization	<ul style="list-style-type: none"> • The presence of a common reporting standard may help to address the problems of comparability, reliability, and relevance. • Ensure that the requirements are proportionally related to the company and avoid excessive administrative costs for the process of reporting. • A shared thought evidences the role of the EU in promoting international standards.
Materiality	<ul style="list-style-type: none"> • The concept of double materiality should be better described. • Business associations agree upon the presence of guidelines and examples of good practices for the double concept of materiality in the revised directive. • The need for an explanation of the concept of double materiality for each category.
Assurance	<ul style="list-style-type: none"> • A large part of respondents requires mandatory assurance. • The principal concern is the cost of assurance, especially for SMEs. • Assurance helps with credibility towards stakeholders.

Digitalization	<ul style="list-style-type: none"> • Non-financial information machine-readable may enhance searchability, reliability and comparability. • Readable information requires common standards previously. • Several cybersecurity questions have been raised. • The cost of having machinery-readable information may be huge for SMEs. • Creation of a central European hub to store information available to investors and other users.
Location of reported information	<ul style="list-style-type: none"> • The presence of financial and non-financial information in the same report helps the communication of business performance and overall strategy. • The integrated approach may be costly to implement and can be considered a goal in the long term. • In the case of two distinct reports, they should be published at the same time.
Personal scope	<ul style="list-style-type: none"> • Some respondents argued with the definition of PIE. • Extend the obligation of reporting to companies operating in the EU. • Instead of considering only listed companies, respondents suggest the definition of large companies used by the Accounting Directive. • The risk of the company depends more on the industry in which operates than its size. • Companies should have different requirements connected to the nature of their company.

Based on the public consultation, the European Commission published in April 2021 the “Proposal for a Directive of the European Parliament and of the Council” which amends previous directives regarding corporate sustainability reporting.

Given the before background, the proposal of the Corporate Sustainability Reporting Directive affects the following aspect:

- Extension of the scope. The proposal aims to extend the mandatory reporting rule to all listed companies, non-listed companies which respond to at least two out of three criteria and subsidiaries companies that operate in the European economy, but the parent is a non-EU company.
- Provide detailed requirements of what and how to disclose.
- Sustainability reporting standards, proposed by the EFRAG, aim to improve the comparability among ESG reports.
- The mandatory part of the consolidated management report removes the choice between separate and integrated reports.
- Introduction of assurance’s obligation to verify compliance with reporting standards.

The proposal has been debated between the European Commission and the Council, meanwhile, the EFRAG, which role is to be a technical advisor for the European Commission, has focused on a possible roadmap to develop a comprehensive set of standards for sustainability reporting, published in March 2021.

In 2022 the EFRAG submitted its first set of EU sustainability reporting standards, which are now in a stage of discussion with EU bodies and Member States. By the end of 2022, CSRD has been published in the official journal and become effective.

The next paragraph analyzes the CSR Directive if all the proposed points are comprehended in the new legislation and the main differences encountered with the previous directive. A brief discussion of the European standard will provide an overview of the new requirements. These aspects will be finally considered in perspective to companies, to understand the possible real impact of all these measures.

2.2.1 New requirements for sustainable reporting: CSRD and its application

The CSRD entered into force in the European Union on 5 January 2023, after being approved by the European Parliament and the Council's adoption. EU Member states have eighteen months for the transposition of the directive into national law.

The intervention of the regulators has been necessary, as stated in the new directive since the gap between the information needs and available information provided was growing (European Union, 2022). The principal aim of the new regulation is to meet stakeholders' needs, which were unsatisfied by the previous directive. Specifically, the critical theme has been to guarantee access to relevant information to evaluate companies in terms of risks caused by climate change and environmental degradation. These two topics are crucial, since they are considered in the European Green Deal published in 2019 which engages the EU to ensure a conscious economic development.

Another intention of the new regulation is to foster a culture of transparency, where companies disclose their employee governance and policies.

The major divergence with the NFRD is the perimeter of companies included for the applicability of the regulation. The new directive perspective considers the increasing needs which require additional categories to share sustainability-related information. For this reason, the CSRD considers in addition to previous regulations (European Union, 2022):

- “Large” entities which are not admitted on a regulated market in the EU and exceed at least two criteria for two consecutive years:
 - The average number of employees during the fiscal year: 250.
 - Total assets: €40 million.
 - Net turnover: €20 million.

- European companies that are subsidiaries of a “large group”, are defined with the previous criteria.
- Third-country companies should disclose at the consolidated level if the net turnover generated in the EU exceeds €150 million and have a branch operating in the territory of the Union. To guarantee proportionality of the requirements, the criteria to meet are:
 - Third-country branches should have a turnover higher than €40 million,
 - There is at least one EU entity which is defined as large or is a security listed.
- Small and medium-sized companies which are traded on a regulated market in the Union.

These criteria have extended mandatory requirements for disclosure from more than 11 thousand companies to approximately 50 thousand, covering 75% of total EU companies’ turnover.

The timeline planned for the first application of CSRD has different deadlines according to the companies considered:

- For the 2024 fiscal year (first reporting 2025) all companies are already included in the NFRD, and all “large undertakings” are listed.
- For the 2025 fiscal year (first reporting 2026) all “large undertakings” as defined by the new directive’s criteria.
- For the 2026 fiscal year (first reporting 2027) small-medium sized companies and non-complex institutions.
- For the 2028 fiscal year (first reporting 2029) third-country companies are required to report at the global consolidated level.

In addition, the CSRD has also introduced new requirements above the previous five: business model, policies and their outcome, risks and risk management, and key performance indicators (European Union, 2022). Specifically, as stated in the Directive, disclosure requirements should “ensure that undertakings report information on their resilience concerning risks related to sustainability matters”. The aim is to focus even more on companies’ disclosure on sustainability-related topics, with a particular view on climate-related ones. Article 30 of the Directive requires companies to disclose whether their business models and strategy are “compatible with the transition to a sustainable economy and with the objectives of limiting

global warming to 1,5 °C in line with the Paris Agreement and achieving climate neutrality by 2050, as established in Regulation (EU) 2021/1119”.

Another requirement added regards the disclosure by companies of their targets related to sustainability matters, specifically if they are directed to the reduction of greenhouse gas emissions pointed to for 2030 and 2050. The request also contains a description of the progress made towards the settled targets. As stated in article 33, the NFRD did not require “forward-looking” information but provided short, medium and long-term horizons that may add value to sustainability reporting users.

The additional requirements of the CSRD for sustainability reports are:

- Description of administrative, management and supervisory bodies’ roles related to sustainability matters.
- Related to previous bodies, indicate whether are present incentives schemes linked to sustainability.

These additional requirements are derogated for small and medium-sized companies, and small and noncomplex institutions, which are demanded to disclose only the previous five requirements, already present in the NFRD.

A crucial aspect of the new directive is the double materiality, which requires companies to assess their impacts related to people and environments (impact materiality) and at the same time value from a financial perspective (financial materiality).

As previously anticipated, the CSRD has introduced the digital format for sustainability reports as a response to increasing information credibility. Article 55 demand companies publish their management reports on their website. The introduction of the digital report may also enable to centralisation of all the data “in an open and accessible format that facilitates reading and allows for the comparison of data” (European Union, 2022).

Once completed the report, companies are expected to mark up the content according to the Delegated Regulation (EU) 2019/815, which has introduced the XBRL language. This technology has been until now only applied to IFRS standards and consists of “the application of a taxonomy to convert human-readable text to machine-readable information” (European Union, 2018). The final document will be in XHTML format. In addition, companies are required to mark-up with *tags* sustainability reports.

Since the application to sustainability report, it is necessary to develop a digital taxonomy for related sustainability matters, which is considered the Communication of European Commission “A European strategy for data” (European Union, 2022).

Clarification of whether to disclose the information has been made by the CSRD. The previous directive allowed companies to choose between integrated and separate sustainability reports. In the second case, between the publication of the management report and sustainability one should not pass more than six months. However, as reported in article 57, the time of availability of information may alter the connection of sustainability information with financial one and reduce findability and accessibility. This aspect influences the behaviour of users of information, especially limiting users. At the same time, providing information in a separate report may have a negative effect in terms of the impression of sustainability disclosure, which may result to be less relevant.

For these reasons the Directive does not provide to Member States the extent to decide where to disclose sustainability information and requires to “report sustainability information in a clearly identifiable dedicated section of the management report” (European Union, 2022).

As proposed, the CSRD has introduced an assurance review for non-financial statements. Previously, the NFRD only required the verification of the publication of integrated or separated non-financial reports but not the evidence for the information disclosed. As stated in article 60 of the new Directive, this aspect has two counterpoints:

- Threaten the credibility of non-financial information, by not having the same level of assurance of financial statements, creating therefore misleading.
- In case the same Member States required the assurance verification of non-financial statements with the transposition of NFRD in their national law, the absence of common standards may encounter assurance engagement.

Therefore, the CSRD has introduced a progressive approach to assurance verification by starting with limited assurance engagements which will improve reasonable assurance engagement. The first case requires less verification by the auditor, who performs fewer tests and is demanded to “express an opinion about the compliance of the sustainability reporting with the Union requirements based on a limited assurance engagement” (European Union, 2022). This approach has been adopted to allow the assurance market to develop reporting practices for sustainability reports and be able to perform reasonable assurance engagements.

Another relative point of this approach is that it allows progressively the reduction of reporting costs for companies since reasonable engagement is more costly.

The table below resumes the principal points discussed above and compares the two directives: NFRD and the new CSRD.

Table VI. *Overview of NFRD and CSRD. Personal elaboration based on Climate and company (2022) and KPMG (2022).*

	Non-Financial Reporting Directive	Corporate Sustainability Reporting Directive
Time of applicability	Applicable since FY 2018 and still the implementation of the new Directive.	Entered in force in January 2023 and Member States have 18 months to transpose into national law. There are some delays in the application of the Directive: <ul style="list-style-type: none"> • For the 2024 fiscal year (first reporting 2025) all companies are already included in the NFRD, and all “large undertakings” are listed. • For the 2025 fiscal year (first reporting 2026) all “large undertakings” as defined by the new directive’s criteria. • For the 2026 fiscal year (first reporting 2027) small-medium sized companies and non-complex institutions. • For the 2028 fiscal year (first reporting 2028) third-country companies are required to report at the global consolidated level.
Companies in scope	Large public interest entities, recognized in: <ul style="list-style-type: none"> • Listed companies, • Banks and insurance companies, Which has more than 500 employees.	<ul style="list-style-type: none"> • Listed companies. • “Large” entities which are not admitted on a regulated market in the EU and exceed at least two criteria for two consecutive years: <ul style="list-style-type: none"> ○ The average number of employees during the fiscal year: 250. ○ Total assets: €40 million, ○ Net turnover: €20 million. • European companies that are subsidiaries of a “large group”, are defined with the previous criteria. • Third-country companies should disclose at the consolidated level if the net turnover generated in the EU exceeds €150 million and have a branch operating in the territory of the Union. • Small and medium-sized companies which are traded on a regulated market in the Union.
Number of companies in scope	EU: more than 11 thousand	EU: approximately 50 thousand
Disclosure content requirements	The sustainability matters’ topics: environment, social responsibility and employee treatment, respect for human rights, anti-corruption, and bribery matters. The directive requires: <ul style="list-style-type: none"> • A description of the business model, • A description of the policies undertaken by the company and the outcomes of these, with the due diligence process activated, 	In addition to environment matters, social responsibility and employee treatment, respect for human rights, anti-corruption and bribery matters, the directive requires disclosure of: <ul style="list-style-type: none"> • Business model, sustainability policies and their outcome, • The definition of targets (forward-looking information), • Risks and risk management,

	<ul style="list-style-type: none"> The principal risks considering the nature of the group and considering whether this is relevant, are likely to have adverse impacts and how the company manages these risks, Non-financial indicators that can be relevant to the company. 	<ul style="list-style-type: none"> Key performance indicators related to sustainability matters, Description of administrative, management and supervisory bodies' roles related to sustainability matters.
Reporting Standards	Defined at the national level.	Companies must rely on the new EU standards, related to: <ul style="list-style-type: none"> Environment, Social, Governance, Sector-specific ones.
Materiality	Double materiality is defined in the non-binding guidelines (European Commission, 2017).	Double materiality is defined in the Directive and considers impact materiality and financial materiality.
Mandatory assurance	The auditor demands only to verify if companies in scope have published non-financial statements. Some countries have introduced already during the transposition mandatory assurance verification.	Introduction of mandatory disclosure with a progressive approach: starting from limited assurance engagement to reasonable assurance engagement.
Location of reported information	The directive left to the Member States the possibility to define whether companies must disclose in integrated or separated reports.	Non-financial information should be included in the Management Report.
Format of the report	Companies are required to publish on their websites the PDF version.	To align with financial statements, companies are required to produce a machine-readable report with the XBRL language which produces the report in the XHTML format.

2.2.2 Analysis of the European Sustainability Reporting Standards

As stated above, within the adoption of the CSRD, the European Commission required companies to comply with the European Sustainability Reporting Standards (ESRS). The principal aim is to assure a good level of information for stakeholders, guaranteeing a level of disclosure like the one required for financial reporting.

The EFRAG has been technically appointed as advisor for the European Commission and has released the first draft set of ESRS to the European Commission in November 2022. Now, the European Commission, with the Member States, is in a phase of consultation on the first set of drafts of ESRS, which will be adopted by July 2023 and applied for reporting by the financial year 2024, for the reports published in 2025. The timing respects the one above considered for the application of the CSRD (EFRAG, 2022).

According to the exposure draft, the reporting standards cover the following disclosure areas (EFRAG, 2022):

- **Governance** to monitor, assess and prevent risks, manage impacts, and identify opportunities.
- **Strategy** and business model adopted to interact with material impacts, risks, and opportunities.

- **Impact, risk, and opportunity management** which equals the process of identifying, assessing, and evaluating risk and opportunities and managing impacts.
- **Metrics and targets** for the identification of the measures to integrate for evaluating performance and define the actions needed to undertake to pursue the targets.

This change in the structure allows the ESRS to be more similar to already existing standards, like TCFC and the ISSB. In addition, some concepts, like the definition of financial materiality, are like the ones proposed by the ISSB (PwC, 2022).

The first set of standards is composed of twelve standards categories, divided into:

- **Cross-cutting standards**, which means that “they apply to all sustainability matters” (EFRAG, 2022):
 - Draft ESRS 1 General requirement,
 - Draft ESRS 2 General disclosures.
- **Topical standards** can be structured in sub-topics to cover several areas.

Environment:

- Draft ESRS E1 Climate change,
- Draft ESRS E2 Pollution,
- Draft ESRS E3 Water and marine resources,
- Draft ESRS E4 Biodiversity and ecosystems,
- Draft ESRS E5 Resources and circular economy.

Social:

- Draft ESRS S1 Own workforce,
- Draft ESRS S2 Workers in the value chain,
- Draft ESRS S3 Affected communities,
- Draft ESRS S4 Customers and end-users.

Governance:

- Draft ESRS G1 Business conduct.

Additional standards will be released with the next set, and will particularly refer to (EFRAG, 2022):

- Sector-specific standards focused on specific industries.
- Specific standards related to small and medium-size companies.
- Specific standards for non-EU companies.

As previously mentioned, the ESRS has formally stated the double materiality of the disclosure content. Double materiality refers to the impact of materiality and financial materiality, which EFRAG defines in this way:

- **Impact materiality** as “an actual or potential, positive or negative impact on people or the environment over the short-, medium- and long-term time horizons.” (EFRAG, 2022)
- **Financial materiality** as “the identification of information that is useful to investors, lenders and other creditors when they, as primary users of general-purpose financial reporting, assess the effects of sustainability matters on the undertaking’s cash flows, development, performance, position, cost of capital or access to finance”. (EFRAG, 2022)

The two materiality aspects should be considered interrelated, and both considered in the disclosure management process correlated to sustainability matters.

Another concept redefined by ESRS is the value chain, which is related to the materiality approach above defined, and requires covering information related to the upstream (for example suppliers) and downstream (for example customers) of the value chain. The disclosure of value chain-related data is particularly required for ESRS 1, which regards climate and therefore Scope 3 calculation, which identifies the GHG emissions of a company.

A particularity of the implementation of ESRS is that Annex D for ESRS 1 are indicated some requirements which are not demanded to be reported immediately, at least until these become relevant for their materiality (EFRAG, 2022). In other cases, for the first three years after the adoption of CSRD, only the qualitative aspect of some requirements is required to comply with.

The EFRAG has also established the qualitative characteristics that the disclosed information should present to meet stakeholders’ needs. These are (EFRAG, 2022):

- Relevance is related to the definition of double materiality and therefore companies should consider information that might affect the actions or decisions of some stakeholders.
- Faithful representation requires information to be “complete, neutral and free from error” (EFRAG, 2022).
- Comparability, which allows data to be related to previous years or other companies that at least operates in the same industry.

- Verifiability by several actors who ensure the validity of the information,
- Understandability, which is translated into immediate, comprehensible, clear, and concise information.

The result, aimed by the European Commission with the implementation of the European Sustainability Reporting Standards, is to encounter the principal problems of the sustainability disclosure management process, due to a limited and fragmented definition of the information required to be disclosed. At the same time, the effort of the European Commission is to simplify companies' transition to new standards, which is given by the similarity pursued with the already available standards or the progressive implementation of the ESRS. Under this view and considering the novelties introduced by the CSRD, the next paragraph tries to assess potential impacts on companies due to the recent developments in the sustainability reporting landscape.

2.2.3 CSRD impacts on European Companies

The adoption of CSRD will have significant impacts on various aspects that affect the life of a company. As previously stated, the number of companies affected will be around 50 thousand and the ones already claimed to disclose non-financial information will be required to change extensively their disclosure management.

The new directive aims to harmonize the sustainability reporting landscape, by increasing the reliability and credibility of the disclosed information. In a nutshell, the CSRD aims to standardize European Companies' communication, by equalizing the importance of financial and non-financial information for companies' life.

The dominant revision is the broader set of companies in scope, strengthening the shift from voluntary to mandatory disclosure, prior attempt with the NFRD. In addition to this, companies are also demanded to integrate their report into the management report, assessing in this way investors' needs and providing them with adequate information for their decision-making process. Therefore, from this point of view, the principal change for companies will be to understand how to interact directly with financial and non-financial information.

From a methodological perspective to produce the sustainability reports, the standards under which companies used to disclose non-financial information will be replaced by the ESRS adopted by the EFRAG. Therefore, companies will internally have to understand the main gaps

with the new required disclosure and implement the novelties.

Considering this aspect, also the newly introduced definition of materiality impacts the disclosed non-financial information. The sustainability topic object of the disclosure will acknowledge contemporaneously financial and impact materiality, which may exclude or involve topics priory not considered. This may require the company to a new definition of the significative impacts and their classification by the sustainability relevance.

Another aspect to be considered by companies is the verification by auditors of the non-financial information disclosed. Therefore, the management is required to be able to share relevant material in support of the disclosed data.

Finally, also the publication of non-financial reports has been regulated and requires the *XHTML* format and the “tagging” of the defined sustainability information. This development may require companies to review their disclosure process, particularly the data collection process, the data consolidation phase, and the production of the report. Therefore, companies may necessitate the integration of an IT system which will support disclosure management, considering both financial and non-financial information.

Additionally, to the requirements directly related to the disclosure process management, companies will face developments on several aspects of their organization and external actors. The major impact may regard (PwC Newsletter, 2022):

- Risk and compliance units will have a central role in defining in which way the company is demanded to be compliant with the CSRD. Risk management will be called to review its system to also capture sustainability risks.
- Investor relations, who may change their perspectives with the CSRD. Therefore, management should understand the impact on them and the demanded information.
- Board and governance became a crucial points for the evolution of disclosure management. Companies should identify their role in the sustainability strategy and asses potential risks and opportunities.
- Finance and treasury will increase their importance in a company’s life. This department will define carbon pricing, and the financial aspect of sustainability materials defined under the new regulation and study the synergies of disclosing a single integrated report. At the same time, since it is the direct speaker with investors, it should study in which way CSRD may influence capital providers’ expectations and considerations.

- Technology may be the tool to enhance the change for disclosure management. Companies will evaluate IT systems that help with the data collection, consolidation, and verification of non-financial data. Another relevant aspect is also to look for a solution which provides an easier way to interact with financial and non-financial information.
- The value chain will be affected by the begging, with the supplier, and at the end with the customer. Companies will look for a more sustainable supply chain and understand the emissions to calculate Scope 3. At the same time, companies must be able to evolve their market offer in line with customer expectations on ESG-related impacts.
- Human resources will count as a non-tangible asset to disclose adequately.
- Auditors must develop a process for passing from reasonable assurance to considerable assurance. Financial auditors may be advised also for non-financial information assurance.

These supposed outcomes are based on the comparison of the new requirements with the previous ones. The scope of the European Commission has been to foster accuracy, consistency, and assurance for non-financial information. At the same time, it is not clear how companies will undertake the application of the Directive within the internal process. A complexity to consider is that the Directive requires companies to involve multiple teams across the departments. Therefore, companies may encounter elevated costs for collecting the required data or may fail in adapting their internal process, revealing a more time-consuming disclosure process.

The follow of study will underline if technological solutions may help companies in managing the new emerging complexity. Particularly, understanding interconnected solutions improves the collaboration among business units, by making available real-time data, guaranteeing in this way transparency and consistency. Also given the complexity of sustainable related data, automated date and programming accurate calculations may reduce the time needed for the reports' preparation.

The next chapter elaborates on the actual literature which has analyzed the impacts of using technology for the reporting process. Most case studies still regard financial-related information and analyze the role of auditors from this perspective. Literature concerning technology and sustainability reporting is still limited, but the analysis will underline similarities with the financial process, and highlight the discrepancies.

Chapter 3. Digitalization of corporate reporting: insights from current trends and future direction analysis

Considering actual trends, in addition to the increasing interest towards sustainability topics, another stream of research analyses technological evolution. The last few decades have been shaped by the pervasive phenomenon of digitalization, starting from our lives, and impacting every single aspect of today's business. Particularly, the digital evolution has altered the speed of operations managed by companies, therefore requiring more flexibility in the decision-making process, a redefinition of the strategic positioning, and a recalculation of the achievable economic efficiencies (Bhimani and Willcocks, 2014).

The digital revolution can be traced back to the development of computer machines by the mid-20th Century, but the most notable revolution has been introduced by the Internet and the World Wide Web, which allowed global connection and fostered the exchange of information. The rapid development fostered the creation of user-friendly operating systems which allowed widespread adoption of the new technologies (Bhimani and Willcocks, 2014).

Companies, to interact with the new disruptive network and exploit its value, had firstly to adapt their business models and redefine their enterprise architectures. Value creation models have been developed and new industries raised, like communication, media, and entertainment. Technology has been used to define new strategies and first integrations in corporate functions regarding marketing, operation, planning, budgeting, and sales (Al-Htaybat and von Alberti-Alhtaybat, 2017). These evolutions have influenced management structure, decision process and strategy definition, having also financial management repercussions.

Technology has affected corporate communication, changing the way stakeholders interact with companies. With the advent of the Internet, listed companies started to publish the final management report on their websites, and after all, it became a common practice (Beattie and Pratt, 2003). At first, companies discovered the advantages of reaching a broader disclosure audience thanks to easy access. This reduced the cost of reaching stakeholders and changed the amount of information disseminated.

Companies and corporate reporting are evolving as technology has been updated. After the World Wide Web, the main revolution has been mobile device adoption, which provides new ways of accessing information, engaging online, and conducting business. This aspect, as reported by Al-Htaybat and von Alberti-Alhtaybat (2017), has moved corporate reporting from a static status to a dynamic one. The potential of real-time data has been therefore considered

and allowed by Cloud Computing, which changed the way storage data and the collaboration between business functionalities.

The digital era and the broader environment in which companies operate required the management of a great amount of data. The evolution under this consideration involved the application of big data technologies and analytics tools which allow to extract and elaborate valuable insights from the data set considered. Recent technological developments regard the Internet of Things (IoT), which allows the interconnectivity between devices, and Artificial Intelligence (AI) which automates significantly various processes, that originally are held by human intelligence.

Previously mentioned technology evolution has reshaped how business collects, analyze, and presents financial data. Nowadays, technology has automated the various steps of corporate reporting and reduced the possibility of human errors. Transparency is improved thanks to greater information and real-time updated data.

In the last decade, literature interest towards technology adoption and its relative impact on business reporting increased. Several studies agree upon the way technology affected corporate information, by increasing the audience. This shifted the control of disclosed information from a “central” point towards an individual one (Beattie and Pratt, 2003). Thanks to the internet, audiences started to have access to corporate data without time restrictions and limitations.

Behind technology’s benefit, it is important to underline that it brought several challenges too to companies. The first steps of the evolution required the re-definition of the strategy and structure of management accounting. The adoption of technology solutions required new soft skills for the professionals and implied a new cost structure for corporates, which started to rely more on intangible assets. Also, the assurance phase changed, requiring auditors to undertake new audit procedures in consideration of the new paradigms (Bhimani and Willcocks, 2014). These challenges increased over the years the demand for greater transparency. Under a normative aspect, it required the definition of data security procedures, which guarantee the respect of privacy and protect sensitive information. Considering new users’ needs, historical financial models were not any more efficient. Stakeholders start to demand a holistic view of the company, shifting from only a historical point of view to a forward-looking approach, which allows them to understand corporate strategy, vision, and mission. These requirements were satisfied with the integration of non-financial and more qualitative data, which developed the integrated report.

Technology plays a crucial role in the reporting process of integrated reports since it allows the interaction between various data sets, which integrate financial and non-financial data. In addition to the benefits already stated for financial reports, considering sustainable data technology improved the standardization of collected frameworks' indicators and allowed a more transparent process, which facilitate the monitoring and assurance of the report (Miglionicco, A., 2022). Sophisticated data analytics tools allowed to weaken the complexity of impact calculation, assessing more precisely the impacts of a company's activities on environment and social aspects.

However, technology also presented additional issues for sustainable reporting. Particularly, the lack of a definition of mandatory standards is limiting the adoption of technology solutions and compared to financial data, it makes it even more difficult to define what to disclose and how to report it. Another counterpoint is that financial and non-financial reports have divergent deadlines, which obstacle to the interaction of the two typologies of data (Technology for IR). Under this consideration, it is possible to hypothesize that the new requirements of the CSRD will enable technology adoption, which may facilitate the management of the expanded reporting scope and the numerous indicators to disclose.

The theme of the technology impact on reporting practices is quite a novelty in the literature field, meanwhile, the study of digital technologies on stakeholder engagement and sustainability reporting process is still limited. These three topics, financial data, technology evolution, and sustainable reporting, have been mainly singularly analyzed. In reality, these three aspects are interrelated and interdependent. As reported by Lombardi and Secundo (2020) "the corporate reporting process and accounting, mandatory and voluntary reporting (financial versus non-financial information) and earning management cannot be free from the spread of digital technologies and infrastructure that could support and enhance the engagement of various stakeholders and could satisfy the shareholders' need for clear and fair information".

The following chapter analyses the first impacts of technology on corporate disclosure, which at the begging involved only the financial data. Under this view, the new assurance practices developed are considered. Finally, the focus in on non-financial reports, and which way digital technologies impacted the interactions of companies with their stakeholders. The expected outcome aims to define similarities and discrepancies in the way digital evolution influenced firstly corporate financial reporting process and, more recently, ESG reports.

3.1 Analysis of technology influence on corporate reporting: impacts, benefits, and paradoxes

As previously anticipated, technology has transformed the corporate reporting process and had several impacts on companies. The following literature review analyses the developments of corporate reporting within the digital evolution. The study aims to identify the possible benefits and counterpoints of this new hybrid nature of corporate reporting. This first analysis may rely more on financial reports, which have long-time well-established reporting process, allowing the comparison of the technology reporting process and previous corporate reporting practices.

3.1.1 Digital evolution: what are the impacts on corporate reporting?

Historically, corporate reporting was mainly conducted only on financial data and for providing investors with adequate information for investment decisions. The focus was on financial metrics and past performance evaluation.

The first disruption of technological evolution has been the way to distribute information. The advent of the internet allowed companies to publish their annual reports on their websites, therefore, as reported by Al-Htaybat and von Alberti-Alhtaybat (2017), “as accounting and corporate reporting have adapted and traditional print forms of corporate reporting have been shifted to internet-based practices”. Firstly, the company’s communication strategy was mainly directed to customers and only a little information was directed to investors (Hedlin, 1999). Only after more knowledge of the possible leverages of online communication, companies started to redefine their strategic communication and provide digital versions of the principal documents. In this stage, the use of internet capabilities was still limited, and companies did not take advantage of the potential for improving and updating reporting practices (Hedlin, 1999; Lymer and Debreceeny, 2003). Companies begin to differentiate their communication to diverse groups of audiences only when investors’ use of internet source information for their investment decisions becomes a common practice (Lymer and Debreceeny, 2003).

During this phase, companies started also to exploit the eXtensible Business Reporting Language (XBRL), which enables to mark off information and enable hyperlinks for an easier user experience and for improving research opportunities (Lymer and Debreceeny, 2003; Al-Htaybat and von Alberti-Alhtaybat, 2017). XBRL nowadays is regulated. European requirements have defined the Electronic Single Electronic Format (ESEF) with the Directive 2004/109/EU. ESEF taxonomy defines a hierarchical structure to tag for complying with the

financial information classification (ESMA, 2023). With the CSRD, the XBRL format will be extended also to non-financial information.

A considerable implication of this evolution is the interaction with external stakeholders, which are audience groups. Companies that used to focus online communication only to customers started exploiting the possibility to reach several categories of stakeholders. Under this view, the disclosed data reached a considerable amount.

This aspect of digital interaction has been particularly changed within the third phase of digital evolution, which regards modern technologies like socials, cloud platforms and mobile graphics. These new technologies enable a new level of accessibility and research that have a disruptive impact on companies' communication, providing real-time and anywhere stakeholder connectivity (Al-Htaybata and von Alberti-Alhtaybat, 2013). Under this view, social media are an effective stakeholder engagement tool which should be included in a company's communication strategy.

This real-interaction can be seen by companies as a tool for reducing information asymmetry (Al-Htaybata and von Alberti-Alhtaybat, 2013 and 2017; Lombardi and Secundo, 2020). Disclosing financial information on social can be more immediate but allows companies also to "gather stakeholders' responses to the disclosures through this form of interactive corporate reporting" (Al-Htaybata and von Alberti-Alhtaybat, 2019).

Different stakeholder engagement also implies a correspondent level of the disclosed information. The increase in audience heterogeneity required companies to adapt their communication. Stakeholders start to demand information beyond financial data. This may include information related to environmental impact, social responsibility, governance practices and risk management.

The need for a more comprehensive overview of the company has been responded to by the development of integrated reporting, which provides a more holistic view of the value generated by a company. This new trend has been the object of different studies and it has emerged that social media for integrated reporting purposes are effective in improving transparency (Rivera-Arrubla and Zorio-Grima, 2016) and efficient in connecting companies with specific stakeholders (Brennan and Merkl-Davies, 2018). The study of Lodhia and Stone (2017) confirm also that the interactivity provided by new technologies (web or social media platforms) is useful to "provide stakeholders with detailed online supplementary information which is interconnected with the components of the coincide integrated report, analyze and

respond stakeholder’s information requirements, and provide stakeholder with greater access to online data, search and analytical tools”.

Considering the need for disclosing the impact of organizations on environmental, social, and governance aspects for addressing stakeholders’ expectations, sustainability reporting is another fundamental aspect of corporate reporting strategy. Technology in this case has been applied for the calculation of specific data, like greenhouse gas emissions, waste management and other ESG indicators. In the second paragraph, the analysis will be deep into the role of technology in enabling companies to collect, analyze, and communicate on ESG-related topics and its implication.

Table VII. *Overview of the ways technology evolution has influenced corporate reporting. Personal elaboration.*

Corporate reporting	Technological influence
Real-time reporting	<ul style="list-style-type: none"> • Traditional reporting presents a time lag between data collection and reporting. • With technology, information is continuously updated. • Stakeholders and managers can monitor performance constantly. • Continuously updating allows for monitoring emerging issues and improving the decision-making process.
Information asymmetries	<ul style="list-style-type: none"> • Companies increased disclosed information for meeting stakeholders' needs. • Different channels of communication with easy access increase transparency. • Accessibility and timely manner foster the credibility of companies.
Data	<ul style="list-style-type: none"> • Digitalization has increased the data amount to manage. • Technology allows companies to collect and elaborate data for reporting. • Data analytics tools elaborate data for making informed decisions and improving performance. • Data visualization tools create interactive reports easy to access by users.
Automation	<ul style="list-style-type: none"> • Automation of reporting phases allows the reduction of time and effort. • Financial software allows one to get automatic data from various sources. • Increase efficiency and reduce errors.
Integrated Reporting	<ul style="list-style-type: none"> • Technology allows to collect and analyze diverse data necessary for integrated reports. • Integration of financial and non-financial data. • Helps in the definition of long-term goals.
XBRL and Standardization	<ul style="list-style-type: none"> • Easier analysis of financial information. • XBRL language enables companies to tag financial data. • Improve accuracy and transparency.

3.1.2 *Paradoxes of technology evolution*

The rapid change in corporate reporting has not only implied benefits, presenting challenges related to the need for new skilled managers, data privacy management, the interpretation of data and the redefinition of new business models.

Internet reporting changed the perspective of the disclosed information, shifting towards a consumer-driven business (Beattie and Pratt, 2003). Companies started to shape their

communication based on stakeholder requirements, which bring a broader range of disclosed information.

This aspect influences the company's assets, by fostering the importance of "soft" assets, like intellectual capital for comprehending the external environment and adapting towards its corporate strategy. Therefore, the first challenge for companies has been to have accessibility to skilled professionals that follow the path of technological evolution and can analyze a great amount of data.

A particular aspect to consider is that technology implementation has been incremental and digital technology upgrades have been faster than corporate processes (Bhimani and Willcocks, 2014). For corporate reporting, digital evolution did not respect the usual steps of strategy definition, structure, and accounting system implementation, forcing the organization's management to rapidly change their modus operandi (Bhimani and Willcocks, 2014).

Another key point is that companies' investments in software and hardware affected their cost structure. According to Bhimani and Willcock (2014), digital evolution affected cost structure at first implementation by:

- Increasing fixed assets and fixed costs. Technology investments initially presented a great expenditure with later earnings.
- Changing the process of actual costing. The use of technology changed the determination of the cost for an item or service since companies had to define how to allocate technology implementation costs.

Above these considerations, technology costs decreased over time, thanks to the great adaptation of all businesses and the effective results obtained.

A challenge dictated by the real-time data, and therefore the continuous updating of the disclosed data, is the quality and accuracy of the data. This aspect raises a conflict between timely and reliability (Al-Htaybata and von Alberti-Alhtaybat, 2013).

According to Eckerson (2002), data quality should "consistently meet knowledge worker and end-customer expectations" and respect several aspects like accuracy, integrity, consistency, completeness, validity, timeliness, and accessibility. To provide good quality data is relevant to align all groups of workers and functionalities to the relative importance. Under this view is important for companies to provide education and define mandatory measures and methods for the analysis of data quality (Eckerson, 2002).

From the previous point emerges also the importance of training and the reduction of the skills gap of the employees. In addition to management's ability to define the technologies needed to implement and adopt new processes, it is important to involve all workers affected by the preparation and definition of corporate reporting. Providing adequate training programs and support is crucial to ensure employees can effectively use the technology for reporting purposes. According to Mishra and Pani (2021), knowledge is a precursor to innovation and companies should exploit existing knowledge to develop new responses to business problems. Under this view, organizational learning has become a crucial step for implementing digital innovation.

Another aspect to consider is the development of comprehensive change management. Technology implementation enabled new processes and workflows which can create resistance from the work force. Management should therefore, in addition to investing in organizational learning, define in which way the company is going to implement the new technology: outsourcing the process of implementation or outsourcing skills for internal development (Mishra and Pani, 2021).

Other challenges that emerged through technology development are the management of data security and privacy, to protect against unauthorized access, and the evolution of auditing practices, changing the way assurance is performed. The following paragraphs get deep into these two aspects.

To conclude, this analysis concentrates on the potential challenges that companies can encounter. Organizations should define the potential benefits and risks of a technology implementation process and perform a cost-benefit analysis. These two steps prepare companies towards the digitization of corporate reporting, because as reported by Al-Htaybata and von Alberti-Alhtaybat (2013): “the digitization of accounting and corporate reporting cannot be reversed or even stopped, but instead should be incorporated into accountants’ tacit knowledge, education and work processes, akin to computers, enterprise-resource planning systems or the internet in general.”

3.1.3 Digital age and the protection of data privacy

New technology development allowed continues exchange of information and interconnectivity, which raised the questions of how data is gathered and how it is managed.

In the European context, the General Data Protection Regulation (GDPR) defines the data protection framework. Particularly, the objectives of the regulation are (European Union, 2016):

- Define the protection and processing of personal data.
- Protect fundamental rights of freedom and the free choice of protecting personal data.
- Guarantee free movement of data within the European Union.

With this regulation, the European Union set specific data protection principles and responsibilities for companies (ACCA, 2018). The principles introduced regard:

- *Accountability*. This requires companies to demonstrate compliance with the data protection principles. For example, disclose transparent privacy policies, report effective procedures, and demonstrate the integration of privacy protection regulation.
- *Consent*. Individuals should be demanded to provide their consent for the treatment of data. It must rely on separate forms and be easy to withdraw.
- *Transfer of data*. The EU Regulation does not allow the transfer of personal data outside the European Economic Area and in case, the transfer should follow adequate safeguards.
- *Data breaches*. Any company should notify if a data breach is likely to impact the data privacy of an individual.

An implication of the GDPR is the update of companies' existing systems to comply with several requirements (PwC, 2017):

- Cyber security controls, which limit the wrong usage of personal data.
- Allow privacy audits.
- Define specific procedures to protect privacy in case of incidents.
- Anonymization of the data used.
- Prevent the loss of flow of data.

According to PwC analysis (2017), GDPR does not represent only a legal requirement, but it represents an opportunity for companies to improve operations and innovation. The three pillars to consider are the improvement of *Business* operations, the change in *Customer* experience and the update of *Technologies*. Operating towards these three domains and transforming business operations allows companies to not only be compliant with regulations but also to

operate more ethically and sustainably.

The focus of *Business* is to reduce complexity, by standardizing and identifying specific procedures. Looking at the improvement of *Customer* experience, organizations should assess customers and actors considered, to shape and adapt the privacy compliance towards their experience. Considering *Technology*, it is important to identify whether data are assessed, update the data registry and control the data management strategy.

The introduction of GDPR made data privacy a crucial point in the digital age and it has provided legal obligations for European companies (Fox *et al.*, 2022). The GDPR, as previously mentioned, allows individuals to control their personal data. However, due to the increase of people analytics thanks to the new developed technologies, the theme of data privacy is always analyzed and re-shaped, requiring new guidelines and frameworks (Tursunbayeva *et al.*, 2022). In this context, companies are therefore demanded to follow market trends, update data security policies and act ethically.

3.1.4 Accountants' role: evolution of audit practitioners with technology enablement

An implication of technology implementation is the change in auditing practices. Real-time reporting is contrary to the traditional assurance process, which used to be provided periodically.

Several benefits, as already reported, have been introduced by the constant update of the information disclosed, which as stated by Trigo *et al.* (2014), “along the organization life, the real-time reporting in accounting gives complete and instantaneous information about key dimensions of the organization allowing the management to decide the better direction and actions to take in each moment”.

Real-time reporting has increased the quantity of information disclosed, previously limited by the historical reporting approach (Trigo *et al.*, 2014). Therefore, under this view big data technologies have become fundamental to perform data analysis and aggregation (Al-Htaybata and von Alberti-Alhtaybat, 2017).

According to Trigo *et al.* (2014), technology development responds to real-time reporting challenges and the large data set:

- Business Process Management Suites (BPMS), which offer modules for Business Activity Monitoring (BAM) and allow management to have dashboards for continuous monitoring. This technology allows to perform and automate internal controls.

- Cloud computing provides flexibility, and in line with the real-time reporting concept, allows anyone to access information without limitations. Several vendors are present in the market, some of them are Oracle, SAP, Microsoft, or Sage.
- Enterprise Resource Planning (ERP) technologies easily gather real-time data and historical values. Withing these, the XBRL language has fostered the exchanging of business information, increasing efficiency, accuracy, and reliability. Particularly, it allows companies to make easier real-time reporting.
- Business intelligence (BI) is the most advance technology, which mainly uses it to get the data from the original source. Accounting Intelligence (AI) extracts data values directly from the ERP (Enterprise Resource Planning).
Particularly, this technology can be easily customized according to companies' requirements and may help in the decisions process, by identifying new opportunities.
- Blockchain, which has been introduced into practice more recently. This technology enhances the transparency of the audit process since it does not allow to reverse or modify a transaction, allowing to have reconciliation in the processes and access to identical records for all parties (Moll and Yigitbasioglu, 2019).

Technology advancements have therefore reshaped the nature of auditors' work. It has favoured the development of automated audit procedures, reducing manual effort. It has enabled remote auditing, allowing auditors to not be directly present at the client's location and with technological tools, it has enhanced the continues auditing, by allowing constant monitoring of client's transactions. Technology has also facilitated the creation and maintenance of audit trails, recording all auditors' work tracks and documents, simplifying the process, and allowing better collaboration.

“The manuscripts on the technological influences on accounting suggest that digital transformation has radically changed the nature of accounting practices and for accountants to be ready to leverage the potential of digital tools, they need to focus on developing their core competencies through lifelong education and skill development training.” (Chong *et al.*, 2022). Particularly, technological developments influenced the redesign of executive responsibilities and required new technology skills, not only from companies' users but also from accountants (Bhimani and Willcocks, 2014).

A critical point is how auditors get data and critically analyze them to communicate to the

companies. Auditors are required to have data analytical skills to extract data and provide an evaluation of the company (Chong *et al.*, 2022) but at the same time, a critical point is the rapid update of the technology, which requires a constant revision of the technological skills. According to the Association of Chartered Certified Accountants (ACCA, 2018), auditors will be required to acquire knowledge of the new business model developed and become experts in using emerging technologies. Smart technologies and analytics will allow auditors to gain information beyond the financial information allowing the interconnection of financial aspects with non-financial topics. ACCA defines future professional skills, underlines the digital knowledge to apply existing and emerging technologies and is able to define best practices and create value.

An adverse aspect of the new technologies is the possibility of these replacing auditors' work. Most of the literature reports that even though technology allows better performance for data gathering and elaboration, accountants' knowledge is fundamental for analyzing critically data and trends (Al-Htaybata and von Alberti-Alhtaybat, 2017; ACCA, 2018; Chong *et al.*, 2022). Skills like creativity, which allows professionals to adapt to new situations and explore potential outcomes, or like the vision for thinking innovatively from existing trends, should be integrated with the analytical skills of accountants (ACCA, 2018).

Particularly, as reported by Al-Htaybata and von Alberti-Alhtaybat (2017) "the digitization of accounting and corporate reporting cannot be reversed or even stopped, but instead should be incorporated into accountants' tacit knowledge, education and work processes, akin to computers, enterprise-resource planning systems or the internet in general".

3.2 Accounting transition: digital technologies for sustainability reporting

Technology developments have influenced recently also the sustainability reporting process, which comprises two branches of accounting: environmental accounting which refers to energy, waste, water and carbon footprint, and social accounting which regards employee, governance, and stakeholder interest indicators (Vărzaru, 2022). In this context, new digital technologies enhanced the management of massive amounts of data for traditional financial indicators and new sustainability indicators. As in the previous paragraph, the considered technologies are cloud computing, Big Data, Internet, and Artificial Intelligence, which has been reported by Vărzaru, (2022) "have generated an environment that facilitates the achievement of sustainability goals".

As for financial reports, several benefits have been discovered considering the impact of technology on sustainability accounting. Particularly, several studies agree upon the following implications (Burritt and Christ, 2016; IIRC, 2016; Miglionico, 2022; Vărzaru, 2022):

- Technology has facilitated the collection and elaboration of ESG data, which is more heterogenic to provide an overall view of the sustainability performance of the company.
- The use of advanced systems has increased the credibility of data, by improving accuracy and data integrity.
- Linked to the previous point, technology has enabled stakeholder engagements, providing real-time data and interactive sustainability reports.
- Systems designed for sustainability accounting incorporate principal standardized frameworks, such as the GRI, SASB or TCFD. This functionality helps companies to adopt the relative indicators and to comply with them, ensuring consistent and comparable reporting of sustainability information.

These overall aspects allowed companies to measure better their environmental and social impacts and to make informed decisions, regarding particularly sustainability strategy and the definition of the targets.

Audit practices have been influenced too, as previously analyzed. For the sustainability reporting case, the starting point in confronting to financial audit process differs, since the actual Non-Financial Reporting Directive does not require auditors' reviews. Therefore, audit practices are under development, and they should follow regulatory requirements evolution. In the sustainability reporting context, the practices and digital skills of the accountants are developing at the same time, requiring flexibility and the ability to identify new regulation requirements.

Above the controversies of the adoption of technology for reporting process, as before mentioned, the case for sustainability accounting is that the relative regulation is the object of several revisions, which may not be always immediately implemented in the digital systems. Therefore, it is possible to encounter gaps between regulation prerequisites and digital systems' capabilities since technology should respond to an incremental definition of sustainability accounting concerns and requirements.

The following paragraph analyses the presented context, reporting case-studies that verify the outcomes of the digitalization of sustainability accounting, the evolution of auditors' practices and possible technology developments and its functionalities towards integrated report required by the new European Directive on Corporate Sustainability Reporting.

3.2.1 Literature review of the relationship between technology and sustainability reporting

General outcomes from the literature review highlight that digital technology adoption enhances the quality of the disclosed data and facilitates sustainability reporting in specific sectors or for companies with relevant sizes (Burritt and Christ, 2016).

For many years sustainability reporting has not been considered by companies as a real opportunity to behave better environmentally, but only as an instrument to look better towards outside stakeholders. This is reflected in a lack of engagement towards long-term sustainability targets, which limits investments in technology, leaving space towards inappropriate data collection and undermining the credibility of sustainable accounting (Burritt and Christ, 2016; Vărzaru, 2022).

The main problems connected to this vision of sustainability reporting are (Burritt and Christ, 2016):

- Greenwash, which reflects an overstatement of corporate environmental performance.
- Brownwash, which indicates an underestimation of corporate environmental performance.

Several studies, focusing on environmental regulation, the fragmentation of the disclosed information and the critical aspects of the reporting process reported in the previous chapter, analyze the adoption of digital technologies for sustainability reporting and accounting. It is relevant to highlight that sustainability accounting and sustainability reporting are two different concepts. The first one relates to the collection of the relevant values for the chosen indicators meanwhile reporting is the final step for disclosing information towards external stakeholders. The adoption of a technological system can combine the two aspects, and enhance the process of disclosure from the begging, with indicators definition, towards the final publication. In this way, companies may be enhanced towards sustainable development (Vărzaru, 2022).

Sustainability literature can be divided into two main streams: the first considers the relationship and possible interdependencies between sustainability and technology, and the second focuses on the analysis of the impacts of technology adoption in the sustainability

reporting process. This view is confirmed by Beier *et al.* (2017), which highlight that only a small part of the literature relates to the investigation of technology impacts on sustainability concerns. Also, Tiwari and Khan (2020), evidence little empirical evidence of technology's impact on sustainability accounting.

Burritt and Christ (2016) evidence possible outcomes for digital implementation, like raising the quality of data, obtaining more accurate data, improving efficiency, and facilitating the consolidation step. Regarding the potential of technology, the authors indicate the need for more sophisticated technology for collecting and analysing interconnections between financial and non-financial information.

The study of Müller *et al.* (2018) analyzes the benefits and challenges of technology adoption in relation to companies' size and sector. Results evidence that major benefits are linked to large companies, due to their long-term focus on the business model. In addition, the implementation choice depends on the opportunities pursued by the company. Particularly, for sectors like steel, chemical, and plastics, the opportunities are more related to the operational level, like reduction of time consume, finding efficiency and flexibility. On the other side, for mechanical and plant engineering businesses, the opportunities relate to the strategic aspect, of pursuing competitiveness in the sector.

The study of Miglionico (2022) analysis technology developments and identify the potential for standardization. Particularly, it evidences that automation of climate risk assessment reduces managerial opportunism and provides the right level of granularity necessary to improve data quality.

Bonilla *et al.*, (2018) differentiate in various steps the adoption of technology for sustainability-related topics. It evidences that in the first stage of deployment, the overall impacts of technology are still limited. The second stage of the operation is differentiated using technology for the final outputs. This step has resulted as the most beneficial for the sustainability reporting process. The third step focuses on the elaboration of sustainable goals. According to Bonilla *et al.*, (2018), for the efficiency of goal setting process is relevant to have an advanced sustainability platform which enhances performance valuation. The final stage, related to long-term projection, identifies a strong influence of several aspects: governments, regulations, and frameworks. A complexity, already anticipated, is the heterogeneity of national regulation, which creates niches among technology implementation and blocks the creation of sustainability patterns.

The outcomes of Klymenko’s research (2021), find evidence that generally companies consider sustainability and technology as two different phenomena. According to Klymenko, companies should identify the possibilities dictated by technology implementation, which according to the results is limited to the difficulties of the companies in defining the metrics to disclose.

The table below presents the discussed papers.

Table VIII. *Overview of the studies analyzed. Personal elaboration.*

Author	Research focus	Outcomes
Beier <i>et al.</i> , 2017	Technology impacts on sustainability	The study analyzes China and German companies and evidence of a possible positive outcome for the technology implementation over sustainability issues.
Burritt and Christ, 2016	Technology and sustainability analysis	The results evidence positive outcome for the implementation of technology in the reporting process.
Bonilla <i>et al.</i> , 2018	Technology impacts on sustainability	The study evidence that technology has different roles in sustainability reporting, which depend on the level of maturity of the reporting process.
Klymenko <i>et al.</i> , 2021	Technology and sustainability analysis	The study reports the possible benefits of the accounting reporting system for ESG performance evaluation.
Miglionicco, 2022	Technology and sustainability analysis	The results evidence the positive impacts of technology adoption: standardization and limiting of management opportunism.
Müller <i>et al.</i> , 2018	Technology impacts on sustainability	The outcomes of technology implementation depend on the size of the company and the nature of the sector.
Tiwari and Khan, 2020	Technology and sustainability analysis	The study of Indian Companies classifies three levels of technology implementation and the relative steps for GRI indicators’ compliance.

Overall, the general outcomes of the analyzed papers define a positive impact of technology on sustainable corporate reporting. However, these benefits are influenced by several aspects, which can be companies’ characteristics (size and industry), or the stakeholder engaged in the reporting process. An aspect to consider is that sustainability accounting and its recent development, present a more heterogenic environment compared to the one of financial accounting. This is due to a longer knowledge of financial practices and requirements, which allows to better define the response of technology to possible issues. Literature highlights that this level of maturity is still missing for sustainability reporting, and technologies still have to develop more sophisticated tools to respond to the new emerging sustainability-related concerns.

3.2.2 Sustainability sets new requirements for auditors' skills and practices

As previously analyzed, the evolution of the reporting process also affects the auditor's role and practices. Digitalization, as evidenced by financial reporting, has enhanced the assurance process thanks to auditing software which allow accuracy and reliability of the verification.

Another disruptive evolution for auditing practices has been the development of non-financial frameworks and emerging relevance for disclosing the environmental performance of companies. This additional aspect has broadened the audit scope, challenging auditors with new requirements and new skills to develop to assuring reliability and accuracy also for sustainable data.

It is important to underline that only in the last ten years sustainable reporting regulation has been under development and for many years non-financial reporting has been elaborate under voluntary assessment. Therefore, initial third-party assurance had the objective to increase the reliability of the disclosed data (Perego and Kolk, 2012). Standardization of the sustainable reporting standards has been favoured by the common adoption GRI framework, which over the years has gained consensus. Another key difference for sustainability assurance is that external assurance is not mandatory required by the European Regulation and this limits the development of sustainable auditing practices. Particularly, the recent development of this trend limits IT solutions and auditing practices, providing lower quality compared to financial accounting services.

Recently, the literature related to the analysis of auditing practices and sustainability has increased its interest. Several outcomes report that assurance has been an effective tool for improving transparency and enhancing the sustainability targets of companies (Cancela *et al.*, 2020; Zaman *et al.*, 2021). Particularly, Al-Shaer and Zaman (2018) analyzed in which way audits enhance sustainability, finding that it increases the independence of the reports, meanwhile Velte (2018) evidence that external assurance increases the quality of the disclosed data. Moreover, an important aspect to consider is the new required skills for sustainable auditing. Part of the literature focus on the perception of auditors over the sustainability trend and their role. Ahmed (2016) finds evidence that auditors believe that their role is crucial for orientating companies towards long-term targets and better sustainable performance assessment. On the other hand, auditors may link their role's perception towards traditional accounting practices, to advisory services for support companies for sustainable compliance (Gray *et al.*, 2014).

Considering auditor's training and education, the repetitive updates of standards and frameworks limit the definition of proper accounting practices. The limited expertise is also due to the restricted offer of university programs regarding sustainability topics (Chong *et al.*, 2022). Generally, university courses provided are optional and not comprehended in the mandatory list. This results in a limited knowledge of sustainability issues and consequently limits sustainability accounting.

The overall consideration of external assurance for sustainability reports indicates a positive impact on the guarantee of transparency and accuracy, increasing stakeholder engagement. Therefore, the emerging outcomes demand an improvement of professionalism to define proper audit activities. As reported by Hazaea *et al.* (2021), “as a result of different aspects/research subjects of sustainability assurance, auditors should clarify the criteria used and systematically refer to established standards that enhance the credibility of their verification and the readability of assurance statements, as without such standards would there be great variability in the wording used within the conclusions and assurance statements.”

With these considerations, auditors should identify opportunities and challenges in the development of sustainability-related context, particularly in the prospective of the CSRD integration, which will require mandatory assurance. The directive integrated also financial and non-financial data in a single reporting, which demand accountants and auditors to rely on and provide a more holistic view of the company's performance, assessing the impact of sustainability factors over financial KPIs. The environment requires therefore a constant update and enhance of auditor competencies to follow the evolving role of auditing in the context of sustainability reporting.

3.2.3 Insights for future developments of corporate reporting

Technology developments have positively affected corporate reporting processing, even if digital systems may lack effectiveness for some functionalities, as highlighted particularly for sustainable reporting. This trend is confirmed by an analysis of Deloitte (2018), which evidences time spent by finance teams in the elaboration of the final disclosure. It evidences that a large part of the interviewed reporting managers takes more time in creating and updating reports (current time spent 48%, preferred time spent 3%), contrarily to their willingness of engaging more in interaction and communication with the business and outside stakeholders (current time spent 18%, preferred time spent 69%).

Technology developments will also continue and will challenge companies to always be updated. Particularly, new technologies on the horizon for reshaping corporate reporting are still in an early phase of adoption (Deloitte, 2018; PwC, 2019):

- Robotic Process Automation (RPA), which benefit is to automatize users' actions, processes, and internal controls. It is estimated that around 45% of activities can be automated, reducing time-consuming actions and human errors.
- Chatbots represent virtual assistants that assist users and indicate solutions in case of need.
- Visualization software, which represents dynamically the desired data with more user-friendly interfaces.
- Predictive analytics with the use of algorithms allows forward-looking analysis.

The future of corporate reporting will foster therefore the characteristics previously identified. It will dominate by artificial intelligence, which will improve users' experience and facilitate companies' processes. Systems will be more interactive for company internal users, which may interact with chatbots, and at the same time, they will affect the information reported. The timeliness of reporting will be improved by a constant update of the data. Therefore, companies for the next years will be engaged in a re-definition of corporate reporting processing, increasing the focus towards stakeholders' needs.

Another insight considering sustainability comes from the introduction of the CSRD and its new requirements. The new European Directive is likely to drive the adoption of technology enablement solutions, particularly for ESG data but also for facilitating the creation of Integrated Reports. Under this view, technologies facilitate the combination between sustainable data and financial for providing a comprehensive view of the company. The 68% of companies that have already started in the elaboration of integrated reports evidence better understandings of business opportunities and risk, but significantly the 79% and 78% evidence respectively improvements in the decision-making process and increase in the collaborative thinking shared among the several departments (IR, 2014).

Several benefits are linked to integrated reporting (PwC, 2019):

- Direct Value
 - Lower cost of compliance and lower procurement costs.

- Revenue growth by the development of new business models leaves space for more innovative products which create new streams of revenue.
- Indirect Value
 - Risk management by the reduction of capital cost and the reduction of the dependence on scarce resources.
 - Brand enhancement for the consumers and for internal employees increases employee engagement.

An aspect to consider on the legislative side is that CSRD expands the reporting scope of sustainable reporting, requiring the disclosure of several indicators. This implies a different view of the role of data, which should be better managed and structured for collecting, analyzing, and reporting ESG indicators (IR, 2016). Technology is the vision of integrated reporting, which present big differences compared to the technology required for traditional reporting. Reporting is effectively only the last mile of a more comprehensive approach. Technology should explore all the steps that anticipate the disclosure of information, which regard particularly (IR, 2016):

- Strategy definition, therefore, technology should facilitate collaboration.
- Operations which vary across the company and technology should provide connectivity across the multiple departments and systems.
- Quality, which defines the process of quality control across companies' departments, is facilitated by the vast information collected.

A relevant aspect to consider is the implementation step. Companies that adopt information systems have various analyses to perform, to understand which are the needs and what are the desired outcomes. Key steps that a company should consider for a digital strategy implementation are (PwC, 2022):

- Identify the KPIs to report.
- Create a reporting structure compliant with the regulation.
- Develop employee skills.
- Leverage outside experts in technology.

Considering the technology adoption for enhancing reporting obligations, some companies will have already in place technology capabilities, meanwhile, another part should define the strategy to adopt for defining the sustainability reporting process. Companies should therefore

assess their current capabilities, identify the gaps, and prepare a roadmap for technology implementation designed to respond to the CSRD.

Another point to consider is that technology provider companies should monitor and implement timely updates of regulatory bodies to ensure compliance with the directive and enhance the capitalization of the opportunities offered.

To conclude, technology integration will be a crucial point dictated by the complex environments in which companies operate. Companies should define an information architecture which enhances support management and external stakeholder decisions. As reported by the IR (2014), “Such an architecture is needed because the modern business landscape poses a new set of challenges: telling the story of how an organization creates value over time, and across multiple capitals beyond just the financials, requires connected, rapidly changing information to flow into management reporting, analysis and decision-making.”

It is important to note that the outcomes considered in this chapter are based on an elaboration of the context previously analyzed, considering technology implementation, regulation development and the new requirements for disclosed information. The evolution of the reporting process effectively represents a competitive advantage, that if enhanced, will allow companies to gain investors and differentiate from the market. Lastly, it is essential to consider that the specific implication for the companies will depend on their size, geographical location, and existing reporting practices. Therefore, companies are recommended to identify their specific circumstances and define the right approach for the setting of a holistic strategy that enables sustainability reporting in line with new regulation requirements.

Chapter 4. Research and methodology definition: how does technology support compliance?

Given the previous analysis, the current study investigates the interaction between sustainability reporting and technology, highlighting the related implications for companies and practitioners.

The previous chapters analyze three different topics:

- The development of sustainability trends, demands companies to disclose environmental and social information.

Different theories, like stakeholder theory, legitimacy theory, and institutional theory, support the emerging need for voluntary disclosure. This need has been responded also by private organizations, which has provided companies with standards and frameworks that offer companies a structure to comply with. The most established are the GRI, SASB, and TCFD for sustainability reports, IRRC for integrated reports and CDP for sustainable performance-related questionnaires.

- Sustainability reporting development, which was raised to provide guidance to companies which were already disclosing sustainability information.

In the European Context, the first relevant legislation has been the Directive on Non-Financial Reporting (NFRD, 2014), which established a first set of topics to be disclosed and the related fields to consider. The Directive has been largely discussed for its insufficient regulatory power, which leads to member states and management discretion. This led to the integration of the directive with two sets of guidelines (European Commission, 2017 and 2019) for improved quality and enhance non-financial disclosure. The regulation process ended up with the publication of the Corporate Social Reporting Directive (CSRD, 2023), which increase the number of companies included and dictated more stringent guidelines, providing also mandatory reporting standards.

- Digitalization of reporting process had first an impact on the financial report and after, with the rase of interest, on sustainability reports.

The overall outcome considered highlights the positive impact of technology related to data management, analytical analysis, and collaboration within corporate teams. Some studies have already identified the potential of digital technology on sustainability reporting, which usually is found in increasing the standardization, reliability, and

accuracy of data. Technology at the same time influences also the assurance verification, the skills of the professionals involved and the data privacy policies.

The analysis performed interacts with these three topics, analyzing not only the relation between sustainability reporting and technology but also the inter-influences between sustainability reporting regulation and technology. The reason behind this view is that sustainability reporting has been established with an incremental process, which involved different working fields, and is still under improvement. Therefore, a possible contribution to the literature is to identify the drivers behind the strategic sustainable transformation.

The methodology adopted for the analysis relies on two data collections:

- Case study for Digital Technology implementation for the ESG reporting process.
- Semi-structured interviews with sustainability experts support companies during the definition of the ESG reporting process and digital enablement.

The source of data has been provided by PwC Italy, there has been performed a traineeship, which offered the possibility to interact with clients' sustainability and digital needs, experts in the digitalization of finance processes and professionals in the sustainability field.

4.1 Research propositions

The above overview on digitalization reports overall positive outcomes but does not provide direct practices for the technology implementation. The process for the technology adoption requires several aspects to define previously:

- Define the company's needs and the most crucial point to improve with digitalization.
- Define the digital tool to adopt which response to corporate needs.
- Identify the budget for the implementation project.
- Identify the professionals inside the company who will be the object of the digital transformation.
- Define which internal offices are included, in addition to the sustainability one.
- Decide if proceed with internal implementation, relying on internal expertise, or outsourcing the skills needed.

In addition, the literature lacks a clear definition of the various steps for the technology implementation process. Most of them follow the ESG reporting process, like data collection, data analysis and reports, but do not identify the first propaedeutic steps.

In light of these arguments and previously reported evidence, the first proposition investigates the various steps needed for digitalization, identifying which activities are required to perform the technology implementation and what are the final outcomes for the reporting process.

Proposition 1. Technology implementation requires a well-defined implementation process.

After having identified the key steps for digital implementation, the analysis aims to identify the outcomes of a well-designed implementation project. Through this analysis, the goal is to understand whether the integration of IT systems has led to an improvement in sustainability reports, in terms of the quality of the information involved and better communication of corporate sustainable goals.

Proposition 2. Well-defined technology implementation projects enhance the sustainability reporting process.

Considering the regulatory field, the overview of the existing literature suggests concerns “about the ability of the mandatory regime in changing the characteristics of the reported NFI” (Papa *et al.*, 2022). In particular, the European Directive 2014/95 on Non-Financial Disclosure has been the subject of much criticism for its shortcomings, such as lack of data credibility, ineffective reporting, reduced comparability of data, and a failure to define standards to be followed. With respect to this view, one proposition is that the adoption of IT systems has made it possible to overcome some of these regulatory shortcomings and anticipate the requirements of the new 2022/2464 European Corporate Sustainability Reporting Directive.

Proposition 3. The interaction between sustainability regulation and digitalization: technology supports compliance with the European Regulation on non-financial disclosure.

This last proposition aims to analyze initially the potential and criticality of technological advancement with respect to the demands of NFRD (AS-IS scenario) and then defines the opportunities and drawbacks arising from CSRD (TO-BE scenario).

4.2 PwC Presentation

The analysis of the research proposition relays on the internship realized in the consulting group PricewaterhouseCoopers. All the information reported is useful to academic research and any data owned by PwC S.p.A. and its clients will be hidden.

4.2.1 PwC Global

The PricewaterhouseCoopers Group (commercially named PwC) operates in 152 and counts 328,00 professionals in its network.

The group has been founded by the fusions of Price Waterhouse and Coopers & Lybrand companies in 1998. Nowadays, it is a key consulting group which is recognized as one of the Big Four, the most recognized audit companies. The other competitors are Deloitte & Touche, Erne & Young and KPMG.

PwC operates with well-established and influencing companies. In 2022 the group provided services to 84% of the Global Fortune 500 companies (PwC, 2023).

The group operates with private and public companies, within different sectors, and it offers services in various fields: assurance, consulting, deals, legal, tax, people & organization, strategy, sustainability, and climate change (PwC, 2023).

4.2.2 PwC Italy

The group in Italy present 24 offices with 8,000 professionals. It offers solutions at the local and global levels. The sectors in which operate are named Line of Services (LoS), which are below reported.

- Audit and assurance are engaged in the activity of reporting verification. LoS services may regard actuarial services, corporate reporting, IFRS, Capital Markets, and Financial and Internal Audits.
- Consulting support companies identifying trends and creating opportunities for growth. LoS' services regard several companies' activities, like operations, customer management, finance transformation, technology implementation, and people organization.
- Deals support companies to create value through mergers, acquisitions, disposal, and restructuring.
- Tax and Legal LoS include attorneys and accountants who support the development of legal strategies to protect businesses and work alongside companies to protect the value created and maintain proper taxation.
- ESG LoS support companies to define a strategic sustainable strategy, change internal operation, and report appropriate sustainable data.

- Internal Firm Services (IFS) LoS deals only with the internal operations of the firms, like human resources.

The internship object of this thesis research regards the Consulting LoS, particularly the Finance Transformation unit, which supports companies in innovating their internal processes by integrating technology and digital innovation. The strategy of the unit relays on seven levers:

- Finance organization and structure, which recognizes the interaction of human capital between digital workforces.
- The finance workforce and capabilities changed with new digital innovations, requiring continuous improvements.
- Process excellence and automation of workflows improve the efficiency of businesses.
- Cloud ERP and digital platforms are relevant for connecting and providing trust data.
- Automated and predictive controls enabled by Artificial Intelligence.
- Advanced analytics, insight, and action. Artificial Intelligence allows predictive financial planning forecasts and business forecasts, which are key drivers for business performance.
- Strategic finance business partnering leverage real-time and connected data to drive decision-making processes.

The other LoS directly involved in the project, the object of the case-study, is ESG. The three dimensions under which the LoS operates, consider:

- Strategic reinvention, which aim is to align business operations towards the company's goals. This includes the definition of an ESG strategy for corporate companies and a sustainable finance strategy for the financial sector.
- Business transformation integrates actual operating processes with sustainable solutions oriented to the definition of a more sustainable business model. Activities may regard climate change, oriented to the reduction of emissions, or governance, which includes ESG principals in the internal controls systems and in enterprise risk management models.
- Reimagined reporting, which redefines traditional reporting to enhance the change path towards more sustainable performances. It involves sustainable reporting support, for the identification of the non-financial information to report, and integrated reporting support, to enhance the adoption of a holistic view of the performance of the company.

4.3 Case study: ESG reporting digitalization for the Fashion Retail Industry

The project involved a Group operating in the fashion luxury industry for the redefinition of the reporting process, on two sides:

- Strengthen the sustainability strategy of the group, starting with the alignment of the ESG report with the GRI reporting standards and with the adoption of best practices.
- Adopt an IT tool, already used by the financial unit, to leverage the potentiality of an automated process, and ensure consistency and accuracy of the reporting process.

The project adopted an integrated approach, considering multidisciplinary teams. The LoS engaged has been the ESG one, in charge of the functional aspect of the project, and the Financial Transformation one, which managed the technical aspect of the implementation of the digital tool.

To provide a better understanding of the case object of this study, a brief overview of the client, the approach adopted for the delivery of the project and an introduction to the tool chosen for the implementation.

4.3.1 Presentation of the client

The luxury fashion group operates globally and manages two renowned brands of high-quality wear. The Group designs manufactures and distributes luxury wear for women, men, and children. Additionally, it produces leather accessories and footwear.

The Group recently has been traded on the New York Stock Exchange and presents strong revenue growth during the years, reaching in the previous fiscal year more than €1 milliard of turnover.

The Group is characterized by a long sustainability commitment, since its foundation. It has been engaged in activities oriented towards environment preservation, social welfare, and cultural development.

In its production, the Group started the adoption of used fabrics and recycled the ones used, to reduce waste production. For these projects, the Group has been renowned and results as one of the major fashion brands committed to reducing the environmental impact.

4.3.2 Presentation of the project

The client started during FY 2021 a redefinition of its disclosure management. The process of innovation began with the implementation of a digital tool for financial disclosure, followed by the adoption of the same tool for ESG disclosure. The objective of this implementation project has been to develop the potentialities of disclosure management and automated the process, increasing the credibility of the group's disclosed information.

Focusing on the sustainability project, the goal for the client was to redefine its reporting strategy, delivering value to stakeholders. The projects have been developed on three workstreams:

- The redefinition of the sustainability reporting strategy, performing a benchmark analysis with the principal competitors and integrating the most recent indicators.
- The implementation of a tool for supporting the data collection, consolidation and elaboration for the final sustainability report.
- The redefinition of the calculation for the emissions under Scope 1, Scope 2, and Scope 3, proving an internal operating manual.

For the purpose of the analysis, the digital implementation workstream will be considered, evidencing the work methodology, the implementation process and the final outcomes of the reporting process.

Generally, the implementation of a digital tool requires different consequential steps: Design, Built, UAT (User Acceptance Test) and Go Live. This approach adopted allows the client to better follow the progress of the project, reducing the resistance to change. Indeed, an articulated project which introduces disruptive technologies may cause clients concerns. Considering this view, PwC adopts the *Agile Method* for project delivery. The agile method is inspired by the *Agile Manifesto* published by Beck *et al.* in 2001, which sets four values and twelve principles elaborated by software development practitioners and identified the need for alternative project management, which was not relying anymore only on a documentation driver (PwC, 2017).

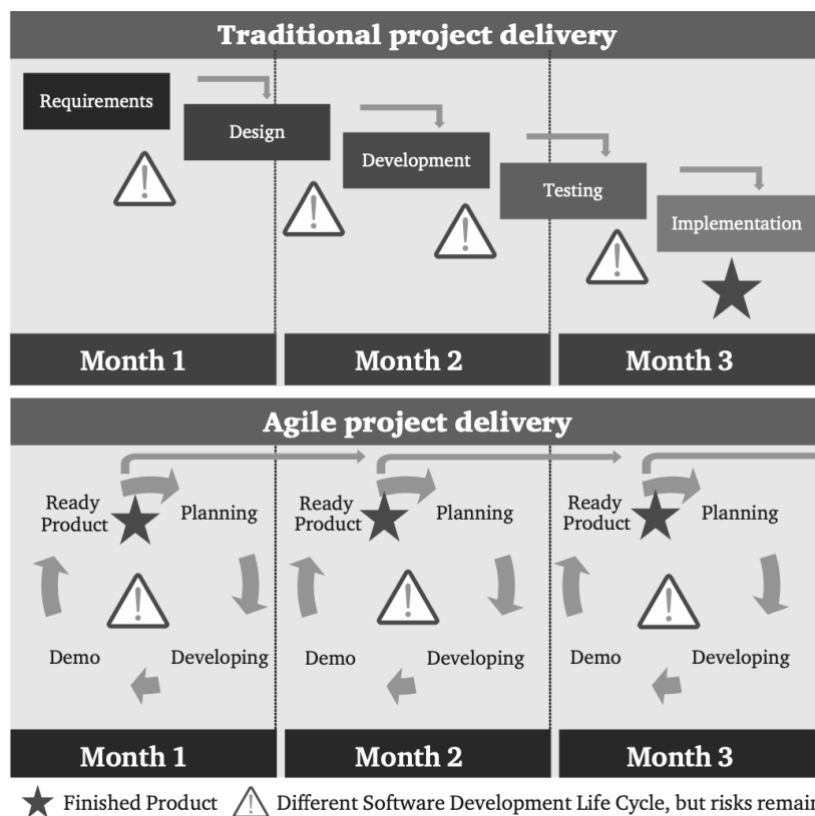
The values encourage considering first people over process, and adjusting plans to customer needs:

- Individuals and interaction over process and tools.
- Working on software over comprehensive documentation.

- Customer collaboration over contract negotiation.
- Responding to change over following a plan.

These values modified the traditional project delivery, requiring every single period to consider the definition of the requirements, the setting of the output, and the planning and interaction with the client to receive feedback.

Image I. *Traditional vs Agile view of project delivery*. Source: “*Agile Project Delivery Confidence*”, PwC (2017).



This approach has been adopted also in this case study, which allowed to control the milestones predefined, respect the implementation timelines, and integrate the client’s requirements.

The implementation of the reporting platform for the sustainability project has been managed in three phases, below reported.

1. *Analysis and design of the process.*

The first phase is oriented to the analysis of the actual process, identifying requirements, the data system in use and the people engaged. This allows to define which activities

are fundamental to optimising the disclosure management experience and to build the design of the solution for satisfying client needs.

This phase is also relevant for the alignment of the work plan with the other workstreams, to guarantee consistency and timeliness for the release.

2. *Set-up of the solution and implementation.*

The second phase involves the setting of the structure for elaborating the data, which depends on the digital solution chosen. In this case study, the setting activity regarded the data collection and the final report.

As in the first phase, the coordination with the other functional streams of the project is fundamental for the adaptation of the solution to new features.

3. *Connect data and solution release.*

The data elaborated are directly connected to the final report, to guarantee the constant update and coherence between the data collected and the data reported.

This phase is characterized by the “Go live” of the project, which implies the client’s use of the new technology. During this stage, the technical team still performs support activities to resolve eventual critical issues that may emerge or to handle requests for evolutionary activities.

The analysis will identify the stages necessary to perform every single step and provide the outcomes of the implementation.

4.3.3 Presentation of the digital tool implemented: Workiva

The tool implemented for responding to clients’ needs is Workiva. The US company has been established in 2008 as WebFillings, to change the way companies were elaborating their reports, releasing the first cloud solution in 2010. Today the platform is used by thousands of organizations, including over 85% of the Fortune 500.

Workiva offers a cloud technology which enables dynamic and connected reports, ensuring consistency. It allows collaboration among teams and provides an audit-ready platform.

The four milestones used by Workiva to describe the platform are:

- *Connect* data to where it is stored. This allows clients to connect the platform to their source systems, like Enterprise Resource Planning (ERPs), General Ledgers (GLs), Customer Relationship Management (CRM), Enterprise Performance Management

(EPM), Human Resource Management Systems (HRMS) or Human Capital Management (HCM) platforms and Governance, Risk, and Compliance (GRC), through open APIs².

- *Transform* the connected data in the *WData* platform, through the integration of queries. This allows to create specific datasets which can be combined to aggregate data. In this way, data resources are ready for the roll-forwards of the entire process.
- *Report* in the *WDesk* platform the elaborated data with connecting links, that through connectors allow to refresh data easily. This platform allows data collaboration, reporting and compliance of the processes.
- *Automate* the overall process, modelling it to respond to internal needs. The platforms allow automated roll-forwards process for all the documents included, like spreadsheets, documents, and dashboards.

Workiva platform offers diverse solutions for reporting management:

- Annual and Interim Financial reporting.
- ESEF Reporting.
- ESG Reporting.
- FERC Reporting.
- Management Reporting.
- Product Line and Business Unit Reporting.
- SEC Reporting.
- Tax reporting.

Additionally, the platform offers solutions for Governance, Risk, and Compliance, Internal Audit and Controls Management, XBRL tagging and other activities like calculation of transfer pricing, filling of initial public offerings, and management of transactions like mergers and acquisitions.

For every single solution, Workiva offers the client a *Workspace*, where it is possible to collaborate, store and elaborate data. Workspaces can be connected; therefore, data can be easily used for various purposes.

² Open APIs (Application Programming Interfaces) refer to a specific language which define structure and syntax not restricted to the programming language. In this way it can be used for other applications.

Focusing on the ESG solution, Workiva offers an ESG platform to manage sustainability reports, starting from the definition of the frameworks to use, to the collection and the elaboration of the data.

The solution offers different working files for ESG reporting:

- The ESG Explorer, where the customer can explore the ESG frameworks and the various standards in use.
- The ESG Program allows the organisation of the topics disclosed, collecting data, and aligning the metrics disclosed with the frameworks and standards of the ESG Explorer.
- A Data Collection template is used for collecting the data values that are automatically connected to the ESG Program.
- The ESG Factbook template relates to the ESG Program and enables the elaboration of the data collected for the final report.
- Final outputs are linked to ESG Factbook and can be updated for disclosing the right data values. This enables a dynamic flow for the reporting process.

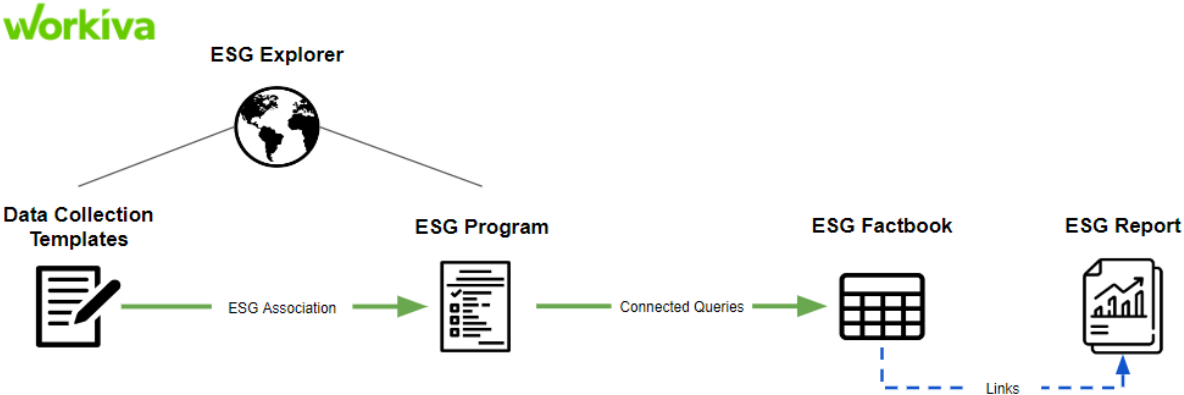
Below is reported graphically this working flows of the Workiva ESG Solution.

Additionally, the ESG Program allows the creation of tasks for the users of the platform, enabling collaboration and the creation of simultaneous processes.

The solution traces all these steps, proving an audit history which enhances and facilitates external assurance.

In light of the CSRD, the platform offers tagging functionality also for the ESG reports.

Image II. *The architecture of Workiva was used for the digitalization of the reporting of the Case Study. Personal elaboration.*



4.4 Interviews on the digitalization of sustainability reporting

A second way to collect data has been through interviews with the sustainability managers of PwC, and members of the ESG LoS. They were questioned on the actual trends in sustainability reporting and the relations of technology with sustainability reporting.

The following paragraph reports the methodology adopted for performing the interviews and in which way has been analyzed. A second paragraph reports knowledge of the IT systems in use for sustainable reporting, which may be referred to during the interviews.

4.4.1 Methodology adopted for the interviews

The interviews gave the opportunity to have a result on a larger sample. Indeed, by not lingering only on the case study, previously presented, the interviews gave the possibility to have a more heterogeneous view of current trends for sustainability reports and their digitization.

Participants have been questioned on their perceptions and work experiences, which may refer to PwC or other working contexts.

As reported by Al-Htaybat and von Alberti-Alhtaybat (2017), for defining a sample size it is important to identify an inclusion or exclusion criteria, for determining who can be considered or not for the study. In this case, the chosen criteria have been inclusive, therefore the sample includes participants with several experiences. This guarantees heterogeneity, which allows for finding commonalities across several responses, reflecting a more heterogeneous phenomenon (Strauss and Corbin, 1998). Indeed, it has enhanced a holistic data set which guarantees different viewpoints and knowledge for the analysis.

The sample chosen for interview participants has been based on sustainability professionals working within PwC, who are part of the ESG LoS, and who hold manager or senior manager roles. Six participants have been identified, which were selected for their experience in sustainability reporting projects, and particularly had several experiences with digital implementation. This allowed a comprehensive analysis, relying on the results of several project outcomes and a broader overview of the study.

Additionally, participants work with clients of diverse industries, for example industrial, fashion, food & beverage, and banking and assurance. This allowed to have more generalized responses and the determination of commonalities and differences across industries.

The different participants' backgrounds, such as internal control experience or audit roles, also allowed the analysis of the phenomenon under study in relation to other organizational functions of companies.

Table IX. *Overview of participants' roles and backgrounds. Personal elaboration.*

Interviewee	Position	Field of experience
1	Manager	Sustainability and Climate Change for different industries
2	Senior Manager	Sustainability and Climate Change for different industries Governance, risk, and compliance
3	Manager	Sustainable Finance
4	Manager	Sustainability and Climate Change for different industries
5	Manager	Sustainability and Climate Change for different industries
6	Senior Manager	Sustainability and Climate Change for different industries

Participants have been interviewed on the basis of a semi-structured questionnaire, which allows for analysis in each interview key aspects under study. The three topics explored with the interviewees are:

- The actual trend in sustainability reports for identifying key drivers for the digitization of the sustainability reporting process and the relative outcomes.
- The influence of the legislation, particularly the European Directive 2014/95 on Non-Financial Disclosure, for the choice of integrated digital systems for sustainable reporting.
- The identification of opportunities and adversities of the implementation of the new 2022/2464 European Corporate Sustainability Reporting Directive, in relation to the digitization of the reporting process.

Table X. *Questions for interviews. Personal elaboration.*

Questions
1. In your experience, what percentage would you quantify as the number of companies that have adopted IT solutions for non-financial reporting process? What characteristics do companies that invest in a digitization process have?
2. What are the main drivers that prompt companies to initiate a digitization project in the development of non-financial reporting? What are the targets pursued?
3. Relative to the various stages of the reporting process, which ones are most impacted by the integration of IT systems for sustainability reporting? On which do you highlight the greatest benefits?
4. In contrast to the previous question, what aspects do you consider most critical in a digitized reporting process?
5. In your experience, have you found that the adoption of IT systems has influenced and led companies to opt for integrated reports even before CSRD?

-
6. In your evidence, do you find that companies which have adopted an IT system for the reporting process have achieved greater credibility of the reported data, ensuring the traceability of the reporting process, and improving its accuracy and transparency?
 7. Do you think that companies that have adopted IT systems have overcome some of the regulatory gaps in the NFRD?
 8. Considering the reasons limiting digitization, do you think that the high fragmentation of frameworks and standards in sustainability reporting, has been a deterrent to the adoption of IT systems for the Reporting process?
 9. Considering the introduction of CSRD, what do you perceive to be the major difficulties encountered by companies in implementing the new regulations? Which among them could be overcome through IT systems integration?
 10. In terms of reporting process and quality of reports, do you think there will be a gap between companies that have already initiated sustainability reporting process and others not previously mandated?
 11. In your opinion, what do you think will be the impact of CSRD and technological evolution with respect to SMEs?
-

Questions have been rephrased in order to follow the conversation and give the opportunity to all participants to provide their perspectives. This enhances the credibility of the research method, indeed, “allowing the interviewees to express their opinions is an important element of qualitative research, as researchers want to extract interviewees’ perceptions rather than lead them to any preconceived conclusions” (Al-Htaybat and von Alberti-Alhtaybat, 2017).

Participants have been contacted via email and the interviews took place on Google Meet, in Italian language, and lasted between 45 and 90 minutes. They were fully recorded and transcript for improving the analysis.

Interviews were instrumental in analyzing the interactions between the sustainability trend and the digitization trend. Participants reported direct examples from their experiences, highlighting companies' perspectives. This allowed to understand the objectives pursued by the clients who undertake digitalization projects, what are the key factors driving the digitalization of sustainability and possible future developments.

4.4.2 Overview of the IT Systems in use for Sustainable Reporting

Different software has been developed to respond to sustainability needs. Particularly, the typologies of systems are as below divided:

- ESG Data Integration Software, which integrates the data collection and usually offers audit management functionalities.
- EHS management Software enhances a company’s compliance with Environment, Health, and Safety regulation.
- Sustainability Software allows for evaluating activities’ impacts on sustainability aspects.

- Environmental Software supports companies in the definition and measurement of environmental policies.
- Government Software automates financial and management activities.
- Reporting Software provides access to disclosed data and allows the creation of sustainability reports.

During the interviews, participants referred mainly to ESG solutions, which guarantee the collection of sustainability metrics and allow the elaboration of a final report. Most of the solutions mentioned enhance audit assurance, increasing the credibility of data. At the same time, software solutions are criticized for a lack of direct connection to other corporate systems used by other functions, like financial, human resources, risk and compliance.

Below are briefly reported some of the most used systems in the sustainability reporting field, which may have been used by participants for their answers.

Table XI. *Overview of ESG Reporting Software. Personal Elaboration.*

Software	Description
Tagetik	Offers an ESG solution: ESG & Sustainability Regulatory Reporting, which presents a pre-build solution for configuring data models, and pre-configuring reporting, which allows to have built-in calculations for the consolidation of data. The ESG & Sustainability Planning and Analysis allow the integration of financial and non-financial data. Tagetik is a cloud and web-based solution. Link to the website.
SAP	Offers an ESG solution, SAP Sustainability Control Tower. It offers the possibility to set targets and monitor the progress. SAP is a cloud and web-based solution. Link to the website.
Workiva	Offers an ESG solution, which allows the connection with other systems and applications. Through the ESG Explorer, the user can navigate the frameworks in use. It enhances the collaboration and the data collection process. It gives the possibility to connect the solution with other solutions (financial, risk, etc.). Workiva is a cloud and web-based solution. Link to the website.
Microsoft	Offers Microsoft Cloud for Sustainability, which allows to integrate data from other systems and analyze data within dashboards. Microsoft is a cloud and web-based solution. Link to the website.
Sphera	Offers different solutions for ESG: health & safety management, operational compliance, environmental accounting, and corporate sustainability. It allows to have a broader view of the sustainability of the company and collect all the data. Sphera is a cloud and web-based solution. It also offers a mobile version. Link to the website.
ESEGeo	Offers an ESG solution, which enhances user experience with an intuitive interface and allows connections with Excel to manage data sourcing. ESEGeo is a cloud-based solution. Link to the website.

These are only some of the digital solutions on the market. It is important to underline that as reported by participants, some companies may develop in-house software to respond to the sustainability issues of the company. Therefore, the analysis will not be focused on a specific tool but instead will be comprehensive and more extended on actual trends of corporate sustainability tools.

Chapter 5. Analysis of the findings related to the digitalization of sustainability reporting: drivers, benefits, and the interplay with European Regulation

The case of digitalization is an emerging aspect also for the sustainability reporting process. Participants indicate that client interest in this theme is increasing, particularly in light of CSRD implementation. However, indicatively the percentage of companies that have adopted digital solution stops around 20%, considering both voluntary and mandatory disclosure, and generally are recognized to be multinational corporations, or larger organizations which usually present higher attention to data management.

The following chapter reports the outcomes obtained from the case study and the interviews. This chapter highlights the drivers and necessary steps for digital implementation, the benefits and critical aspects of digitalized processes, and the interdependencies of European Regulation in the context of digitalization for sustainable reporting.

The first paragraph evidences the increasing demand for effective sustainable communication, which with the development of digital solutions has influenced companies in adopting digital solutions for the sustainability reporting process. The sections report the main drivers, in relation to the internal and external drivers and focus on the necessary steps for the implementation process, indicating the considerations that companies should undertake for a successful implementation.

The second paragraph evidences the benefits of digitalization in relation to the reporting process, improving data collection methodology, reducing time-consuming activities, and enhancing the decision-making process. Also, critical points have been reported, that should be considered for enhancing the digital reporting process. Deep analysis has been provided on the internal system of controls and how it could affect the sustainability reporting process. The last paragraph analyzes how the Non-Financial Reporting Directive, and the Corporate Sustainability Reporting Directive are shaping companies' practices. It also presents a deep study of the regulation related towards sustainable finance, highlighting that different regulations may shape the sustainability reporting process and influence the adoption of digital solutions. The section evidence also the interaction of technology with European regulation, identifying which have been the issues addressed by technology advancements.

The overall chapter sets the basis for the discussion of the results and the verification of the propositions defined.

5.1 Drivers and implementation process for the digitalization of non-financial disclosure

In light of digital implementation, a key aspect to consider is the drivers that prompt companies to adopt software, and therefore the desired outcomes, which are fundamental for the definition of the digital tool and the design of the desired solution.

5.1.1 Drivers of technology implementation

From the analysis of the response to the interviews, it emerges that the main reasons that push companies in implementing digital tools can be divided into internal drivers and external drivers.

In the first case, digital solutions respond to internal complexity. The objective generally pursued is the simplification of data collection, by:

- Providing a single system and commonly defined rules for entering and visualizing data.
- Defining systematic controls that verify if data has been correctly entered, therefore reducing the data imputation risk.
- Implementing a solid consolidation process, which enhances the robustness of calculation.
- Managing systematically the volume of data.
- Integrating data from other systems, allowing to collect values from the original sources, reducing manual elaboration.
- Enhance internal control by reducing the dispersion of data which is collected in a single data point.

For more advanced non-financial reporting entities, data visualization is another goal pursued. For example, the creation of dashboards, which are automatically updated with the data collected, enhances the performance evaluation regarding environmental projects undertaken or specific indicators disclosed.

For external pressures, market requirements recognized by several companies are:

- Guarantee an effective assurance control, which ensures data reliability and the reliability of the reporting process.
- Disclose the environmental strategy to align consumers and stakeholders.

It is important to underline that drivers differ by company, corporate strategy, and industry. Participants' experiences highlight that the organization's dimensions, in terms of extension and turnover, have a fundamental influence on the reporting strategy and the possibility of a digital implementation. Under these terms, the biggest companies or groups are the ones considered to be more propensity towards the adoption of a digital solution. Particularly, it has emerged that multi-site companies are the ones most interested in digitalizing their sustainability reporting process. In this case, the complexity is given by the collection of data, which results in fragmentation, and hampers the consolidation process.

Business with higher turnover levels presents a higher willingness to invest in digitalization project since the costs for these is limited compared to their investment opportunities. However, another lever to consider is the actual business experience in sustainable reporting. Companies which have already implemented a clear reporting process are more inclined to improve it with digital integration. However, some participants have identified a change in the trend, since some clients started with the digital implementation for developing simultaneously a reporting procedure.

Another factor that has considerable influence is the way in which companies integrate sustainability into their corporate strategy. Some companies mandated to disclose non-financial information may consider ESG reporting just as an obligation, therefore the main result detected in the reporting process is to be compliant. On the other side, some companies leverage sustainability disclosure as an opportunity to improve business strategies. This fits particularly suits companies in the financial industry, which are required to disclose information related to financial sustainability. Under this view, data is fundamental for strategic needs and reporting activity.

These considerations demonstrate that tool adoption and digitalization projects rely on different perspectives, which influence the goals pursued and the process of implementation. Companies that pursue only compliance with the regulation may opt for software, like ESG Data Integration Software previously presented, which integrates data collection templates and facilitate the collection process. On the other side, companies that consolidate financial and non-financial goals may have more specific demands and seek more elaborate software that fulfils their needs. Market trend registers an increase in these types of demand since new regulation is more stringent and requires the management of a vast amount of data. Under this view, the software selection verges on integrated digital solutions, which can be integrated with the other systems

in use by the business and guarantees a constant flow for the reporting process. Another key factor considered by companies is also the connection with the financial software in use. Several companies decide to adopt the financial tool also for sustainability reporting, or if not available, look for a sustainable system solution that interacts efficiently with the financial one. However, a common aspect pursued by the companies is the flexibility of the software to be customized for internal needs and at the same time to be able to respond to external pressures, for example by integrating new standards and facilitating compliance with regulation.

5.1.2 Identification of the steps necessary for sustainable digital solution implementation

A crucial point to define when implementing a digital solution is the data management and storage, therefore understanding who oversees the data and where it is collected. Defining these aspects is crucial for establishing clear structure ownership, ensuring data accuracy, guaranteeing data privacy, and enabling data integration and analysis.

The primary step pursued by an organization which defines its sustainability reporting process is the identification of reporting boundaries, therefore the definition of which sites, or companies should be included in the reporting perimeter and which data can be retrieved by the several entities included. This is fundamental to the identification of individuals involved in the process and therefore included in the implementation project, and to the definition of the data location, functional to the design setting of the solution.

Defining who manages data is fundamental for integrating users into the systems and at the same it can be leveraged by the company for establishing roles and responsibilities. This approach enables the adoption of systematical practices for standardizing the reporting process, providing requirements for validation and verification. Indeed, data ownership and responsibility settings enhance data governance. From a technical view of the implementation process, identifying the actors involved in the digitalization process allows to define training sections for showing solution functionalities. Particularly, it also enhances the UAT (User Acceptance Test) activity, which permits the verification of the digital structure implemented and its functionalities.

A crucial step for the implementation process, and propaedeutic to data storage management, is to define documents and information of interest. Only by identifying the needed data is possible to proceed with the allocation research. By defining where data is stored, it is possible to provide access to the designated professionals, which can be internal teams, auditors, or

consultants. At the same time data storage identification allows the integration of the systems during the project, which enhances data flow through different systems and guarantees consistency in data aggregation and elaboration. Considering this view, the perimeter of the company can effectively require specific aggregation and consolidation steps. For example, data can be aggregated by product lines, sites or locations, according to the data output design. An interdependent aspect of data management and storage is the definition of security procedures. When considering non-financial data, part of it can be related to sensitive information, therefore ensuring protection from unauthorized access or breaches is fundamental.

Previous identification of the necessary steps for a digital implementation process has been defined as the crucial ones for proper system integration and for improving the efficiency of the reporting process. However, the extensiveness of these activities depends on the purposes pursued. Companies that desire a more comprehensive reporting process, with the interaction of the internal systems in use and the sustainable digital solution, may investigate deeply existing technology infrastructure for defining properly the complex structured derived by the additional systems. At the same time, it is important to highlight that the definition of the interest data, its allocation and ownership, are requirements common to all the types of digitalization of reporting process and exercises that all companies should perform.

5.1.3 Insights from the case study: drivers and implementation process

The case study previously considered is useful for a view of the client's perspective and how implementing projects are managed.

Group's main drivers for the redefinition of the reporting strategy derived mainly from the external drivers:

- The alignment of the sustainable reporting with the new GRI standards released.
- The redefinition of the reporting strategy, following international best practices by performing benchmark analysis.
- The elaboration of a solid reporting process to share with stakeholders, creating and retaining value.

Considering these objectives, the Group decided the adoption of a sustainable system for leveraging the capabilities of an automated reporting process. The desired outcome has been to

guarantee the coherence of the sustainability reporting process and to define an accurate internal process of data collection and elaboration.

Considering participants' statements on the software's selection influence, the case study confirms that financial systems are often used also for sustainable reporting. The Group opted for the integration of Workiva, already implemented at a financial level, for leveraging the interconnection of the two solutions. Considering both processes, the Group has been engaged in a more comprehensive project, which enhances disclosure management on both sides, financial and non-financial disclosure.

Considering the implementation workstream, the project plan followed the steps previously stated:

1. Analysis and design of the process.
2. Set-up of the solution and implementation.
3. Connect data and solution release.

The first step required an effort from both sides of the client and PwC teams. During the design workshop, have been defined the following aspects:

- The group's subsidiaries are included in the data collection perimeter.
- The GRI indicators for which multi-site collection is needed and the consolidation process.
- List of internal individuals included in the collection process, identifying data providers (who insert the value of the data required) and data approvers (who approve the data inserted).
- The definition for which data collection forms were was necessary a control system.

In this phase, the focus of the technical team has been also to analyze the current process for defining the necessary developments for guaranteeing the outcomes pursued. Particularly, the Group shared the relevant documents for the collection of data related to the previous year and other data systems in use for mapping eventual integrations.

The outcome of this phase has been the delivery of the Solution Design Document (SDD) which illustrates to the client the design of the solution for responding to internal needs and requirements, resulting in useful also for the identification of eventual integration.

The second step regards the set-up of the solution. In the case of sustainable reporting, this phase is focused particularly on the implementation of the data collection structure. Templates

for data input have been created with the functional team, which supported the client to define which data is required for guaranteeing compliance with the considered standards. The integration of the forms has been followed by the definition of automated consolidation formulas and the provision of control systems.

In this phase the individuals indicated by the Group have been added to the platforms, creating for them a user account. A relevant aspect related has been the definition of permissions. Users have been given access only to the data collection templates for which were required to insert the value. On the technological level, users have been also engaged in training sections for enhancing collaboration on the platform. Additionally, considering the technology implemented, the technical team created a process system composed of tasks for each user, there has been indicated information for the inputting and deadline for the submission.

During this phase, also the structure of the reporting has been created to respond to the new requirements. For connecting data values through multiple documents, the technical team enabled the ESG Program of the Workiva solution, which allows getting the value for a particular indicator in several files.

The output of this phase has been the implementation of the relevant document on the platform and the starter kit for data collection and elaboration.

The third and final phase regarded the updated of the disclosed information, by integrating the collected data in the final report. Through the creation of hyperlinks, data reported in the various documents can be automatically updated in case of adjustments, particularly required by auditors.

The outcome for the client is the solution implemented and ready for the roll-forward to the next year.

Below the table summarize the various activities described. It is important to underline that the specific activities are modelled for responding to client needs and depend on the technology system chosen for the integration. However, a relevant aspect to highlight is the communalities of the steps necessary for the implementation and the action required according to participants for enhancing the sustainability reporting process. In fact, the development of practices concerning the world of sustainability is recent, so various levels of process structuring can be encountered. Some companies may have already well-defined the reporting perimeter of interest and the information to be collected and processed. However, for others, the process is still under development, and the adoption of technological systems may confront companies

with the challenge of more effectively defining a structure to support data collection and sustainable report elaboration. The starting point always revolves around defining what to report, who provides the data and where the data is contained. Only with these points in mind can sustainable reporting strategy and process be developed, for both simple and complex entities.

Table XII. *Phases for the digital implementation of the case study. Personal elaboration.*

Phase	Design	Activities	Deliverables
Analysis and design of the process	Define the design of the solution to respond to client issues and enhance the digital solution outcomes	<ul style="list-style-type: none"> • Define reporting perimeter • Select the data to disclose • Indicate data providers and data approvers • Analyze actual process • Analyze the system in use • Study the relevant documentation • Manage design workshops 	Solution Design Document and discussion with the Client
Set-up of the solution and implementation	Locates the files to be structured: <ul style="list-style-type: none"> • Data collection • ESG report 	<ul style="list-style-type: none"> • Create data collection forms • Insert consolidation formula • Set control points • Integrate and train users • Create permissions • Perform UAT • Develop tasks • Create ESG Program • Connect data value 	Document implemented and data collection available for starting the process
Connect data and solution release	Update qualitative and quantitative information for the final report	<ul style="list-style-type: none"> • Connect data though hyperlinks • Update content 	Dynamic report to publish and automated reporting process

5.2 Benefits and critical aspects of the digitalization of sustainability reporting process

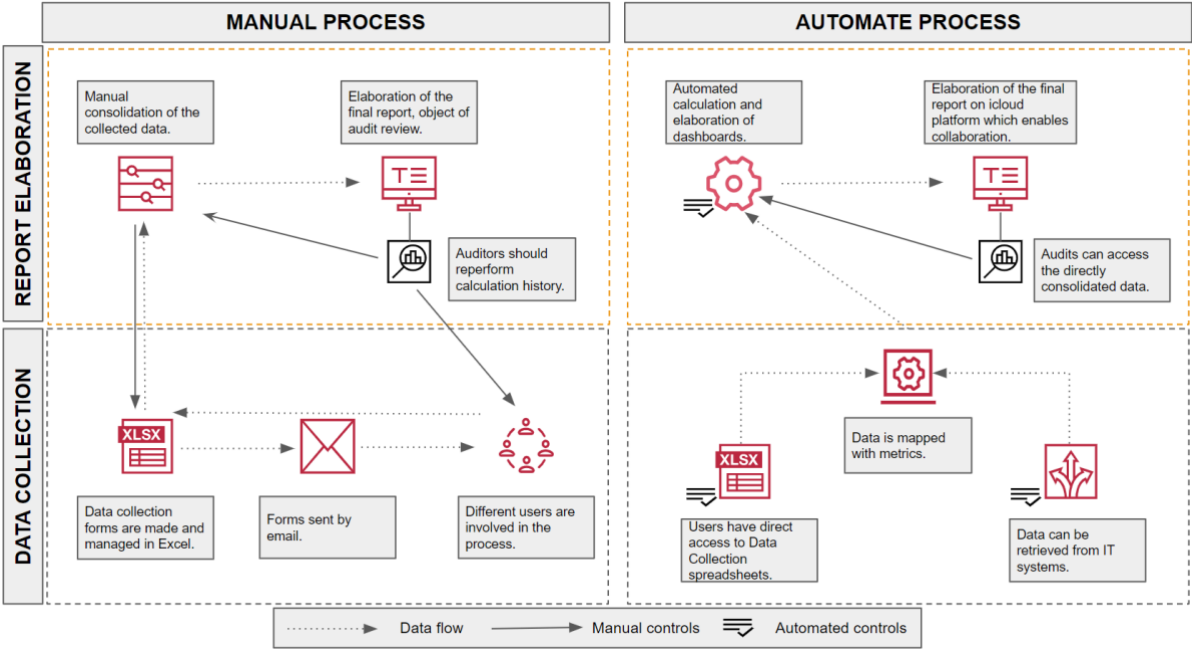
The digitalization of the sustainability reporting process has several benefits but at the same time, it involves critical aspects. The opportunities derived by a software implementation generally coincide with the drivers for digitalization previously explored. On the other hand, critical points are highlighted when initiating an implementation project and may derive mainly from the recent development of sustainable reporting practices.

5.2.1 Potentialities for technology implementation: evidence from the field and the case study

The implementation of the digital solution for the Group allowed to identify the potentialities achieved and the critical aspects to consider for improving the reporting process. In the image

below it is possible to identify the prior process and evidence of the evolution with the technology adoption.

Image III. *The evolution of the sustainability reporting process. Based on the case study, personal elaboration.*



Previously, the company sent data collection templates via e-mail to the various entities included in the reporting scope. However, this caused many interactions between users and the ESG functional unit. In fact, if the data was not complete or lacked evidence, it was necessary to recontact the person in charge. This process, therefore, caused data disparity and the need to retrace the background of the data collected at regular intervals to understand its nature and integrity. These prerogatives also impacted the data consolidation stage for the preparation of the final report. Therefore, during the elaboration of the sustainability report, it was necessary to update the data in case of corrections. This required numerous manual interventions and there was a risk of losing the granularity of the data and consistency with the information reported within the document.

However, this type of process, preceding the implementation of the digital platform, is not limited to the case study group. As pointed out by the interviewees, these procedures are common to many companies, whose main difficulty is understanding the articulation of the data collection process, starting from the data to be requested to the management involved and the data collected. The key counterpoint of this type of reporting system is the scarce efficiency of

the control system. Detecting an error can be more accidental than systematic, due to heterogeneity in the data storage. This reduces the quality of internal controls and increments time consumed since it results necessary to directly contact the interest individuals involved in the data collection for requiring adjustments or explanations. At the same time, auditors' practices result more laborious since it requires the analysis of numerous documents and the understanding of the complexity behind the data elaboration.

The result of the project is a more robust data collection process that allows for greater control. Workiva's platform has allowed the Group to work together within a single iCloud platform, which allows for the real-time refreshing of data. With respect to the process described above, users then interacted directly with the digital solution to enter the required data and were able to enter comments for asking explanations for the compilation. Instead of emails, individuals received tasks which were directly linked to the data collection templates and were reminded of the submission deadline. Proximately to the deadline, in case the task was not complete, the system sent a reminder for the task. This achievement allowed the sustainability team to reduce time in the verification of emails and the search for data collection forms. At the same time, the solution also allowed the direct uploading of attachments within the data collection template. The support material was thus no longer dispersed in the various emails but rather encapsulated in a single repository. The integration of the data collection' templates also settled the consolidation methods and automatic checkpoints were also defined to check the appropriateness of the data. This allowed for no need to retrace files shared via email and reduced the possibility of intercepting errors dictated by manual operations. For the data collection process, data and users resulted in the same platform, allowing the sustainability team greater control over the various stages of the reporting journey. Additionally, the needed financial data has been easily retrieved from the financial workspace available.

Moreover, the solution has facilitated the creation of a single document with the possibility of co-working and integrating the different users indicated for content updating and editing activities, reviewers, translators, consultants, and design agency workers. With an automatic refresh of data, the Group has been able to have a dynamic report.

A relevant aspect has been the definition of permissions, therefore the access settings for every single user for the documents accessible by them. This has been particularly important for guaranteeing the privacy of sensitive data.

The implementation of the platforms has also improved not only the internal controls but also the auditor assurance, by providing them access to all the files concerning the sustainability reporting process, reducing the complexity of overviewing several documents.

The result obtained allowed the Group to improve communication with stakeholders and the implementation of the digital solution enhances a solid and systematic data collection also for the following reporting years.

The above results are influenced by the capabilities of the solution selected, which in the case is Workiva. However, part of the case-study outcomes can be extended to retrieving the benefits of a digital integration project for sustainability reporting. As stated by the participants, the adoption of a digital solution facilitates the data collection, by standardizing the process. Under this aspect, the technology requires companies to improve a quality perspective in the reporting process. Indeed, it requires a clear definition of the responsibilities and how to collect properly data, all aspects that the company may define more confusingly before the adoption of a system. With this consideration, technology could enhance data management and may facilitate the possibility to use the data collected also for other strategical goals, distinct from the reporting process. Additionally, automatic updates of data values ensure consistency between the information disclosed, with a potential increase in the data quality. For more complex realities, digital solutions allow to connect all the systems in use by the company, for creating a solid technology architecture.

An aspect underlined by all the participants has been the greater robustness of the data thanks to the enhancement of the control processes, both internal and external. Internal auditors have begun to combine the control of financial processes with the control of sustainability-related processes to ensure a more holistic and inclusive internal control. At the same time, external assurance has been facilitated by the provision of a unique repository, enabling the verification of the calculation.

The capabilities reported have one constraint, which is the goal pursued by the company that determines the system to adopt and the process for implementation. More complex realities may look for all the insights highlighted; meanwhile, other companies may search for easier solutions that aim to simplify data collection. Effectively, more complex systems, like the ones connected to the other systems of the company, require elaborate implementations and a continuous adaptation to the new requirements, which requires specific technical skills. Therefore, a well-defined implementation process enhances reporting process, but the specific

benefits rely on the company's needs and results pursued. The table below reports the benefits identified in the analysis.

Table XIII. *Potential capabilities of software adoption for sustainable reporting. Personal elaboration.*

Theme	Opportunities
Data Collection	<ul style="list-style-type: none"> • Standardization of the process • Definition of the reporting perimeter • Users collaborate on the same platform • Possibility to insert attachments
Consolidation	<ul style="list-style-type: none"> • Automatic consolidation formulas • Set methodology consolidation (geographic, entities, etc.) • Dashboards for results visualization
Elaboration of the report	<ul style="list-style-type: none"> • Presence of different workers on the document file • Automatically update of data values • Coherence with information content
Data privacy	<ul style="list-style-type: none"> • Clear definition of the responsibilities • Management of permissions • Limit access to restricted data
Control	<ul style="list-style-type: none"> • Data storage on unique platform • Possibility to verify history of data collection • Reduce time for controlling activities

5.2.2 Critical aspects of technology implementation for sustainable reporting

Digital implementations set also challenges for companies. As for the possible capabilities, the critical aspects depend on several factors: the sustainable strategy of the company, the objectives pursued, and the software selected.

Considering the weaknesses noted by the participants, the criticalities of a digitized process can be divided into the various phases that characterize it:

- The decision to integrate a digital solution.
- The definition of the software to adopt.
- The settings of the implementation process.
- The post-implementation updates.

The process of digitalization starts with the decision of implementing software, which requires corporate to evaluate the cost opportunity of the project. The initial investment could represent an obstacle for companies, particularly for small realities. Generally, an implementation project requires also technical experts for the customization of the digital solution, a cost that is added to software licenses. Considering this view, part of the participants suggested that some

companies have started with the development of in-house software, even if the market trend highlights outsourcing.

Another aspect connected to the budget available for the digitalization project depends on corporate structures. Several companies do not have a sustainable structure, therefore sustainability relies on other divisions, like marketing or communication. This implies few resources available and in some cases minor attention to ESG issues, which restrict decision possibilities for improving the sustainable strategy. This bias is in a phase of reduction, mostly for the largest companies, which have identified the importance of non-financial information and are redefining their corporate structure.

When coming to the selection of the software, a key aspect considered by the companies is the flexibility of the systems to adapt to corporate needs and to a sustainable strategy. Some software in fact, after the implementation resulted in cumbersome, unadaptable to updates, and with unreliable automation, implying technical intervenes and manual corrections, which can increase the possibility to encounter errors. Considering in-house software, flexibility may be failed since the elevated customization may obstacle updates. In addition, flexibility can be considered under a geographical view, since not all systems work in all Countries, such as China, conditioning, therefore, the software selection.

Moreover, considering more complex realities, with an articulated sustainable reporting system, participants have evidenced difficulty to find systems that integrate effectively with the other systems of the corporate. A reason may be that only recently ESG reporting practices have been improved, and therefore technology still must be updated to respond to this demand. Another possible explanation is the heterogeneity in the nature of data, for example, information related to energy, emissions, water, waste, and human resources generally are stored in different systems and under various methodologies. Another crucial point of the actual digital solution is the scarce support for the materiality definition. Often this is set externally and only import within the software, which currently does not provide interfaces for its creation.

This last consideration on data heterogeneity is a critical point also for the implementation process. This implies different calculation methodologies for consolidating data, requiring adequate customization of the systems for obtaining the interested data. A related issue is the measure units, which differs for the various KPIs and implies tailored calculations to align data units with the ones required by the standards.

The identification of the individuals in charge of providing data, as previously highlighted as a key step to perform, can result in critical considering the not well-defined internal governance structure, specifically for multi-sites companies which may not have a clear view of the site structure. Another factor, depending on the sustainable strategy of the company, is the complex technology implementation, which connects all data and systems, and it is fundamental also to change corporate culture. Workers may be required to change their usual work practices and improve their technology skills.

The critical points of digitalization project design are related to the prior necessity to create a reporting process and then establish coherence with what is to be implemented. After having implemented the digital solution, the process may require to be updated for internal needs, a change in the reporting perimeter or in the materiality, or for integrating new regulation requirements. This aspect can be critical if considering a system with limited flexibility, which limits the reachable capabilities.

Considering the evidence from the case study, the most critical points emerged for the implementation process design. Data providers and data approvers changes required a long time for the definition and changed through the project time, requiring constant updates of the permissions. On the other hand, the unit measures have been created supporting templates that allowed the conversion. Another aspect has been the redefinition of data to disclose, therefore for some indicators, the reporting perimeter changed through the implementation.

Table XIV. *Critical aspects of digital adoption for sustainable reporting. Personal elaboration.*

Theme	Critical Aspects
Integrate a digital solution	<ul style="list-style-type: none"> • Initial investment • Technical skills • Corporate structure: sustainable division not present • Budget of the division in charge
Software selection	<ul style="list-style-type: none"> • The flexibility of the system • Possibility to integrate with other systems • Low support in materiality definition
Implementation process	<ul style="list-style-type: none"> • Elevated customization • The heterogeneity of data disclosed • Identification of individuals in charge • The strategy of the company • Change corporate culture
Post-implementation updates	<ul style="list-style-type: none"> • Update perimeter • Update permissions • Integrate new disclosure measures

5.2.3 Digital sustainability reporting process and control systems

During the interviews, particular attention has been indicated to the control systems in use for non-financial data. As previously stated, digital integration enhance the creation of controlling practices, which highlight errors or incomplete data. Under this view technology enhances the integrity of the collected data, providing systematic controls. At the same type, a critical aspect which does not rely on technological software is the control systems for non-financial data. Considering the external assurance, as explained, it is characterized by a limited approach, therefore the identification of errors is less probable compared to the reasonable assurance required for the financial information. A possible solution to external verification could be the enhancement of internal control. However, most of the total of the companies do not include non-financial data in the internal control systems, as indicated by the participants.

It has been suggested that an answer to this could be the implementation of an Internal Control System for Non-Financial Information (SCIINF). This process is not mandatory; however, it aims to develop consistent and high-quality non-financial data for shareholders and stakeholders. The objectives pursued are the simplification of the data flow, the coordination among the different functions and a clearer vision of the corporate sustainable strategy. Integrating a SCIINF relies on the application of the CoSO Framework, realized by the Committee of Sponsoring Organizations of the Treadway Commission, firstly to improve the quality of financial reporting enhancing corporate governance, ethical conduct, and efficient internal controls. In 2013 the framework has been updated to comprehend all types of reporting, internal, external, financial, and non-financial meanwhile recently, in March 2023, a specific guide related to ESG reporting has been published for fostering the relevance of sustainability information.

The CoSO framework establishes five groups of principles that should be followed for the definition of internal controls:

- Control environment, which relies on the factors that can shape workers' way of operating and sets a fundamental basis for the other components of internal control.
- Risk assessment requires activities for the identification of potential risks that could encounter the goals pursued by the company. Considering non-financial information, it results fundamental to consider risk also related to the non-financial reporting process.

- Control activities consist of a set of activities that perform internal control and enable management to identify the occurrence of a risk situation and manage it towards the company's objectives.
- Information and communication require a functional system that allows fluent communication among the management and the personnel for efficient operation. Considering sustainable teams, often lack adequate communication and employees involved may not know their role, affecting the data collection.
- Monitoring activities are involved to ensure the efficiency of processes and controls in operation. Contrary to financial reporting, non-financial information presents inadequate control activities.

Considering digital integration, the participant expert in GRC, suggests the integration of COBIT (Control Objectives for Information and related Technology) which provides guidelines for IT governance, specifically indicating the requirements for implementing and maintaining an adequate corporate IT system. As for CoSO, the framework's principles are organized in five topics:

- Evaluate, Direct and Monitor the IT strategies in relation to the goals pursued.
- Plan and Organize organization strategy and technology systems in support.
- Acquire and Implement technology solutions which should integrate organizational processes.
- Deliver, Service and Support IT services, guaranteeing security.
- Monitor and Evaluate IT tool's performance, providing internal control systems.

Considering an internal control system for non-financial data, all the above activities are functional and should respect the principles of CoSO, which are completeness of the non-financial data reported, the adequacy of disclosed non-financial information with the standards adopted, the correct imputation of data and its tracking, segregation functions which mean that several individuals are involved and perform their activities through the digital systems, if present, and finally the traceability and archiving of the activities and controls performed for future consultations.

Therefore, the integration of technology solutions is not sufficient for enhancing internal controls for non-financial information. It improves the creation of a reporting perimeter and eventually a gap analysis of the reporting process in use. However, for developing the control

and quality of data, non-financial data have to be integrated with the other available data of the company. The sustainable strategy should be conducted to the definition of systematic controls which are transversal to the various corporate functions, defined as Entity Level Control (ELC). Considering technology, all the activities regarding integration and maintenance should be the object of IT General Control (ITGC), for identifying the risk of malfunctions and evaluating the related risks. Considering only non-financial information, it is necessary to integrate specific controls that analyze the sustainability reporting process in its integrity, to prevent mistakes. These types of controls are indicated as Process Level Control (PLC).

Once these activities are implemented, it is important to monitor the effectiveness of the control procedures and report the results internally to all functions for the identification of eventual variations or improvements.

These considerations aim to improve the perception of non-financial information and aligned it at the same level as financial information. As suggested, the internal audit function that performs internal controls for financial processes, for which there is a mandatory requirement if the company is listed, should also begin to integrate processes related to sustainability information. In fact, monitoring activities are essential to ensure the sustainability reporting process in a holistic view of the company. The degree of intercession in risks is indeed high, considering even simply how non-financial data is collected once a year, while financial data has a more systematic and constant process throughout the year. Hence, improving internal control helps to achieve robust processes and improve corporate communication with external stakeholders.

5.3 Technology and European Regulation on sustainable reporting: analysis of the interdependencies

After a focus on the impacts of technology on the sustainability reporting process, the analysis keeps with the identification of the interconnections between technology and regulation. Particularly, the aim is to identify the impact of technology on compliance with sustainable regulation, and from the opposite view, verify if the European Regulation has limited or enhanced the adoption of digital solutions.

5.3.1 Non-Financial Reporting Directive and sustainable software

The literature analysis has identified the positive outcomes of the technology implementation, particularly in relation to the Non-Financial Reporting Directive, which has been discussed for lack of standardization, low data quality and the space left to managerial discretion.

These points have been discussed with the participants, for understanding their position on technology capabilities in overcoming normative gaps.

It has emerged that technology has made the reporting process more efficient but has not directly enabled the standardization of reports and reduction of discretion. In fact, the software has not influenced the adoption of a particular standard. Participants agreed with GRI's affirmation in the European context but did not acknowledge that this was due to the implementation of digital systems; it was more due to a competitive strategy since everyone was using it within the target market. Additionally, participants does not find evidence for the influence of technology over the standardization of disclosed information, and therefore the comparability among sustainable reports. The reasons behind this consideration are two:

- GRI standards allow relative freedom in defining how to report values for some KPIs.
- The flexibility of the software allows to adapt data collection templates for responding to the company's needs.

Therefore, the implementation of digital software did not standardize the type of data disclosed by the various companies, replicating heterogeneity rather than propelling toward homogeneity. The standardization capacity of digital software is therefore limited to the internal reporting process but does not overcome the complexity of the standards adopted.

However, a participant suggested that technology implementation may enhance the definition of a European Single Access Point (ESAP), which aim is to collect sustainable reports in digital format and aggregate data for analysis. The collecting system results now in a phase of definition, but the digitalization of reporting process may enhance its definition.

Changing perspective, the analysis with participants focused on the influence of the regulatory landscape over the digitalization of the sustainability reporting process. It has emerged that the NFRD has not been a crucial aspect for integrating digital systems, since the principal adoption criteria is based mainly on a cost-opportunity analysis. On the other hand, participants reported dissenting views with respect to the fragmentation of legislation, considering the various updates and the not well-defined data to report, and the consequent limitation of the adoption

of digital solutions. Part of them agreed with the limit meanwhile others identify a poor definition of the internal sustainable reporting strategy, which constrained the digital evolution of the reporting process.

Considering the type of non-financial reports, sustainability reports or integrated reports, participants' experiences highlighted that technology has not facilitated the adoption of integrated reports, mainly for the complexity of interacting financial and non-financial data in the same reporting process. Recently, in the vision of the CSRD introduction, companies started to require information about integrated reports and started to adapt their reporting process. Always under the legislation evolution, the introduction of XBRL tagging may push companies towards the adoption of digital solutions.

Overall, no considerable influence of the directive of non-financial disclosure on the adoption of technological systems has emerged. However, participants did report other regulations that have had a considerable impact instead and have pushed companies more toward digitally integrating their reporting process.

5.3.2 European Regulation and its influence over digital systems adoption: the EU Taxonomy and Sustainable Finance

Another very important legislative path, which has developed in parallel with European regulations on sustainable reporting, is that on sustainable finance. Indeed, finance has also begun to consider sustainability factors related to capital, investments, and portfolios, thus playing a key role in the transition to a more sustainable economy. Under the view of this market trend, the demand for better regulation for sustainable investment products has increased. In 2016 the European Commission created the High-Level Expert Group on sustainable finance (HLEG), which settled a set of recommendations implemented in the Action Plan adopted by the European Commission in 2018. The Action Plan's goal is to connect finance and sustainability, and it proposes a series of strategies that can be represented under three categories (European Commission, 2021):

- Reorienting capital flows towards a more sustainable economy.
- Mainstreaming sustainability into risk management.
- Fostering transparency and long termism.

The package also presents a series of actions for integrating the above measures, for facilitating the definition of sustainable activities and for disclosing the necessary information to investors, to enhance investment decisions.

The instruments given by the European Commission for developing sustainable investments solution are the EU Taxonomy and EU Green Bond Standard, which is still in the face definition and has been published only as a proposal.

The EU Taxonomy (European Union, 2020) has been adopted in 2020 and presents a classification of economic activities in relation to environmental sustainability. Therefore, the classification helps companies, investors, and policymakers in the evaluation of a company's sustainable performance, in relation to business activities.

The objectives considered by the regulation are (European Union, 2020):

- Climate change mitigation.
- Climate change adaptation.
- Sustainable use and protection of water and marine resources.
- Transition to a circular economy.
- Pollution prevention and control.
- Protection and restoration of biodiversity and ecosystems.

In 2021 has been released the first delegated act on the activities to consider in relation to climate change mitigation and adaptation, which has been applied for the first time in 2022. In order to identify if the actions selected for a company are effectively aligned with the EU Taxonomy, the standards also set a list of conditions for the evaluation (European Union, 2020):

- Making a substantial contribution is one of the objectives mentioned, therefore it creates a positive impact on the environment or reduces the negative impacts.
- Do not do significant harm to other objectives, therefore, do not preclude other environmental goals.
- Complying with minimum social safeguards.
- Complying with the technical screening criteria.

The EU taxonomy applies to all companies already object to the NFRD, and to financial market participants that trade financial products in the European Borders. These actors are required to disclose to which extent a company's activities comply with the regulation. Companies are required to provide the requested information in relation to specific KPIs, which are "green" revenues, capital expenditures, and operational expenditures. Especially, financial institutions will report to which extent their financial products are aligned with the EU Taxonomy criteria, following the same KPIs.

The consolidation of this information, which is represented by financial and non-financial data, requires particular effort for the inherent complexity. Therefore, participants indicate that the EU Taxonomy Regulation represent a relevant driver for the adoption of software, which facilitates data storage and elaboration in a unique repository. This consideration finds already relevance since several clients are requiring this type of support from consultants and software developers.

Considering the financial field, European Taxonomy relies on the European Package of Sustainable Finance for enhancing the transition towards a sustainable economy. Starting from the instrument of EU Taxonomy, the package offers disclosure indication, which comprehends:

- CSRD, however, is applied also to non-financial companies.
- Climate benchmark regulation, entered into application in 2020, which provides technical requirements for increasing transparency in the comparison of financial products easier.
- The Sustainable Finance Disclosure Regulation (SFDR), adopted in 2019, defines a set of rules for reducing greenwashing and enhancing sustainable finance. Particularly, requires financial advisers to disclose the sustainable risk linked to investment processes or financial products. At the same time is demanded to report the possible adverse impacts of an entity and its financial products level in relation to ESG matters. The aim is to clearly identify the sustainability of an investment.

This in-depth analysis indicates that the number of legislative pressures for financial companies results higher compared to other industries. According to the participant with sustainable finance experience, these forces may have prompted the adoption of digital software for enhancing the elaboration of a vast amount of data, required by sustainable finance standards or additional disclosure regulations.

This consideration can be extended, and therefore, when analyzing the impacts of European regulation on the adoption of sustainable reporting technologies, it is necessary to understand the regulatory complexity of the sector or activity involved and that therefore pressures may originate from multiple factors.

5.3.3 Future developments under the CSRD application and technology role

Considering the evolution of the reporting regulation, companies may identify opportunities or counterpoints for the CSRD application. The new Directive introduces a more holistic view of

sustainability, requiring as already stated the disclosure of the sustainable strategy, indicating the target settled and their progress and the sustainable risk correlated to the business. The Directive focuses particularly on the supply chain, requiring companies to identify positive or negative impacts starting with suppliers, and including its commercial relationships. Other new aspects are the introduction of mandatory standards, the integration of non-financial information within the management report and the extension of limited assurance to all sustainability reports.

These novelties require particular effort from companies for improving their compliance. The intersection of financial and non-financial data will require aligning a sustainable report timeline with the deadlines of the financial report, implying a change also in the data collection period. In fact, some companies have already started to develop more timely data collection on a quarterly or semiannual basis, thus ensuring better detection of possible errors and enhancing control. The control system becomes even more central, as it is necessary to identify errors arising from the two natures of the reported data. This complexity will have an impact, as already anticipated, on the company structure, since it requires additional functions working on sustainability and the inherent emerging fields, affecting also corporate culture. Additionally, the already existing functions, like risk management, financial, and human resources, will start to operate under sustainable principles. Under this view, it is important also to consider improving the competencies of the individuals included.

Some aspects, on the other hand, are still undefined, such as the ESRS standards and thus their level of detail, and how the directive will be transposed at the national level. As has already been analyzed for NFRD, the directive may have different impacts depending on the specificities introduced by the national regulator.

Considering these novelties and implications, every single company will define the approach for adapting to this change. However, impacts may take two directions: improve and evolve the company's sustainable business strategy in advance of the new regulation or act passively with respect to the upcoming obligation by not taking advantage of possible synergies.

With this perspective and highlighting the increased number of companies in scope, participants have confirmed the possibility of an emerging gap between companies that were disclosing non-financial reports before the CSRD and the starting ones. The gap will develop mainly on the quality of data since companies without experience must start from the first steps identified, particularly with the definition of the reporting perimeter, and reach the disclosure of

heterogeneous content. Participants suggested that difficulties will not necessarily affect companies that are not obligated, as some customers have already begun to mobilize on a voluntary basis, but instead, the ones that are not starting with a minimum definition of their reporting strategy.

The consequent theme is technology. Companies that have already adopted a digital solution with a high probability will keep working with the same system. On the other hand, other companies will be pushed by the complexity of the new Directive, the increased amount of data the requirement of XBRL tagging, to adopt a system that supports their reporting process needs. Software houses are therefore required to develop systems able to integrate the new regulation requirements and facilitate the reporting. An additional suggestion indicates that software houses should offer different packages that respond to the various needs, starting from the more simply and comprehending the most articulated. A key aspect that the technological solutions should offer is the integration with other systems, which will become fundamental now for managing the complexity. Considering the flexibility of the integrated solution, a participant indicated that the gap could assume an opposite direction. If companies have already implemented software, which however presents low flexibility, a great effort is required for its updating. Opposite, companies that do not have a system will define from the group-level software design and may reach a higher performance level.

Increasing the reporting scope, the CSRD requires also Small and Medium Enterprises (SMEs) to disclose non-financial information. Considering the limited investment power and the less structural organization, participants agree upon larger impacts on these realities. Generally smaller companies do not have a sustainability function; therefore, it will result complicated to define who oversees sustainable data. Moreover, identifying the data to disclose and its location may represent another counterpoint, as these realities generally have a limited system architecture. Considering digital solutions in fact, participants suggested the use of simple software which have to provide support for the definition of the materiality, integration of basic data collection templates and enhance collaboration. The software selection could verge toward cheaper software, or if present could extend the applications in use for the financial or production process.

The outcomes for SMEs are still undefined and are influenced by the sector of the company. In case the company operates in more sustainability-conscious sectors, such as luxury or automotive or in a sector with higher competition, it will be more influenced in the development

of sustainability practices. On the other hand, SMEs that operate in restricted market niches, may not feel the need to adopt effective sustainability strategies.

Concluding, the prerogatives for SMEs and larger companies differ, but at the same time also the expectation. Larger entities will be critically evaluated on the quality of their reports meanwhile for smaller realities more consideration will be given to their proactiveness. This is reflected also in the reporting process and therefore the software selection. Larger companies may search for simplification and rationalization within systems while SMEs will seek easier and more flexible user visualization.

Chapter 6. Discussion of the results: bridging theory and practices of digitalization in sustainable reporting

This chapter delves into a comprehensive analysis of the findings previously reported, in relation to the digitalization of sustainable corporate reporting. The current study has investigated drivers, steps, benefits, and critical points of technology adoption for a sustainability reporting process, exploring the intricate interdependencies between European Regulation and technology.

To provide a comprehensive discussion, this chapter synthesizes the insights of the literature review performed in the first part of the thesis, trying to identify common statements and highlighting misalignments with the empirical findings. With this approach, the aim is to discuss and verify the research propositions identified.

Ultimately, this chapter seeks to contribute to the existing body of knowledge by offering insights into the implementation process, benefits and regulatory dynamics surrounding the digitization of the sustainability reporting process. Companies, by grasping these aspects, can harness technology for sustainable strategy, enhance the corporate reporting process, align with the regulation, and unlock all the potentialities of sustainable digital communication.

6.1 Proposition 1: Technology implementation requires a well-defined implementation process

The analysis of the first proposition enabled the identification of the major drivers that lead companies to implement technology systems to fulfil their sustainability reporting needs. The main aspect that leverages digitization is the management of internal complexity, which also dictates the basis for software selection and implementation design. On the other side, drivers considered linked to the external drivers are in favour of the stakeholder theory (Farvaque *et al.*, 2011; Camilleri, 2019; Singhanian and Saini, 2021; Pigatto *et al.*, 2022) and the legitimacy theories (Tilling, 2004; Lokuwaduge and Heenetigala, 2016). Companies pursue is to increase transparency and data accessibility, improving stakeholder engagement strategies.

When coming to the definition of the propaedeutic steps, prior literature has only focused on the general steps of an implementation project. The analysis has evidenced key points to consider for an efficient technology implementation:

- Definition of the reporting boundaries.

- Data management, therefore, definition of data owners.
- Data storage, which requires the definition of where data is collected.

These considerations find valid relevance in respect of the case study, which also enhanced the identification of the key steps for digital implementation. The primary activity is to analyze current process and their peculiarities, in order to assess the gaps within the digital process. The second phase is focused on the implementation, and mostly on the data collection for sustainable reporting. This step is characterized by the automation of the principal activities usually manually performed, like elaboration or consolidation of data. The last stage is the verification of the performance of the digital solution implemented. The extent of these steps depends on the business needs, so the activities, while not interchangeable, may be shorter or more structured depending on the objectives defined for the reporting process

Considering this view, the analysis has identified levers that have more impact on the design of the implementation process. The most mentioned one is the size of the company, therefore larger companies or multi-side companies are the ones considered most propensity to technology adoption by the interviewees. These realities require an elaborated data collection process; therefore, the implementation step results the most crucial. These findings agree with the study of Müller *et al.* (2018), which evidence also that larger companies have strategies focused more on the long-term.

This introduces another aspect strongly mentioned by the participants, which is the influence of sustainable strategy. More developed strategies have clearly identified process issues and therefore have greater knowledge of their own potential and goals. These realities are divergent from those that see sustainability with a regulatory constraint, so in the latter case, it is possible that the implementation serves to better manage the amount of data but, at the same time, not taking a broader view could also limit the exploitation of technological potential.

From a technical point of view, software selection also has a major impact on the definition of the process implementation. Particularly, integrated solutions may require additional time in the design of desired technology architecture and its implementation.

Another point that emerged from the case study is the need for technical skills to implement. According to Mishra and Pani (2021), companies have to understand who is going to implement

the new technology. The choice is between outsourcing professionals for the implementation or outsourcing skills for internal development.

Considering these preconditions, the first proposition highlights the crucial role of the implementation process definition for technology successful adoption and integration within organizations. A well-defined implementation process sets the necessary steps, tasks, and milestones. The control through the process is guaranteed by the definition of an incremental approach, which assesses, evaluates, configures, and tests the solution desired. The additional analysis contribution is the identification of the most critical steps to perform for enhancing technology implementation and the major influence levers, which shape the system integration process. However, companies should invest time and effort in developing and following well-defined implementation processes. This provides a structured framework that enhances to manage internal complexities in relation to external stakeholder, providing a base for realizing the full potential of technology and pursuing the defined objectives.

6.2 Proposition 2: Well-defined technology implementation projects enhance the sustainability reporting process

The investigation of technology impacts on the sustainability reporting process has allowed to identify the peculiarities of the prior manual process, the benefits of automation but also the relative counterpoints.

The sustainability reporting process prior to technology implementation required a great amount of manual rework, resulting in fragmentation, especially in the highlight of control activities, audit assurance and the definition of data collection reporting boundaries. As previous stated this type of process is common to many realities, however, participants suggest smaller entities may not find these counterpoints as extended they can result in larger companies.

In light of the case study and participants' opinions, well-defined implementation projects can have positive impacts on the sustainability reporting process within organizations. Technology can enhance data collection and data management, by managing information and people on the same platforms and defining processes, controls, and responsibilities. This may reduce the risk of errors and enhance data integrity. Another aspect enriched by technology is data analysis through the possibility to automate the consolidation process, establishing formulas for the analysis of trends and integrating dashboards for better data visualization. These aspects are

linked to meaningful reports that provide stakeholders with more credible and useful data. These considerations are aligned with the previous ones investigated for financial reporting, which indicated that technology enhanced the communication towards stakeholders, who require a more holistic view of the company, implying an increase in the amount and heterogeneity of data to analyze (Burritt and Christ, 2016; Lodhia and Stone, 2017).

Consistent with the findings of Vărzaru (2022), technology solutions usually support the most common framework in use, such as the GRI and SASB, and this helps in the definition of the KPIs to disclose by mapping and aligning the metrics.

Another positive impact is the improvement of the collaboration and coordination inside the company between the departments involved. This gives the possibility to update data in real-time, enhancing its reliability. This vision is in line with the reduction of information asymmetries that may emerge with the disclosure of fragmented data (Al-Htaybata and von Alberti-Alhtaybat, 2013 and 2017; Lombardi and Secundo, 2020).

Usually, data privacy protection is already implemented in digital systems through pre-set capabilities that can be tailored as needed. In the case study in particular, and as mentioned by some interviewees, software allows for establishing access to the most sensitive data and having a more centralized view of privacy concerns. However, the research did not focus on analyzing the necessary steps provided by the General Data Protection Regulation (GDPR) (European Union, 2016) to define privacy management, but limited itself to understanding the potentialities of digital implementation.

Considering the accountants' role, findings are coherent with the trend previously explored. Technology systems offer the possibility to be used as a single repository, allowing accountants to easily gather data. On the other hand, this evolution requires auditors to develop technology skills (Bhimani and Willcocks, 2014; Chong *et al.*, 2022). In light of this consideration, a participant suggested that a possible counterpoint for auditors may be more the process of understanding how a system works for verifying data consistency and integrity. Indeed, this is in line with ACCA's (2018) opinion that identify as a critical point the rapid update of technology, which requires a constant revision of technological skills.

The analysis has also enhanced the identification of the most critical points of an implementation process. As reported by Bhimani and Willcock (2014), technology implementation has an impact on the cost structure of the company. However, participants indicate this consideration mostly depended on the company's size, in terms of turnover, since

larger companies have a different cost-opportunity assessment. As previously reported another aspect to consider is the cost of implementation, in addition to the cost of the systems. An additional point stated in relation to the cost structure, not evidenced in the literature review, is the organization structure of the company. Interviewees suggest that when a company does not have a sustainable function, the budget may be more limited in modelling strategy definition and technology implementation.

Considering the software selection, participants are in line with the findings of Burritt and Christ (2016), which indicate the need for sophisticated technology for collecting and analysing interconnections between financial and non-financial information. Particularly, interviewees pointed out this vision for bigger companies in the light of the CSRD implementation. The analysis allowed also underlines that flexibility is the most important aspect to consider in the software selection, which should adapt to corporate needs and meet sustainable strategy goals. Within the implementation process, this study highlights additional critical points not explored by the existing literature. Data elaboration can require several calculations and the structure complexity of a company may complicate the design of the solution. Also, the materiality definition is not enhanced particularly by the system integration, leaving this step to be pursued out of the system. Contrarily to Miglionico (2022), participants suggest that even if technology enables the standardization of reporting process, does not limit managerial discretion since sustainable frameworks leave space for defining how to report data and generally digital platforms are modelled to respond to internal needs.

Focusing on the post-implementation, the interviewees' opinion is in line with the outcomes of Bonilla *et al.*, (2018), which highlight the need for constant updates for the technology implementation for companies to continue to exploit the full potential of the integrated system. This requires therefore the definition and preparation of all workers involved in the process and the evaluation of the cost of maintaining the software.

Under this consideration, the analysis highlighted that well-defined technology implementation enhances the standardization of the reporting process, improving data collection and management. Technology implementation allows a clear definition of the workflows, strengthening companies reporting practices. The analysis has also evidenced the counterpoint of technology implementation, which indicate that systems will have to satisfy increasingly demanding requirements, and companies should enhance their strategic sustainability definition.

This last consideration leaves space for the essential consideration of the broader impacts of technology implementation within organization boundaries. While technology can streamline the sustainability reporting process, as suggested by participants, its overall impact may be limited by the strategic approach and control models adopted for the management of ESG themes.

In fact, a strategic definition of the organization's goals and values of sustainable reporting provides the foundation for technology implementation, guiding the selection of appropriate tools and the design of the systems, ensuring alignment with the organization's sustainable needs. In relation to the sustainable strategy, interviewees suggested the fundamental need of companies for the definition of an appropriate control process. Technology can support control activities, such as data verification and validation but the effectiveness of these controls ultimately depends on the design of the control model. In light of this, a participant suggest the implementation of an Internal Control System for Non-Financial Information (SCIINF) for verifying the completeness and adequacy of disclosed non-financial information and the correct imputation of data and its tracking. The voluntary adoption of a control model for non-financial information ensures the same level of meaningful financial data and leads the various business functions to work under sustainability principles.

The final suggestion for companies is to focus on developing a comprehensive and integrated approach to sustainability, where technology is viewed as an enabler rather than the sole driver of sustainable reporting issues. Only with the adoption of a holistic approach, an organization can enhance the consideration of sustainability opportunities and risks for organizational visions, allowing sustainable data to be investigated also in a looking forward perspective and can ensure accuracy, credibility, and transparency of their sustainability reporting efforts.

6.3 Proposition 3: The interaction between sustainability regulation and digitalization: technology supports compliance with the European Regulation on non-financial disclosure

Building on the elaboration of the previous propositions, the analysis subsequently focuses on testing interactions between technology and European regulation for non-financial disclosure. The goal is to define the interdependencies between technology and European regulation by analyzing how reporting standards and formats are evolved.

Considering the Non-Financial Reporting Directive, participants have not found a direct influence over technology adoption. Digital implementations are in fact more influenced by a

strategic view of the company and the need for managing complex internal organization structures. Under this view, the principal drivers of technology implementation remain to the ones previously discussed, meanwhile the NFRD is more crucial during the implementation phase for the definition of the solution design to collect data in a proper way, which results compliant with the regulation. On the other side, interviewees have been questioned if the fragmented requirements of the NFRD and the lack of a definition of a unique standard have limited the adoption of digital systems for sustainable reporting, finding not consistent evidence and discording with Brown *et al.* (2009) results.

Changing perspective, the impact of technology has been discussed in relation to reporting practices and regulations. The effectiveness of the NFRD has been questioned in relation to a lack of a proper definition of the standard to use, ineffective limiting of managerial discretion, a poor definition of materiality assessment, and unclear assurance, which led to the failure to achieve the goals of improving communication to stakeholders, increasing data quality and comparability of reports (European Commission, 2020). Even if technology, as previously evidenced, has improved the internal reporting process, this result cannot be extended to regulation influence. Considering the affirmation of GRI, participants do not attribute this to technology implementation, but mostly to a market best practice developed during the years in Europe, in accordance with Buhr *et al.* (2014) and La Torre *et al.* (2018) evidence. Taking under focus management discretion, as before suggested, technology is not recognized has a limit to deciding what and how to disclose, therefore this statement is in line with La Torre *et al.* (2018) and Papa *et al.* (2022), studies that criticized the NFRD in the light of harmonization of non-financial disclosure. This limit is emphasized by the state-specific requirements (Accountancy Europe, 2017), that differ and cannot be overcome by system adoption. Additionally, participants did not evidence of technology influence over the adoption of integrated reports, indicating that the major influence relies on corporate strategy.

Concluding, technology has enhanced the development of disclosing practices and the standardization of the sustainability reporting process in line with the NFRD, but at the same time, it has been a replicator of the heterogeneity presents in the regulation environment.

Additionally, an interesting point of view added by participants indicates that other regulations instead of the NFRD may influenced the adoption of digital tools for improving data management and accuracy. This is particularly the case of financial sectors, for which sustainability has become relevant for portfolio evaluation and business decisions in line with

the development of a sustainable economy. Thus, both for financial and non-financial sectors, participants indicated the EU Taxonomy Regulation (European Union, 2020) as a driver toward technology adoption to manage corporate sustainability. These statements indicate that the influence of regulation depends on the company's industry and thus in the case of the presence of more stringent rules. At the same time, technology adoption for sustainability reporting can be driven by other laws not directly belonging to the non-financial reporting regulation landscape.

In view of the emerging implementation of the CSRD, the analysis has focused on the possible scenario. Interviews have highlighted, in accordance with the previous investigation, that the more impacting points are the disclosure of financial and non-financial information, the assessment of financial and impact materiality, and the evaluation of sustainability risk. In response to these counterpoints, this study gives insight into starting quarterly data collections through the fiscal year, guaranteeing a more systematic control. Indeed, control systems become even more crucial with the new directive and will have a central role in the verification of financial and non-financial information disclosure. Once more, the central point highlighted by participants is the role of strategy, which will determine the effectiveness of sustainable communication. Considering CSRD it is possible to suppose that it will increment the adoption of technology systems for fostering the management of the increased required KPIs by the ESRS and manage the two data natures, financial and non-financial. At the same time, technology can be directly promoted by the XRBL requirement. Technology in this view is required to respond to this complexity and to develop appropriate solutions for enhancing the sustainability reporting process.

Another key point that emerged for the CSRD is the influence of size and sector on the regulation application and technology enablement. If the NFRD participants have highlighted that companies' size has more influence over the sustainability reporting process and technology adoption, in the light of the new directive this differs since the impact will be different on SMEs and larger realities and in the various sectors. Smaller companies have been indicated by participants as the most affected by the regulation, of its reduced corporate structure, which usually does not present sustainability roles. Moreover, in this reality, the sector will affect companies to pursue better sustainable strategies in the case of high competition, or a more compliant strategy if they are in a niche. Considering systems adoption, for these realities it is supposed that the software house will simply propose solutions for the data

collection and elaboration based on the requirements. The companies' sector will have a consistent impact also on bigger companies since the future integration of the ESRS standards with specific sector standards.

Concluding, the analysis asserts that the interaction between sustainability regulation and digitalization shows that technology is modelled to support compliance with the NFRD, and it will be demanded to respond towards CSRD requirements. Although NFRD has not resulted explicitly as a driver for technology implementation, it has been relevant in shaping the organization's approach to sustainable reporting. On the other side, CSRD will likely lead to an increase in the adoption of technology reporting practices, however, the outcomes of the implementation will be influenced by company size and sector.

Overall, technology offers valuable support in data collection, analysis, and reporting, improving data quality and enhancing compliance. However, for an organization, it is crucial to assess the specific requirements to disclose and leverage the use of technology for improving the effectiveness of corporate sustainability reporting.

Conclusion

This thesis provides a study of sustainable reporting evolution, starting from the initial demands for sustainable information and a more holistic view of the company, analyzing the introduction of mandatory disclosure and setting down possible development of technology trends and sustainability reporting. The final aim is to identify in which way technology has impacted the sustainability reporting process and compliance with the regulation.

The literature review has enhanced the identification of the theories behind the initial voluntary disclosure trend of ESG topics. The principal aim of companies was to disclose information for reducing agency problems under the stakeholder theory view, gaining legitimacy and enabling the stewardship theory for directing stakeholders' needs towards sustainability matters. Considering the increasing governance body of sustainability, also institutional theory becomes relevant. These considerations can be extended also to companies that nowadays are not in the scope of the European Regulation but are engaged in the elaboration of non-financial disclosure for enhancing their communication with stakeholders in light of the CSRD implementation. With the development of the sustainability trend, the need for guidelines and regulation increased, and private institutions started to set the principal standards frameworks, like GRI, SASB, IRRC, TCFD and the CDP questionnaire. Increasing concerns of investors on non-financial information have been considered by the European Commission, which over the years has intensified its commitment towards a net zero strategy for reaching a sustainable economic and social system. The first attempt for harmonizing the regulatory landscape of sustainability disclosure has been made with Non-Financial Reporting Directive (NFRD). The directive requires large public interest companies to disclose ESG-related topics, setting a list of requirements to satisfy such as the description of sustainable policies, the principal risks related to the environment and other non-financial indicators. However, the Directive has been objected to criticism for a lack of standardization of ESG requirements leaving to the elaboration of the Corporate Social Responsibility Directive. This last Directive published in December 2022, requires more specific disclosure on ESG matters, like corporate strategy, risk management and the setting of targets related to sustainability. The CSRD is supposed to have a larger impact on sustainable reporting practices and will expand its scope from 11 thousand companies to 50 thousand companies, covering 75% of European companies' turnover. This extent gives the basis for setting the analysis in this regulation context.

The literature analysis introduced in light of this emerging trend, how technology implementation has affected reporting practices. Digital solutions have enhanced the development of dynamic reports, which result more efficient in communication with stakeholders.

Based on this theoretical research, the analysis has focused on the digital implementation of the sustainability reporting process, starting from the definition of the steps to follow for the system integration, the outcomes of the solution and the possible factors influencing this development. The results indicated that the implementation of a digital solution requires a well-defined process that assesses, evaluates, and verifies the various steps. Within this incremental approach to technology adoption, the insight is the improvement of the reporting process, particularly related to data collection and management, the enhancement of collaboration and the constant update of information. In light of this, technology is confirmed to enable reporting process to be compliant with the European regulation, particularly the NFRD. However, the study has enabled also to find possible counterpoints to these statements, which are fundamental for companies to assess their sustainable reporting strategies. Particularly, companies when deciding to implement technology solutions should consider time and effort in developing the system and the possible need of outsourcing the competences for the system integration. Additionally, the integration of a digital solution requires an assessment of the strategy pursued for the definition of the system to choose, the objectives pursued and the solution design. Based on these considerations and the results obtained previously discussed, companies should develop a comprehensive and holistic approach to sustainability and define proper targets to reach and evaluate. Moreover, technology can result in an enabler of the potentialities of integrating sustainability in all company aspects. Companies should identify specific requirements of the regulation, both for non-financial reporting and in case of other sector-specific requirements, leveraging technology for enabling sustainability reporting, to ensure accuracy, credibility, and transparency. Companies are also recommended to define proper control systems, as already applied for financial statements, for the identification of possible errors, enhancing in this way various functions to work under sustainable principles. In this way companies, as reported by a participant, “can leverage sustainability as a strategic lever for conducting business”.

In light of this outcome, the thesis contribute to literature is several ways. The analysis adopted an integrated approach and focused on the study of the interdependencies between sustainable reporting, digitalization, and regulation. This view is innovative when compared to the previously developed body of literature, which has been limited to the analysis of regulation and its impacts on sustainability reports or how technology has affected the reporting process. This study, on the other hand, provides a more holistic view of digital integration considering previous aspects drivers of automation, identifying regulation influences and evidencing possible capabilities. The study elaborated a first analysis of European Directive requirements, discussing on the impacts of NFRD and identifying possible impacts of the CSRD. In relation to the regulatory environment, technology implementation is evidenced to improve the reporting process but did not overcome NFRD counterpoints, and at the same time, it has been proposed a possible evolution of technology adoption under the CSRD. The study also contributes to the identification of the critical propaedeutic steps towards technology implementation and the process to follow, previously unexplored. The analysis of the implementation outcomes has allowed to confirm some previous results and highlight other discordances, like the failure of technology in limiting management discretion. Extending the analysis, it has been evidenced that even control activities can be enhanced digital impacts may be limited by a poor control system and an ineffective reporting strategy.

This last consideration sets practical implications for companies, which are required to enhance corporate strategy and increase sustainability across corporate operations. In this way, the organization will not only comply with CSRD requirements but also establish a competitive advantage. To manage this complexity, companies are suggested to integrate an efficient control model also for non-financial information, enhancing in this way the establishment of clear workflows and performance indicators for monitoring sustainability objectives. In this way also audit assurance is enhanced, enabling the credibility of reported data. Regarding technology, companies should view system integration has a tool to enhance and streamline their report practices. However, the study set also practical insights to consider when implementing a digital solution, which is to find individuals with the appropriate technical skills, conduct an analysis of the technology architecture in use, and define the best strategy for data management and data storage.

The study also suggests software houses develop an integrated sustainable solution with other corporate systems, also including functionality for materiality definition. For smaller realities, the requirement is to guarantee system systems that are easy to integrate and deploy.

However, this study presents some limitations. Since the NFRD has been integrated in different ways by member states, the outcomes of this study may not be valid in another context. The selected participants are all working in Italy, therefore their vision is based also on the Italian regulation related to non-financial reporting, even if their working experiences relates also to international clients. Additionally, the results of the case study may be influenced by the operating sector, therefore technology implementation would have different impacts in other contexts. Moreover, the point of view discussed relates only towards sustainability experts, and an interesting development could be the integration of system developers' or clients' opinions on the digital sustainability reporting process. An additional counterpoint is that the study performs the analysis only on a qualitative dimension, which would be enhanced by the integration of quantification of the trend.

Future research recommendations regard the extent of the sample considered in this study, for having a more holistic view of the trend. Additionally, starting from the outcomes of this study, future research may analyze the effective impacts of CSRD and verify the hypothetical previsions stated, particularly in relation to the adoption of the digital reporting process. In light of the ESRS validation, interesting research would be the verification of the statement of this study, in which standards will have different impacts accordingly to the sector. Considering technology, literature may explore if the system available responds to sustainability needs and verify if digital solutions enhance compliance with the new requirements. An interesting point to verify is that if the quality of disclosed information presents gaps, between companies that were already committed in sustainability reporting and the ones that initiate only recently. Additionally, literature research may explore if the positive outcomes of voluntary disclosure has been effective in the adoption of CSRD. Under these developments, another extent of research is the analysis of auditors' role, how their practices will change in the light of the integration of financial and non-financial information and how technology will support their practices. Moreover, an additional insight of the study is the definition of control models for non-financial information, not yet investigated in the literature, which could be analyzed for its effectiveness and impacts on the consolidation of sustainable reporting practices.

Concluding, sustainability will be an issue that will increasingly affect our lives and bring disruption among various companies. Companies will need to define an appropriate sustainability strategy that considers the complexities of the external environment and leverage technology to create and maintain value. Reporting will be the ultimate stage for communicating externally the company's effort and contribution to sustainability, but a priori it will be necessary to review business models, governance models, and control and organizational processes. In this corporate culture evolution, companies that embrace sustainability practices and technology integration will gain a better position in the thriving business landscape, capitalizing on emerging market opportunities and building resilience for the future.

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