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A Literature Review of Sustainability Reporting by Manufacturing Companies

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Abstract:

Purpose: *The purpose of this article is to analyze various sustainability reporting standards and to systematize knowledge about various reporting techniques and tools, indicating potential benefits and risks arising from them.*
Design/Research questions: *The following research problem was formulated in the article: What are the challenges and benefits of implementing international sustainability standards (ESG) in various industries, as well as their impact on the effectiveness of companies' activities in the field of sustainable development? The following research hypotheses were also adopted: H1: Implementation of sustainability standards is associated with challenges related to resource allocation and the risk of greenwashing. H2: Implementation of sustainability standards positively affects the level of stakeholder engagement and improves the company's image on the market.*
Findings: *The conducted analysis allowed for drawing the following conclusion:, in the preparation of a new method of SD reporting, it would be advisable to move away from ambiguously defined, descriptive, discretionary and subjective indicators, the development of a model and method for assessing sustainable development should be based on objective data from, for example, an ERP system, it is reasonable to create an IT tool that would allow manufacturing companies to quickly perform self-assessment of sustainable development. According to the authors of the article, such an approach would break down some of the barriers that prevent manufacturing companies from making the decision to be sustainable.*
Practical Recommendations: *The study shows that effective sustainability reporting requires continuous reflection, innovation and collaboration between different stakeholders. Companies should be proactive in their actions and strive for transparency, which will ultimately contribute to achieving real sustainability on a global scale.*
Originality/Value: *The study is an attempt to fill the gap in the literature concerning the presentation and summary of the actual advantages and disadvantages of different sustainability reporting methods. The conclusions drawn from the study inspired the authors*

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of the article to attempt, in further research, to standardize the preparation of sustainability reports together with the indication of key indicators and measures.

Keywords: *Sustainability, manufacturing company, reports, industry 4.0*.

JEL Codes: *Q01, Q66.*

Paper Type: *Research article.*

1. Introduction

To meet the demands of today's market economy, companies frequently choose to implement solutions that are designed to, on the one hand, transform production in accordance with the standards set forth by Industry 4.0, which can result in increased production efficiency and the enhanced efficiency of the manufacturing process (Kumar *et al.,* 2022; Nittin *et al.,* 2023) and on the other hand, prioritizing sustainability, contributing to sustainable production and supply chain management and ensuring long-term business sustainability (Ocicka *et al.,* 2022).

Industry 4.0 technologies facilitate the production of goods at a reduced cost, achieved through the efficient utilization of energy and resources, with a considerable reduction in waste. Furthermore, the implementation of sustainability 4.0 technologies enables companies to enhance their production processes. These technologies assist manufacturers in identifying optimal facilities and workers, reducing operational costs, increasing productivity and optimizing resource utilization (Javaid *et al.,* 2022). Moreover, these technologies facilitate more sustainable asset lifecycle management (ALCM), enabling the monitoring of the equipment condition, diagnosis of faults, prediction of potential failures and optimization of performance (Weerasekara *et al.,* 2022).

Sustainability reporting is of great importance in the assessment of a company's economic, social and environmental performance. It provides insight into the key elements such as health and well-being (HWB) indicators, economic indicators and environmental aspects such as compliance with the Global Reporting Initiative (GRI) standards (Dolcini *et al.,* 2023; Putri and Masrurin, 2022). To assess their sustainability performance, companies employ multi-criteria decision-making (MCDM) methods, which involve weighting various criteria, including return on equity, operating profitability and environmental performance, to rank companies based on their sustainability performance (Arsu and Arsu, 2023).

This, however, requires companies to disclose a wide range of information, including the environmental and social impacts of their operations, both directly and through their value chain (Seretakis and Mezzanotte, 2023). Despite the absence of

standardized accounting concepts and summary measures in sustainability reporting, it plays a crucial role in influencing management decisions and enhancing customer confidence in a company's operations (Wagenhofer, 2023).

2. Literature Review

The concept of sustainable development initially emerged from the notion of balancing human needs with environmental protection. However, it gained prominence following the realization of the adverse consequences of economic growth following the Industrial Revolution (Darvishi *et al.,* 2023). The advent of sustainability was driven by concerns pertaining to environmental degradation, social inequality and the necessity of meeting current needs in a manner that does not compromise the ability of future generations to meet their own needs (Yanovska and Parfentieva, 2022). The concept has evolved to encompass a comprehensive approach to economic, social and environmental challenges, as evidenced by the United Nations' 17 Sustainable Development Goals. They aim to address global issues such as climate change, social injustice and geopolitical tensions (Kadomtseva, 2023).

The evolution of sustainability reporting can be divided into three main periods: the pre-standardization period (1962-1998), the standardization period (1999-2016) and the post-standardization period (after 2016). In all of these periods, there has been a gradual shift in corporate reporting practices toward integrating sustainability issues, which reflects changes in the responsibility relationship between companies and society (Busco and Sofra, 2021). The advent of the Global Reporting Initiative (GRI) and the adoption of the Sustainable Development Goals (SDGs) in 2015 reinforced the importance of reporting, as regulators require large companies to disclose reports (Gwalani and Mazumdar, 2022).

Nevertheless, numerous companies have encountered obstacles when attempting to produce such reports. These difficulties can be attributed to a multitude of factors, including the inherent complexity of sustainability, which encompasses a range of interconnected elements, among others:

- industrial, agricultural, energy and environmental aspects as key areas of focus (Larasdiputra, 2024),
- disputes over achieving sustainability arise due to differing views on economic growth and resource substitution (Paridhi and Ritika, 2024),
- implementation of sustainable production is hindered by various challenges, including life-cycle assessment, material selection and recycling difficulties (Bambam and Gajrani, 2023),
- lack of sufficient powers of governing bodies, such as the United Nations, has resulted in inadequate enforcement of environmental policies (Holtzhausen, 2006).

These difficulties collectively illustrate the multifaceted nature of sustainability challenges, which encompass a range of issues from resource management to policy enforcement. To effectively address these challenges, a unified and comprehensive approach is essential. The complexity of the reports, noting the differences and similarities are presented in the studies (Benvenuto *et al.*, 2023; Farisyi *et al.*, 2022). The lack of a single, universally recognized standard according to which the report should be prepared also presents challenges related to their evaluation and comparison between companies (Gazdar, 2007).

3. Research Methodology

The aim of this article is to analyze various standards in the field of sustainability reporting, their application in various sectors of the economy and challenges related to their implementation. The study aims to identify the benefits, limitations and challenges related to the implementation of these standards in enterprises, as well as to assess their impact on the organization's sustainable development strategy.

The article formulates the following research problem:

What are the challenges and benefits related to the implementation of international sustainability standards (ESG) in various industries, as well as their impact on the effectiveness of companies' activities in the field of sustainable development?

The following research hypotheses were also adopted:

H1: The implementation of sustainability standards is associated with challenges related to resource allocation and the risk of greenwashing.
H2:Implementation of sustainable development standards has a positive impact on the level of stakeholder engagement and the improvement of the company's image on the market.

Further analyses are aimed at confirming these hypotheses. The study uses a detailed analysis of research, scientific publications and sustainable development reports published by companies. These reports will be analyzed in terms of the scope of information disclosed, compliance with selected standards and the assessment of transparency of ESG activities.

In addition, empirical research was conducted, which consists of interviews with managers responsible for sustainable development and ESG reporting in companies representing various industries (e.g. manufacturing, energy).

The interviews will allow for understanding the practical aspects of implementing sustainable development standards and the challenges associated with this process. Available case studies from companies that have implemented various sustainability

reporting standards were also analyzed in order to assess the effectiveness of their application and the impact on perceived transparency and financial results.

4. Research Results

A number of standards (guidelines) have been developed in the literature to facilitate the reporting of sustainability activities by entrepreneurs with different business profiles. These standards can be divided into the following categories:

- environmental sustainability, including the CDP, ISO 14001and EPandL,
- social sustainability, including ISO 26000 and the UN Global Compact,
- sector-specific: e.g., SASB, GRESB,
- integrated: e.g., GRI, IIRC.

One of the most widely utilized sustainability reporting standards is the GRI Standards (Global Reporting Initiative). This standard encompasses a comprehensive range of environmental, social and economic indicators. One advantage of this standard is that it enjoys widespread recognition and requires companies to conduct regular surveys of their activities.

Nevertheless, the preparation of a report necessitates a considerable investment of time and a comprehensive understanding of the intricacies of a company's operations. As indicated by data from 2020, 14,662 organizations are engaged in non-financial reporting, resulting in the production of 62,035 reports. Of these, 37,080 are reports developed in accordance with GRI standards (Karwowski *et al.,* 2020). The literature describes the use of the GRI standard in various sectors, including corporate finance. For instance, it has been employed by banks (Zabawa and Losiewicz-Dniestrzanska, 2023; Mulyani, 2020), insurance companies (Chamera, 2022) and airlines (Selami and Dilner, 2021).

Another widely utilized standard is the CDP (Carbon Disclosure Project Questionnaire). The CDP standard primarily addresses forms for reporting a company's impact on climate change, water management and forest management. Consequently, a potential limitation of the standard is its relatively narrow scope, which may not encompass all aspects of corporate sustainability. The source texts present findings from CDP reports by Chinese listed companies (Khalid *et al.*, 2022) and steel companies from the UK (Alsaifi *et al.,* 2022), among others.

The third standard employed in the domain of sustainability reporting is the SASB Standards (Sustainability Accounting Standards Board Standards). The SASB provides sector-specific standards that assist companies in reporting aspects of sustainability pertinent to their respective industries. SASB standards permit companies to publicly disseminate consistent and comparable information regarding

their approaches to issues such as climate change, natural resource constraints and technological innovation.

Consequently, SASB standards facilitate investors' comprehension of a company's financial implications in response to a transforming global landscape (Hales, 2021). The extant literature describes the implementation of SASB reports in US-listed companies, among others (Pizzi, 2023) and analyzes them for the banking sector in Finland (Höckerstedt, 2022).

The TCFD standard (Task Force on Climate-related Financial Disclosures) Recommendations provide guidelines and tools for the reporting of information related to climate risk and its management. The TCFD standard enables organizations to assess the impact of climate change on financial performance in a consistent and comparable manner. The TCFD standard enables companies to redefine and future-proof their operations. The results of the TCFD report have been published online by IBM, among others. The UK government's website provides guidelines for the disclosure of climate-related financial information by UK public sector companies.

Other standards that are commonly utilized for the purpose of sustainability reporting include the ISO 14001 Environmental Management System Audit Checklist, the EcoVadis CSR Assessment Questionnaire and the SA8000 Social Accountability Standard Audit Checklist.

The ISO 14001 standard is the most prevalent reference standard on the market for implementing environmental management systems, as evidenced by Mazzi et al., (2016) and Boiral *et al.,* (2018). One advantage of this approach is its relative versatility, as well as the possibility of receiving a certificate confirming the implementation of the standard in enterprise operations. The literature describes the use of the report in a variety of contexts, including universities (Gomes *et al.,* 2023) and small and medium-sized enterprises (Johnstone, 2022).

The EcoVadis CSR Assessment Questionnaire provides a framework for evaluating a company's adherence to CSR (Corporate Social Responsibility) standards, encompassing environmental, labor, business ethics and sustainable purchasing practices. The disadvantages of this standard are twofold: firstly, the amount of work that is required in order to prepare the standard is considerable and secondly, the cost of preparing the report itself is significant. One advantage is that it can be adapted to the particular characteristics and business model of a given company. The bibliography illustrates the utilization of the report in various sectors, including the pharmaceutical industry (Ftouni, 2023) and the automotive industry (Gabriele and Wolf, 2020). It is frequently employed in the context of sustainable supply chain management (Fraser, 2021; Fraser *et al.,* 2020; Kóča *et al.,* 2023).

The SA8000 Social Accountability Standard Audit Checklist represents a standardized framework for the assessment of social accountability practices. The forms address a range of issues, including forced labor, wages and employee health and safety. The standard is consistent with the provisions of international conventions, including the Universal Declaration of Human Rights and International Labor Organization (ILO) conventions and serves to complement national labor laws around the world, thereby ensuring ethical working conditions.

The SA8000 standard is applicable to any type of organization, regardless of size, geographic location, or industry. It is applicable to both commercial and non-profit enterprises (Chirieleison *et al.,* 2023). The main users of the SA8000 standard are companies operating in the apparel, construction and textile industries, primarily in companies from so-called developing countries (Turzo, 2024; Llach *et al.,* 2015).

AccountAbility is a U.K.-based international consulting firm with a documented history of developing three distinct standards. The AA1000 Accountability Standard (AA1000AP), the AA1000 Stakeholder Engagement Standard (AA1000SES) and the AA1000 Assurance Standard (AA1000AS) (Farooq, 2021) are three standards developed by Accountability, a U.K.-based international consulting firm. The AA1000AP standard specifically addresses the monitoring of sustainability principles and provides guidelines for stakeholder accountability management. This standard identifies four sustainability principles: inclusiveness, materiality, responsiveness, impact.

The set of principles outlined in the AA1000 standard provides a framework for organizations to integrate sustainability into their structures, processes and practices. The standard takes a normative view of the role of stakeholders in business processes, emphasizing an organization's accountability to its stakeholders. It is primarily geared towards large organizations, such as those listed on the stock exchange.

Another instrument that facilitates the reporting of sustainability activities by companies is the EPandL (Environmental Profit and Loss) Report. This tool is designed for the reporting and assessment of a company's operational impact on the environment and resources (Berger, 2024). The report employs a comprehensive value chain analysis to determine the monetary value of environmental impacts across a company's supply chain.

The tool assesses and quantifies both the financial benefits that organizations derive from natural resources, such as food, fuels, waste assimilation and recreational opportunities as well as the environmental costs associated with their operations and supply chains. The standard's methodology is predicated on the assumption that business operations and supply chains are heavily reliant on nature, particularly with regard to the provision of essential services such as fresh water, clean air, healthy biodiversity and productive land (Berger, 2024). The implementation of the EPandL

standard represents a significant endeavor for organizations to quantify the immense value of ecosystem services and to ascertain the true cost of their impact on the natural environment. This standard is most frequently adopted by established companies that are cognizant of their environmental footprint.

The Communication on Progress (COP) is an annual progress reporting tool utilized by organizations affiliated with the UN Global Compact (Orzes et al., 2018) to document their activities and progress in the areas of human rights, labor, the environment and anti-corruption practices. The UNGC is currently the largest corporate sustainability initiative in the world, with over 24,000 companies and institutions from around the globe currently registered.

Membership in the UNGC necessitates that companies adhere to and implement the Ten Principles in their practices. The procedure that verifies the transparency and reporting of an organization's UNGC membership is the annual public disclosure of activities that support and implement the Ten Principles. The COP comprises three distinct levels of participation. There are three levels of participation in the COP: active, advanced and learner. It is a requirement for organizations to submit an annual report to the COP. A failure to report for two consecutive years results in the loss of Global Compact Active status, which in turn leads to exclusion from the UNGC.

Membership in the organization is open to any company, irrespective of its industry or size. In addition, participation in the organization is feasible for public institutions or NGOs. A review of the literature reveals that the tool has certain limitations in its measurement constructs, particularly with regard to management and customer indicators (Magalhães *et al.,* 2024; Xia *et al.,* 2019). This results in unstable and poorly adjusted models. The method demonstrates particular weakness when analyzing management and customer variables, including supply chain management. The only indicator that exhibits reliability is the assessment of the impact on the environment (Magalhães *et al.,* 2024).

Another method is the International Integrated Reporting Council (IIRC), which builds upon the previously established Accounting for Sustainability (A4S) Connected Reporting Framework. The A4S framework was first introduced by Prince Charles, who later became King Charles III, in 2004. (O'Dwyer *et al.,* 2024) During its formative years, the framework was utilized exclusively within the United Kingdom. The standard subsequently evolved and took the name IIRC, incorporating elements drawn from the Global Reporting Initiative (GRI) and the International Federation of Accountants (IFAC).

The objective of the creators was to establish not only the standards themselves but also a specialized entity to develop a framework and set standards for sustainability reporting (De Villiers *et al.,* 2022). The standard's provisions primarily address finance and human resource management. Until 2014, the organization was

experiencing rapid growth. However, recent literature has analyzed the reasons for abandoning the standards it had adopted.

The Science Based Targets Initiative (SBTi) is a partnership between the Carbon Disclosure Project (CDP), the United Nations Global Compact, the World Resources Institute and the World Wildlife Fund. The organization is sustained by financial donations, which are raised from fees for the certification of targets made and from various corporate and charitable foundations. SBTi offers guidance to companies on the calculation of interim SBTs, which it then evaluates and approves.

Furthermore, it encourages companies with approved targets to disclose their greenhouse gas emissions and progress toward meeting those targets on an annual basis (Bjørn *et al.,* 2022). The fundamental premise is to establish targets for organizations that are consistent with the greenhouse gas reduction targets set forth in the 2015 Paris Agreement. SBTi currently recommends the use of two target-setting methods, which are integrated into an organization-specific target calculation tool, for Scope 1 and Scope 2 emissions.

Greenhouse gas (GHG) emissions classified as Scope 1 refer to direct emissions produced by a company. These emissions typically result from fuel combustion, physical or chemical processing and leakage. Scope 2 emissions refer to indirect greenhouse gas emissions resulting from the company's consumption of purchased electricity, steam and heating/cooling. Scope 3 greenhouse gas emissions encompass all indirect emissions not included in Scope 2. These include emissions associated with the production and transportation of purchased goods and services, processing and use of sold products as well as employee commuting and business travel (Bjørn *et al.,* 2022).

The aforementioned goals are to be achieved through the utilization of two distinct tools. The ACA (Absolute Contraction Approach) stipulates that all companies must establish targets for reducing their absolute emissions to a uniform extent. The second approach is the Sectoral Decarbonization Approach (SDA), which assumes that selected sectors, based on the costs of mitigation, will reduce emissions at a faster rate than others. This is done while taking into account the emissions intensity and growth projections for each company in the base year. In essence, the recommendations are founded upon the premise that companies should express their SBT in terms of a percentage reduction in absolute emissions or emissions intensity (e.g., per ton of product or revenue). The scopes, reporting and target-setting tools are selected based on the sectors and industries in which the organization operates, which represents a significant advantage of this approach (Bjørn *et al.,* 2022).

5. Discussion

This article discusses key sustainability reporting standards and guidelines that have become an indispensable tool for companies in various industries, taking into

account their diverse approaches to meeting sustainability goals. Table 1 provides a comparison of the reports, considering both the benefits and challenges of their application.

Table 1. *Comparison of sustainability reports*

Standard	Focus Area	Benefits	Challenges
CDP	Climate change, water, forest management	Specific to environmental impacts, supports accountability	Narrow scope
ISO 14001	Environmental management systems	Versatility, certification potential	Implementation costs
EP&L	Environmental profit and loss across supply chain	Quantifies environmental impacts in monetary terms	Complex analysis, resource-intensive
ISO 26000	Social responsibility	Broad coverage of social aspects	Non-certifiable
SA8000	Social accountability	Ethical working conditions, global applicability	Implementation effort
GRI	Environmental, social, economic indicators	Comprehensive framework, global recognition	Resource-intensive, complexity of operations
IIRC	Integrated financial and sustainability reporting	Links financial and non-financial aspects	Declining adoption
UNGC COP	Human rights, labor, environment, anti-corruption	Broad participation, ensures adherence to UN principles	Measurement limitations
SASB	Industry-specific sustainability metrics	Tailored to industry, supports investor decision-making	Limited cross-industry comparability
GRESB	Real estate and infrastructure	Provides benchmarks for the sector	Sector-specific scope
TCFD	Climate risk and financial performance	Standardized climate risk reporting	Focused on climate aspects
EcoVadis	CSR evaluation (environment, labor, ethics)	Adaptable, used in supply chain management	High costs and effort
AA1000 Standards	Stakeholder engagement and accountability	Emphasizes inclusiveness, materiality, responsiveness, impact	Best suited for large organizations
SBTi	Greenhouse gas reduction targets	Aligned with Paris Agreement, sector-specific tools	Certification and monitoring costs

Source: *Authors' reaserch.*

The result of the deliberations is a discussion of four areas:

- classification of standards,

- challenges in sustainability reporting,
- specifics of standards,
- differentiated approaches to industries.

The division of the standards into categories - environmental, social and sectoral sustainability - indicates the wide range of tools available that can be implemented depending on the specifics of the company. As the most extensive standard, GRI allows comprehensive reporting using economic, social and environmental indicators, making it particularly valuable for companies looking to implement a sustainable strategy. The fact that 37,080 reports have been produced in accordance with GRI attests to its popularity and importance among organizations. However, the complexity and significant resource requirements of report preparation, as well as the multitude of different indicators that are not always determined in the course of a company's standard operations, can be challenging, especially for small and medium-sized enterprises (SMEs). This is consistent with the authors' findings that large corporations and established organizations are more likely to adopt GRI standards because of their ability to manage the associated complexities.

On the other hand, ISO 14001 demonstrates a high degree of versatility and adaptability, as evidenced by its use in various contexts, such as universities and SMEs. Its ability to certify environmental management systems offers organizations a tangible advantage in terms of credibility and market recognition. However, its focus on environmental aspects alone may make it insufficient for organizations seeking a broader sustainability perspective. This is also confirmed by interviews with large companies, which point precisely to the overly narrow scope of ISO 14001.

The use of standards, such as SASB, in specific sectors, including finance, pharmaceuticals or automotive, underscores the sector's role in shaping sustainable business policies. Sector-specific standards, such as SASB, excel at addressing industry-specific issues, enabling companies to communicate appropriate sustainability efforts to stakeholders, particularly investors. SASB's sectoral approach provides tailored reporting that increases comparability and relevance of information. However, its narrower focus may exclude broader dimensions of sustainability, potentially limiting its applicability to organizations with multidimensional sustainability goals, much like ISO 14001.

Similarly, the EPandL standard provides a robust methodology for quantifying environmental impacts in supply chains. Its emphasis on ecosystem services and monetary valuation is an innovative approach, albeit resource-intensive and adopted mainly by environmentally conscious companies. This demonstrates the standard's potential to drive environmental responsibility, but also highlights the challenges of widespread implementation.

The SA8000 standard and ISO 26000 are distinguished by their focus on social

sustainability and ethical practices. SA8000's compliance with international conventions ensures compliance with global labor standards, making it particularly valuable in industries with complex supply chains and intense competition. However, its applicability in developing countries suggests a potential bias toward addressing pressing social issues in these regions, potentially overlooking broader sustainability challenges in developed markets.

The CDP and TCFD standards show how a specific approach to climate change management allows companies to strengthen their environmental responsibility. By focusing on climate and water management issues, CDP provides a framework that can lead to concrete actions to improve sustainability The standards frameworks, particularly CDP, however, show limited applicability due to their narrow scope. While they facilitate robust reporting on climate, water and forest management, their lack of integration with other dimensions of sustainability, such as social and economic aspects, may limit their usefulness for organizations seeking holistic sustainability reporting. This is evident in their selective adoption, mainly by environmentally oriented industries. The authors agree that this sta-standard does not provide a complete picture of an organization's sustainability efforts, and consequently, its use may not provide a complete answer to the question of whether or not a company is actually operating according to sustainability principles.

Integrated standards, such as the IIRC and the SBTi, represent the evolution of sustainability reporting toward a comprehensive and forward-looking framework. The IIRC's integration of financial and human resource elements with sustainability goals provides a holistic approach, albeit one that has encountered challenges in maintaining momentum in recent years. Meanwhile, SBTi's alignment with the Paris Agreement and its sectoral tools underscores the growing emphasis on climate action. The use of tools such as the ACA and the SDA underscores the shift toward measurable and enforceable climate targets. These are standards that can definitely influence the development and greater unification of reports, precisely because of the aforementioned measurability of indicators, something that most reports do not really use.

The diversity of sustainability reporting standards requires strategic decision-making by organizations to align with a framework that best reflects their business, stakeholder expectations and sustainability goals. Larger corporations are well positioned to use comprehensive standards such as GRI and IIRC, while SMEs can benefit from adopting sector-specific or less resource-intensive frameworks such as ISO 14001. Policy makers and industry leaders should encourage harmonization of reporting standards to reduce complexity and increase comparability across sectors.

Moreover, the adoption of frameworks such as SBTi demonstrates the importance of aligning corporate goals with global sustainability goals. This trend underscores the need for increased collaboration between companies, policymakers and standards bodies to develop tools that are both influential and accessible.

6. Limitations of the Study

This research on sustainability reporting has some limitations that may affect the scope and results of the analyses. This research focuses on selected standards, which means that it does not include all possible tools used in sustainability reporting, which could lead to more comprehensive results.

Another limitation is the different level of advancement of ESG standards implementation in companies from different economic sectors. Companies of different size, geographical location and characteristics of operations may encounter different challenges related to resource allocation, scale of operations and adaptation of standards to their specific needs. Therefore, the results obtained based on the analysis of industry cases may not be fully representative of the entire spectrum of companies.

Additionally, the variability and development of the ESG standards system itself, which can be updated and modified as new challenges and social and market expectations emerge, may be a limitation. As a result, the results of this study may be limited to the time of its conduct, and further changes in ESG regulations and practices may affect the conclusions and recommendations arising from this study.

7. Conclusions

Taking into account the research problem posed, related to the challenges and benefits related to the implementation of international sustainable development standards in various industries, as well as their impact on the effectiveness of companies' activities in the field of sustainable it can be stated that:

- the implementation of ESG standards requires a lot of work and human and financial resources. This is particularly evident in standards such as GRI or EcoVadis, which require detailed reporting and analysis,
- there is a risk that companies may present false or exaggerated information about their sustainability activities (greenwashing), which undermines the credibility of reports and undermines stakeholder trust,
- ESG reporting is complex, requires knowledge of many aspects of the company's operations and an integrated approach to managing data from different areas,
- some standards, such as SASB or SBTi, are tailored to specific sectors, which requires companies to work additionally to adapt reporting to their industry,
- standards such as AA1000 emphasize responsibility towards stakeholders, and the UN Global Compact promotes transparency and obliges companies to report annually, which strengthens trust and improves the company's image and relations with stakeholders,
- standards such as TCFD help companies identify and assess climate-related risks, which allows for better risk management and long-term strategy,

- companies using standards (e.g. SASB) can better manage their resources and operations, adapting them to the changing business environment and environmental requirements,
- transparent reporting in line with international standards facilitates access to capital, as investors increasingly consider ESG factors when making decisions,
- companies that effectively implement standards can achieve better environmental and social results, which translates into cost savings and improved operational efficiency.

The above analysis allows to confirm hypothesis *H1*, indicating that the implementation of sustainability standards such as GRI or EcoVadis is indeed associated with challenges regarding resource allocation and the risk of greenwashing. At the same time, the results support hypothesis *H2*, showing that transparent reporting increases stakeholder engagement and improves the company's image.

Taking into account the conclusions from the analysis of publications and reports, as well as interviews with entrepreneurs, it can be stated that the multitude of reports used, does not make it easier for manufacturing companies to report on sustainable development. The general formulation of some indicators, their ambiguity and descriptive nature, as well as their discretionary and subjective nature, result in two fundamental limitations. Firstly, it is impossible to objectively assess the sustainability of a company. Secondly, it is also impossible to compare the assessment with, for example, other companies in the same industry.

Furthermore, the financial implications of conducting such a report must be considered. Sustainability audits are typically outsourced to commercial organizations and consulting companies, which often come at a significant cost. According to the authors' interviews with SME business owners, this can present a significant barrier to implementing sustainability principles within an enterprise.

In light of the aforementioned considerations, it seems prudent to:

- move away from indicators that are ambiguously defined, descriptive, discretionary and subjective in reports,
- develop a model and method for assessing sustainability based on objective data from, for example, an ERP system,
- development an IT tool that would facilitate the expeditious self-assessment of sustainability by manufacturing companies.

As the article's authors posit, such an approach would dismantle the obstacles preventing manufacturing companies from pursuing sustainable practices. It would also preclude the phenomenon of greenwashing, which undermines authentic sustainability endeavors.

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