SUSTAINABILITY TRACING FOR COMPANIES: GOVERNANCE, REGULATION, ECONOMICAL AND ETHICAL CONSIDERATIONS

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ABSTRACT

The proliferation of big data has led to a data explosion, which has surpassed enterprises' ability to appropriately analyse the multitude of data types that now exist. Arguably, one such data type that is challenging for companies to currently exploit but that would benefit greatly from big data analytics is tracing their sustainability performance. Currently, there is consensus in the literature that sustainability tracing based on big data analytics can have a considerable impact in achieving improved organizational sustainability. In a previous paper, we proposed an AI-based framework which uses ESG data to predict and forecast the sustainability performance of companies, and we reflected on how companies could use our framework to implement their enterprise architectures. In this paper, we reflect how our framework can be transformed into a platform solution for ESG data analysis. Our paper contributes to the literature in two ways, firstly by analysing, the regulatory, ethical, and legal opportunities and challenges associated with such am AI platform implementation scenario and secondly by leveraging this platform implementation to outline how companies can use data as a strategic asset for sustainability decision-making.

KEYWORDS

Sustainability, Enterprise Architectures, Business Intelligence Reporting, Data Analytics, Data-driven Decision Making, ESG

1. INTRODUCTION

Sustainability management has increased in popularity in recent years. At the societal level, it is essential to manage the increased risks arising from accelerated change (climate change, the shift from a linear to a circular economy, growing inequality) and to find a balance between economic and social needs. Investors, regulators, consumers and employees increasingly expect companies to be good stewards not only of financial capital but also of natural and social capital, and to ensure that they have the right governance conditions to maintain it. Companies care more about being sustainable in how they do business to meet increased expectations and the legal requirements that reflect them, and indeed to increase and maintain their market competitiveness. Paying attention to the media makes businesses feel more pressure to be sustainable. This leads to questions about how to see if they are making progress towards their sustainability goals.

Businesses use ESG guidelines to check how environmentally friendly, socially responsible, and well-run their companies are. These guidelines inform environmental, social, and governance policy in company decisions. In fact, recent research shows that companies with an ESG agenda not only have better financial sustainability and performance, but they also have higher valuations. Companies that care about environmental, social, and governance issues are seen as more trustworthy, and they do a better job of managing risks and making sure they are prepared for long-term challenges (Xie, 2019; Pedersen, 2020). In addition to reporting, ESG can also become a competitive tool: in addition to the mandatory data, companies can also demonstrate their commitment to sustainability by publishing other corporate data.

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At the same time, Artificial Intelligence (AI) has changed the way businesses use data and operate. AI, along with Machine Learning (ML), and automation, is now pervasive and has become increasingly important for how organizations work. In the last few years, AI has been helpful for companies to analyze and better understand their own organization. Prior to this, businesses used to do their search and selection tasks manually. They used information from self-disclosure and annual business operations, which often contained and led to errors and inaccuracies.

Present methods of using AI to track sustainability aspects of companies are limited in scope (Ebinger & Omondi, 2020; Lee et al., 2021; Hofmann & Langner, 2020). Using ML and AI for analysing ESG big data is still in its infancy and many companies have not yet been successful in their attempts (Macpherson, et al, 2021). We posit, however, that big data can help companies measure how well they follow sustainability rules by leveraging their existing data to yield more precise results, leading to more informed decision-making. At the same time, the effective use of big data requires compliance with the existing rules on the processing of personal data and a rethinking of the relationship framework.

In a previous paper, we used a multi-industry approach to analyze and create a decision support platform that can be used across to various industries and types of businesses. This approach uses technology to gather data from across companies, study it to assess the company's level of sustainability and if necessary, assist them in making smarter decisions to improve their sustainability. In this paper we reflect on:

- possible governance approaches for such platforms, and how they affect working conditions, sustainability, and growth. We reflect on the involvement of people and community, and the different ways people can work together and make decisions with such platforms,
- analyze ethical aspects of such platforms, i.e. fairness, data protection, and making sure that all citizens are involved.
- existing policies and regulatory challenges and opportunities around sustainability collaboration.
- economic value potential such platform can provide, and their impact on social and open innovation.

Future platforms must be open, inclusive, and adaptable for everyone by design. This includes involving people in the process and ensuring the systems support diverse users' needs in their daily activities. In Europe, open infrastructures like open-source projects are getting a lot of attention because of their importance in the digital world and the government's focus on digital independence. However, being open has challenges, as we outlined above from the perspective of governance, ethics, regulation, and economics. In this paper, we analyze the literature on the above-mentioned aspects and propose suitable solutions.

2. SUSTAINABILITY TRACING OF COMPANIES

Sustainability tracing of companies can be captured by Supply Chain Management (SCM) and Information Logistics (IL) and Production Logistics (PL) procedures. Information Logistics embraces documents, and any data format, that can flow through the business processes and the workflows of firms. The trustworthiness of information can be guaranteed by appropriate blockchain technology. Additionally, conformance to reporting requirement, either internal or external, can be demonstrated by following approved standards of accounting methods (European Parliament and of the Council (2024)). A typical property of an ESG Information System (ESG IS) is that the stakeholders involved are numerous, and the input data originates from a vast number of resources. The Triple Bottom Line notion (TBL) is embedded in business management to support sustainability, the three dimensions being economic, environmental, and social (Elkington, J. (1998)). The IL plays a crucial role in ensuring traceability, and in assisting addressing uncertainty and complexity within companies and in the intercompany information exchange. Companies are discovering blockchain's potential to improve external reports through smart contracts, validation, consensus algorithms, and third-party verifications. Blockchain technology through the distributed ledger that provides data integrity and immutability gives trustworthiness to models that are processed by AI, Data Science and Machine Learning. More reliable data means augmented modelling abilities, and new qualitative data may have resulted in the creation of entirely new models.

2.1 AI-Based Architecture Solution

Companies use various types of data to achieve sustainable practices. This data comes from their operations, company records and external sources, such as the internet, and audio and image files. Some companies use Data Warehouses to store and integrate data from different sources, while others use Lakehouses for similar purposes (Haelen, B. 2024).

This practice of data collection and analysis helps companies make decisions using the data (Golfarelli and Rizzi 2009; Kimball 2010). The data warehouses contain static information that remains unchanged. Its purpose is to help the company quickly find answers. Initially, unstructured data from various sources is organized and cleaned. The same data ingestion process is carried out in the case of Lakehouse, however, the gathering of meta-data and creating indexes and links happens through an intelligent data dictionary. Subsequently, a dependable source of information is created for predicting and prescribing different ESG components. By integrating different types of data, an effective data system is established that allows for gradual modification and utilization of the data.

The diagram in Figure 1 shows the kind of data a company can use for ESG rules detection and application.

A data lake is a different type of storage system that should for such situations. The data warehouse deals with organized data, while the data lake has unstructured data that needs to be organized before it can be used. In our architectural solution (Figure 1), we have a data warehouse for making big decisions over a long period of time, and a data lake for making smaller, daily decisions. The data lake has a smaller version of the data and is separate from the data warehouse for long-term reporting and data retrieval.

Companies choose the KPIs they want to monitor for the different ESG areas. Dashboards make it easier to see how a company is performing in areas such as environment, society and governance. The dashboard can help the company make better decisions.

In the data lake, we need to make sure that the data is kept secure and follows the rules for data protection and GDPR. A list of different ML and AI tools should be kept for use by the data lake and data warehouse. Advanced access control methods should be used to protect the integrity, confidentiality and availability of the data. This includes using strong passwords and multi-factor authentication.

2.2 Governance, Legal, Economical and Ethical Consideration

- Governance considerations. Selecting an optimal level of openness is crucial. Managers should carefully consider the governance aspects and the sustainability considerations for their individual company. Just letting different stakeholders use a platform may not be enough for them to truly commit (Halckenhaeusser, Foerderer & Heinzl, 2020). Open access does not necessarily encourage more people to get involved, especially if it is not clear who oversees the platform and why. When a more structured governance approach is in place, relevant and diverse stakeholders can become more involved in using and consulting the data (Schreieck, Wiesche & Krcmar, 2016).
- Legal requirements will mandate the types of information companies share and its level of detail. Such sustainability platforms would need to define and balance companies' obligations in relation to protection of personal data, transparency, prevention and enforcement procedures (antitrust infringements). These are in addition to defining both platform stakeholder roles and their criteria and liability regimens (Eisenmann, Parker & Van Alstyne 2009).
- Economic aspects, in a broader sense, open innovation refers to companies, people and institutions working together to create innovative products. In a world of distributed knowledge, it is imperative that companies rely not only on data from their own products / services, because in general companies have lots to gain if they combine knowledge from diverse sources. This approach can set the basis for the construction of new business models that are yet to be tapped, in terms of both, value creation and value capture (Vanhaverbeke & Chesbrough 2014).
- Ethical considerations. Solid ethical foundations should guide how the platform is designed, implemented and managed over time. Design by itself cannot ensure good implementation. Data privacy, fairness, accountability and transparency are critical ethical aspects to embed from the start. In addition, such platforms should consider inclusion, and how people with different abilities levels can access the information. Consideration should be given to whether a non-expert consumer of a complex and sophisticated product/service can actually obtain useful, meaningful information from a

professional business, or whether mandatory expert qualifications (standards, peer reviews, sandboxes) may be necessary. Such platforms should be good-for-all and prevent any opportunistic behavior (Seth, 2019).
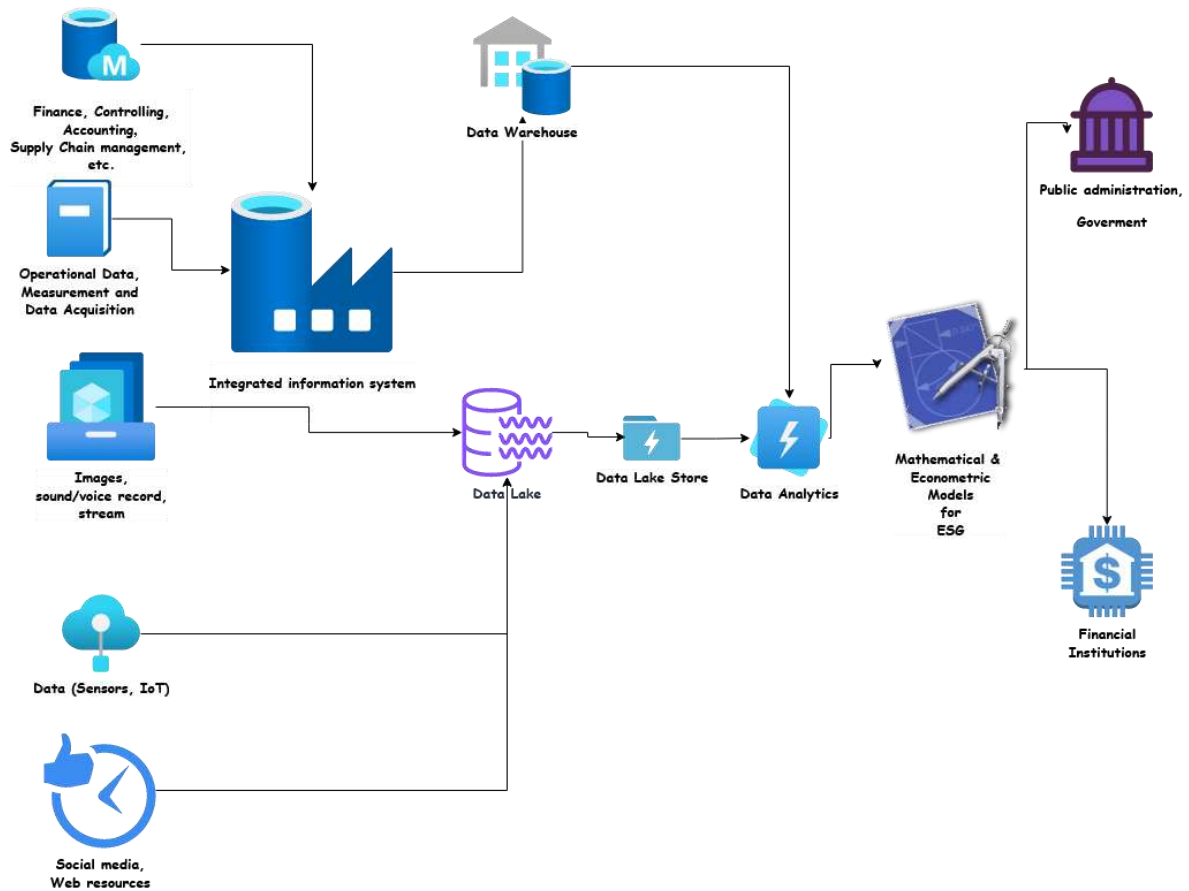

Figure 1. Data sources and their utilization for analysis and prediction of ESG-rules adherence for companies

3. DISCUSSIONS AND FUTURE STEPS

To our knowledge, our research is the first to look at how to create a platform that helps companies track their environmental, social, and governance criteria and offers services to help them improve their performance. This can be a great tool for businesses to help them see how well they are doing in the areas of environmental, social, and governance criteria. They can then work on improving the areas where they are not doing well

Our work and previous research show that looking at how companies handle environmental, social, and governance issues using big data is important for studying sustainability. In general, people are starting to care more about sustainability, but we still need to do more research to find out how artificial intelligence can help finance sustainability in the future. Many companies are working together to study how they make decisions to be more sustainable. This is also getting a lot of attention and money from the EU for research projects.

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