

Challenge of ESG Data.

ESG stands for Environmental, Social, and Governance and is a broad abstract framework that has become a catchphrase for businesses and their investors, covering:

Environmental

The conservation of the natural world, including current issues such as climate change, sustainability, carbon emissions, pollution, energy efficiency, and water scarcity.

Social

Taking into account people and relationships, such as employee engagement, community relations, human rights, and labor rights.

Governance

Governance standards and accountability for ESG standards implementation, board composition, audit committee structure, and anti-corruption.

Non-financial metrics and unstructured reporting narratives are increasingly being used by investors and the companies in which they invest to increase transparency and meet ESG investing mandates and company commitments.

Data Challenge

Although these ESG elements are not commonly included in mandatory financial reporting, we are seeing companies make disclosures in their annual reports as well as standalone sustainability reports, press releases, social media, news reports, and other channels.

Numerous reporting initiatives, such as the Sustainability Accounting Standards Board (SASB), the Global Reporting Initiative (GRI), and the Task Force on Climate-related Financial Disclosures (TCFD), are being developed to address and standardize this data gap, but the complexity and scope of ESG make assessing organizations' or investments' ESG credentials using a single reporting framework difficult.

Companies must also assess not only their internal organization but also their extended supply chain. They must ensure that the suppliers they use are also ESG compliant, which is becoming a data-driven activity that uses data from both the supply chain and third parties to verify and assess compliance.

There is also the issue of companies giving the impression that they are more ESG compliant than they are, which emphasizes the importance of correctly understanding the data.

Gaining a Deeper Understanding

Although there is no standardized approach to gaining insights from data, we are seeing success in the use of artificial intelligence using Natural Language Processing (NLP), which is based on deep learning techniques that can be trained using example data to identify and classify ESG concepts with positive and negative sentiment within the data.

This method employs Name Entity Recognition (NER), which is more than just a simple matching mechanism that matches words based on a pattern because it also allows for the identification and classification of unstructured textual data.

NER works by locating and identifying the named entities present in unstructured text and mapping them into pre-trained ESG categories, for example: environmental classifications such as reductions of emissions, commitments to net-zero, adoption of green energy could all be identified.

NER is just one technique that can be used, but in an operational environment, several learning models and algorithms will likely be combined to create a data pipeline to improve the accuracy of ESG identification and classification.

Sentiment: Positive

This report highlights our continued efforts as a financial institution, an employer and a philanthropist **CR** to address these societal issues, **CR** from our Action for Racial Equity **CR** to our substantial pandemic-related relief. **CR**

In the midst of the global pandemic, we launched our new 2025 Sustainable **SU** Progress Strategy to address another global crisis: climate change. **CC**

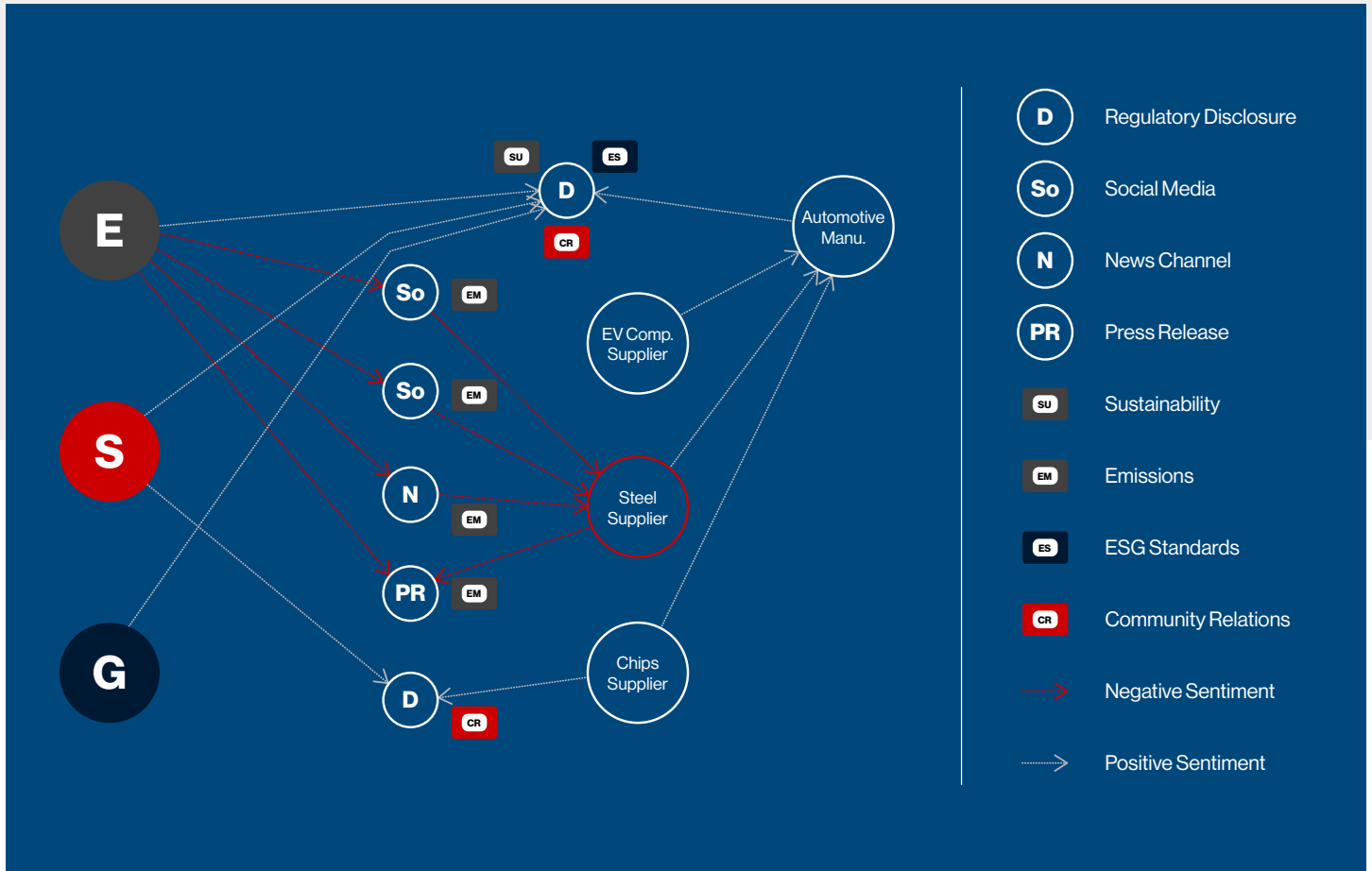
Our new strategy, which had been in the workd well before COVID-19, is aimed at driving the transition to a sustainable, **SU** low-carbon **EM** future in an environmentally responsible **SU** way that serves society's economic needs. Building on this strategy, in early 2021, we took an important next step in our sustainability journey and committed to net zero greenhouse gas (GHG)emissions **EM** by 2050. (Learn more.) COVID-19 became an accelerant for our work, illustrating the deep interconnections of systemic racism **HR** and societal, physical and environmental health.

Once a niche topic for investors, our environmental, social and governance (ESG) focus **ES** is essential to our firm-wide strategy **ES** — deeply integrated into our business — and we continue to evolve our approach to managing ESG **ES** issues and opportunities.

Environment	Classification
SU	Sustainability
CC	Climate Change
EM	Emissions
Social	
CR	Community Relations
HR	Human Rights
Governance	
ES	ESG Standards
GO	Governance

ESG Frameworks

As previously stated, numerous ESG reporting and compliance frameworks, as well as specific corporate reporting approaches, are emerging. Although distinct, some categories are related to the environment, society, and governance. This can be used to create commonality between different frameworks by mapping them against a graph structure, resulting in a single model for evaluating ESG investments and company supply chains. Data can be mapped against the structure of a graph using an ESG knowledge graph and pre-classified NER to provide a unified view of an investment or company's EGS status using both historical and real-time data.



Once the graph is populated, analysis can be undertaken on the graph to create dashboards, reporting and ad-hoc analytics.

Furthermore, graphs provide advanced analytical capabilities that enable new ways of understanding data and gaining in-depth insight into a company's or investment's ESG compliance.

Graph algorithms can be used to analyze the structure to identify emerging trends such as negative sentiment, clustering around specific ESG topics, and the discovery of previously unknown relationships.

The combination of reporting frameworks and graph structures allows for the creation of a unified view of complex ESG reporting requirements, disclosures, and underlying unstructured textual data.



Investor

Artificial intelligence techniques can help investors discover key data that will allow them to validate their ESG investments.

These algorithms can be trained to not only identify ESG topics in unstructured data but also to analyze the tone of the narrative by comparing the words used to a taxonomy of reference words and concepts.

Transcripts of a company's quarterly earnings call, for example, could be analyzed to determine the tone of the words used when a senior manager speaks, as well as natural language processing to easily identify which parts of the presentation cover ESG topics, and then sentiment analysis of the words used to make a high-level assessment of an organization's commitment to mitigating environmental risks.

Even though this is a very powerful approach, humans will not be replaced because advanced analytical methods will be used to augment and automate underlying manual analytical activities.

Supply Chain

Given the complexity, number of suppliers, and length of the chains with primary and subcontracted suppliers, data is critical to ensuring ESG compliance across manufacturing supply chains.

The ability to assess supply chain data from internal and external data sources is critical for determining whether suppliers have met their ESG contractual obligations.

This could begin by scanning contracts and identifying the ESG compliance requirements for a specific supplier, followed by data extraction from within the supply chain and from third parties. Textual data, as well as geospatial data from satellites or ground-based sensors, could be used to monitor greenhouse gas emissions or pollution from manufacturing processes.

Companies face significant challenges in verifying ESG compliance within their supply chains, which may not be adequately identified even with due diligence procedures and spot checks.



High Performance Data

This significant improvement in the ability to perform advanced ESG classification is based on a modern high-performance data infrastructure that leverages both specialized computing such as GPUs and accelerated data infrastructure.

These technologies enable the construction of data pipelines for artificial intelligence NLP model training and graph databases, which require a high level of computation to support the large data sets required to achieve the highest levels of accuracy.

ESG Transparency

As previously stated, ESG data is broad and complex, and it is frequently expressed in textual form. It is critical to be able to process this data and frame it against emerging ESG reporting standards and internal requirements to ensure that both companies and investments are ESG compliant.

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