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ESG Risk Canvas: a conceptual model for structuring the identification, analysis, and response to ESG risks

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Abstract

The advancement of the Environmental, Social, and Governance (ESG) agenda has increased the complexity of organizational risk management, while the literature remains fragmented across materiality, risk analysis, governance, value chain, and disclosure practices, hindering integrated and decision-oriented approaches. This study aims to propose the ESG Risk Canvas, a conceptual, systematic, and visual model to structure the identification, analysis, and response to ESG risks. The research adopts the Design Science Research approach, based on a critical and integrative literature review, to structure and formalize the model's constructs. The results reveal recurrent gaps associated with conceptual fragmentation, the disconnection between materiality and risk, and the lack of structures that integrate strategy, governance, and organizational response. As a result, the ESG Risk Canvas organizes ESG risk as an interdependent system by integrating business logic, strategic goals, stakeholders, materiality, interconnected risks, organizational responses, investments, and measurement and audit mechanisms into a single analytical framework. It is concluded that the model reduces conceptual ambiguities, promotes organizational alignment, and enhances strategic decision-making by structuring the transition between diagnosis and action in complex organizational contexts.

Keywords: ESG risk management, ESG materiality, corporate governance, Canvas models.

ESG Risk Canvas: um modelo conceitual para estruturar a identificação, análise e resposta a riscos

Resumo

O avanço da agenda Ambiental, Social e de Governança (ESG, na sigla em inglês) tem ampliado a complexidade da gestão de riscos organizacionais, enquanto a literatura permanece fragmentada entre materialidade, análise de riscos, governança, cadeia de valor e práticas de *disclosure*, dificultando abordagens integradas e orientadas à decisão. Este estudo tem como objetivo propor o ESG *Risk Canvas*, um modelo conceitual, sistemático e visual para estruturar a identificação, análise e resposta a riscos ESG. A pesquisa adota a abordagem de *Design Science Research*, com base em revisão crítica e integrativa da literatura, para estruturar e formalizar os construtos do modelo. Os resultados evidenciam lacunas recorrentes associadas à fragmentação conceitual, à desconexão entre materialidade e risco e à ausência de estruturas que integrem estratégia, governança e resposta organizacional. Como resultado, o ESG *Risk Canvas* organiza o risco ESG como um sistema interdependente ao integrar lógica de negócio, metas estratégicas, *stakeholders*, materialidade, riscos interconectados, respostas organizacionais, investimentos e mecanismos de medição e auditoria em uma única estrutura analítica. Conclui-se que o modelo reduz ambiguidades conceituais, favorece o alinhamento organizacional e qualifica a tomada de decisão estratégica ao estruturar a transição entre diagnóstico e ação em contextos organizacionais complexos.

Palavras-chave: gestão de riscos ESG, materialidade ESG, governança corporativa, modelos Canvas.

ESG Risk Canvas: un modelo conceptual para estructurar la identificación, el análisis y la respuesta a riesgos ESG

Resumen

El avance de la agenda Ambiental, Social y de Gobernanza (ESG, por sus siglas en inglés) ha incrementado la complejidad de la gestión de riesgos organizacionales, mientras que la literatura sigue fragmentada entre la materialidad, el análisis de riesgos, la gobernanza, la cadena de valor y las prácticas de divulgación, dificultando enfoques integrados y orientados a la decisión. Este estudio tiene como objetivo proponer el ESG Risk Canvas, un modelo conceptual, sistemático y visual para estructurar la identificación, el análisis y la respuesta a los riesgos ESG. La investigación adopta el enfoque de Design Science Research, a partir de una revisión crítica e integradora de la literatura, para estructurar y formalizar los constructos del modelo. Los resultados evidencian lagunas recurrentes asociadas a la fragmentación conceptual, la desconexión entre materialidad y riesgo, y la ausencia de estructuras que integren estrategia, gobernanza y respuesta organizacional. Como resultado, el ESG Risk Canvas organiza el riesgo ESG como un sistema interdependiente al integrar la lógica de negocio, los objetivos estratégicos, los stakeholders, la materialidad, los riesgos interconectados, las respuestas organizacionales, las inversiones y los mecanismos de medición y auditoría en un único marco analítico. Se concluye que el modelo reduce las ambigüedades conceptuales, favorece la alineación organizacional y califica la toma de decisiones estratégicas al estructurar la transición entre el diagnóstico y la acción en contextos organizacionales complejos.

Palabras clave: Gestión de riesgos ESG, Materialidad ESG, Gobierno corporativo, Modelos Canvas.

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INTRODUCTION

The intensification of social, regulatory, and financial pressures on organizations has significantly increased the centrality of Environmental, Social, and Governance (ESG) risks in the contemporary debate on corporate governance and sustainability. The literature indicates that these risks are systemic, interdependent, and dynamic in nature, manifesting themselves throughout value chains, stakeholder relationships, the regulatory environment, and multiple organizational domains (Agrawal et al., 2024; Gallucci et al., 2022). The convergence of physical, operational, reputational, and regulatory risks demonstrates that traditional risk management approaches, predominantly guided by financial or probabilistic logic, are insufficient to capture the complexity and pace of transformation associated with the ESG domain (Cambridge Centre for Risk Studies, 2020).

In this context, Enterprise Risk Management (ERM) can be understood as a structured and integrated process for identifying, assessing, and responding to risks that affect an organization's ability to achieve its strategic objectives (Committee of Sponsoring Organizations of the Treadway Commission, 2023). The incorporation of ESG factors into this domain expands the traditional scope of ERM by including environmental, social, and governance dimensions as relevant determinants of risk exposure and long-term value creation (Lee, 2025; Organisation for Economic Co-operation and Development [OECD], 2023).

Recent literature further emphasizes that the integration of ERM and ESG is not merely a thematic expansion of risk management, but rather a shift in its underlying management logic, requiring holistic and cross-functional approaches capable of capturing interdependencies and systemic effects (Beasley et al., 2005; Jagrič et al., 2025). From this perspective, ESG risk management is understood as a foundational component of sustainable value creation, linking financial performance, institutional legitimacy, and long-term organizational resilience.

Although there has been substantial growth in international frameworks, standards, and guidelines—such as GRI, TCFD, ISSB, the GHG Protocol, and the OECD (2023) guidelines—the academic literature has identified persistent methodological fragmentation in the way ESG risks are addressed. In many cases, these risks are treated in isolation, either as environmental issues, social issues, or compliance matters, resulting in partial assessments that are weakly integrated with corporate strategy and disconnected from formal governance and decision-making mechanisms (Lee, 2025; Uyar et al., 2023). This fragmentation is largely associated with the absence of an integrated ontological framework capable of coherently structuring the relationships among business model, materiality, stakeholders, supply chain, risks, and organizational responses (Kornyshova & Deneckère, 2010; Osterwalder, 2004).

To achieve this overall objective, the study establishes the following specific objectives: (i) critically examine existing ESG risk management approaches by identifying the conceptual, methodological, and operational gaps that justify the need for a new model (Gorzeń-Mitka, 2023); (ii) systematize the main theoretical foundations related to risk, governance, materiality, sustainability, value chain, and visual thinking that support the proposed model (Akkerman & Bakker, 2019; Joyce & Paquin, 2016; Osterwalder, 2004); (iii) analyze the methodological principles underlying Canvas models and other visual frameworks, assessing their suitability for representing complex domains and supporting decision-making processes (Brown et al., 2021; Poeppelbuss & Durst, 2019); and (iv) structure the conceptual components of the ESG Risk Canvas by organizing them into a coherent visual logic that reflects the interdependence among strategy, materiality, risks, and governance (Agrawal et al., 2024; Carnevale & Drago, 2024).

The articulation of these objectives addresses an important gap identified in the literature: the absence of a visual instrument capable of systematically integrating the various elements that comprise ESG risk into a decision-oriented perspective. By consolidating these elements into an integrative conceptual model, the ESG Risk Canvas seeks to contribute to the advancement of the ESG risk management literature by expanding the understanding of the relationships among strategy, governance, and sustainability in complex organizational contexts.

This study expands and deepens the preliminary proposal presented by Muncinelli et al. (2025), originally introduced at the Symposium on Production Engineering (*Simpósio de Engenharia de Produção* - SIMPEP) as an initial conceptual framework, advancing the theoretical refinement and systematization of the proposed model.

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THEORETICAL BACKGROUND

ESG, systemic risk, and interdependent complexity

For the purposes of this study, ESG risk is defined as the possibility that events or conditions associated with environmental, social, and governance factors may positively or negatively affect an organization's ability to achieve its strategic objectives and generate long-term economic and institutional value (Gallucci et al., 2022; Du et al., 2024). This definition encompasses both financial impacts and reputational, regulatory, and operational effects, reflecting the broader nature of these risks in the contemporary organizational context.

Complementarily, the literature characterizes ESG risk management as the systematic process of identifying, assessing, and responding to risks associated with environmental, social, and governance factors that affect operations, reputation, and financial performance, constituting a central element of sustainable corporate behavior (Jagrič et al., 2025).

The consolidation of the ESG agenda stems from the recognition that environmental, social, and governance factors directly influence organizations' ability to create long-term value while simultaneously increasing their exposure to systemic, regulatory, reputational, and economic risks. The literature demonstrates that these factors affect returns, cost of capital, operational stability, and financial sustainability, making them fundamental dimensions of organizational resilience (Gallucci et al., 2022; Maybee et al., 2023).

This agenda has substantially expanded the traditional concept of risk, historically associated with financial and probabilistic metrics, by incorporating physical, transition, social, ethical, and regulatory risks. These risks exhibit a high degree of interdependence and uncertainty and are often difficult to capture using conventional approaches (Lee, 2025; Nurrizkiana et al., 2024).

From this perspective, systemic risk refers to the possibility that adverse events propagate through structural interdependencies between organizational elements and their environment, generating cascading effects that extend beyond the original source of the risk (Cambridge Centre for Risk Studies, 2020). In the ESG context, this characteristic is particularly relevant, as environmental impacts may trigger social, regulatory, and economic effects, giving rise to nonlinear dynamics that are difficult to predict (Du et al., 2024; Ivanov, 2025).

In this context, ESG risks no longer manifest themselves as isolated events but instead emerge within systems characterized by high connectivity, multiple layers of impact, and nonlinear propagation mechanisms (Cambridge Centre for Risk Studies, 2020). The literature highlights that these risks are amplified throughout global value chains (Ivanov, 2025), are highly context-dependent and difficult to measure using stable historical series (Du et al., 2024) and are subject to information asymmetries arising from divergent stakeholder perceptions (Bax et al., 2023).

Given these characteristics, traditional risk management models are limited in their ability to represent the systemic and interdependent nature of ESG risks, shifting the focus from isolated measurement toward the need for an integrated understanding of the risk system.

Materiality, stakeholders, and value chains as mechanisms for prioritizing ESG risk

In environments characterized by high complexity and uncertainty, ESG risk management requires mechanisms capable of reducing analytical overload without eliminating relevant dimensions of the problem. In this regard, materiality emerges as a central prioritization instrument, enabling the identification of relevant ESG topics by simultaneously considering their impacts on organizational performance and their impacts on society and the environment. Materiality also serves as a mechanism for prioritizing the topics from which ESG risks should be identified and assessed.

The literature indicates that materiality is sector-specific, dynamic, and highly dependent on stakeholder perceptions (Wit & Pylak, 2020), while also being influenced by public policies and regulatory pressures that continuously redefine the boundaries of what is considered acceptable (OECD, 2023). Its association with organizational legitimacy further reinforces the role of social perception in determining the relevance attributed to ESG issues (Boiral et al., 2025).

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However, studies indicate that materiality and risk are frequently treated as parallel and disconnected processes, resulting in inconsistencies between diagnosis, prioritization, and decision-making. This limitation is further reinforced by the observation that a significant proportion of ESG risks emerges from the interactions between organizations and their social, economic, and institutional environments (Freeman, 2015; Gallucci et al., 2022), as well as throughout value chains that extend beyond the formal boundaries of the firm (Ivanov, 2025; OECD, 2023).

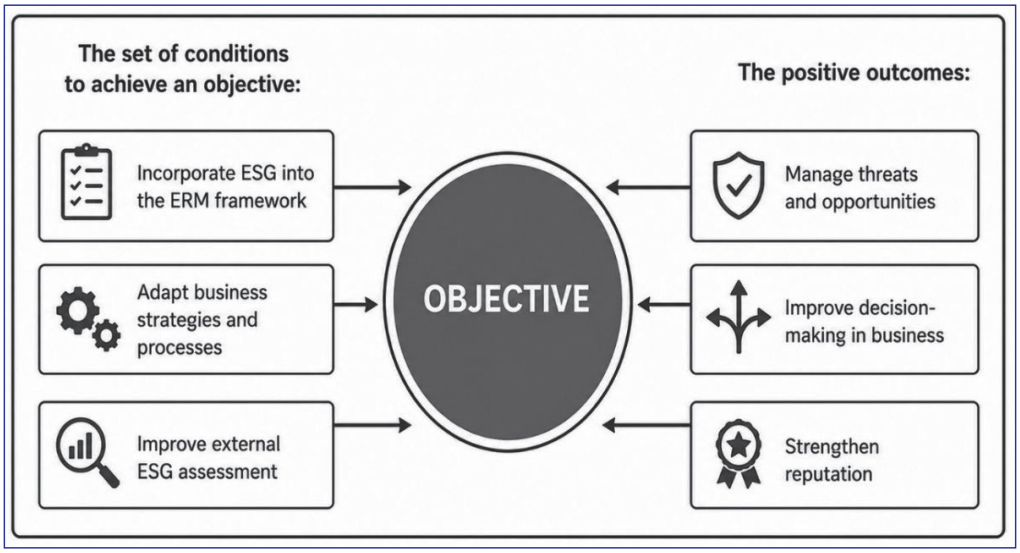
Strategy, business models and organizational architecture

ESG risks do not arise exogenously; rather, they are shaped by the way organizations create, deliver, and capture value. The Business Model Ontology defines business models as representations of the logic through which value is created, delivered, and captured (Osterwalder, 2004), providing a structured framework for understanding how strategic decisions shape risk exposure.

Elements such as the value proposition, key activities, resources, partnerships, and the economic and financial structure define the points at which environmental, social, and governance risks may emerge, propagate, and generate economic and reputational impacts. In this sense, ESG risk can be understood as a direct function of the organization's value creation logic.

The business architecture literature reinforces this perspective by emphasizing the interdependence among organizational capabilities, processes, information, and structures in absorbing, mitigating, or amplifying risks (Business Architecture Guild, 2018). ERM can be understood as a structured and integrated approach aimed at identifying, assessing, and managing risks across the organization, overcoming fragmented approaches and promoting a holistic view of risk exposure (Beasley et al., 2005). In this context, incorporating ESG factors broadens the scope of ERM by integrating environmental, social, and governance dimensions into organizational decision-making (Figure 1).

Figure 1
Integrating ESG into the ERM Framework



Source: Adapted from Massey (2024).

The integration of ESG into corporate risk management demonstrates that these risks should be treated as an integral part of organizational architecture. Complementarily, the Business Process Management literature emphasizes that organizational processes enable auditability, traceability, and the systematic identification of risks (vom Brocke & Mendling, 2018), reinforcing the connection among strategy, operations, and risk exposure.

Visual thinking, ontologies, and structural gaps in ESG risk management

Given the need to integrate strategy, governance, and ESG risk, visual models have become increasingly relevant for organizing complex information and supporting decision-making processes. Canvas-based structures have been used to synthesize multidimensional domains, facilitate interdisciplinary communication, and reduce analytical ambiguities (Brown et al., 2021; Joyce & Paquin, 2016).

The literature on ontologies and conceptual models also highlights the importance of structures capable of organizing relationships among different elements of a system, thereby promoting analytical consistency and shared understanding (Kornyshova & Deneckère, 2010; Vijaya et al., 2025). In the ESG context, the absence of such structures hinders the integration of materiality, strategy, governance, and organizational response, thereby justifying the proposal of an integrative visual model.

THEORETICAL FINDINGS FROM THE LITERATURE REVIEW AND IMPLICATIONS FOR DESIGN

The theoretical findings presented in this section synthesize the main elements identified in the literature on ESG, risk, materiality, stakeholders, governance, and visual thinking. The integration of these domains made it possible to identify recurring patterns and conceptual requirements that underpin the proposal of the ESG Risk Canvas.

Integrative synthesis of literature

The reviewed literature converges on the need for approaches capable of representing ESG risks in an integrated manner, moving beyond models that are excessively segmented across environmental, social, and governance dimensions. The analysis of the studies led to the identification of five key theoretical findings that underpin the proposal of the ESG Risk Canvas.

The first finding indicates that ESG risks exhibiting a high degree of interdependence and are poorly aligned with traditional linear models. Environmental, social, regulatory, and reputational impacts tend to propagate in interconnected ways, making them difficult to understand through isolated or strictly quantitative approaches.

The second finding demonstrates that materiality and risk analysis frequently remain disconnected in organizational practice. Although materiality serves as a mechanism for prioritizing relevant issues, the literature highlights limitations in translating these issues into concrete risk exposures and structured organizational responses (Gallucci et al., 2022; Lee, 2025).

The third finding indicates that a significant proportion of ESG risks emerge from relationships with stakeholders and value chains. Many of these risks arise beyond the organization's formal boundaries, particularly in contexts involving dependence on suppliers, business partners, and institutional pressures (Freeman, 1984; Ivanov, 2025).

The fourth finding reinforces that governance directly influences an organization's ability to interpret and respond to ESG risks. Oversight structures, decision-making processes, and control mechanisms shape the way risks are prioritized, monitored, and managed.

Finally, the fifth finding highlights the absence of structures capable of integrating strategy, materiality, governance, and risk within a single analytical system. Although relevant frameworks exist for disclosure, risk management, and sustainability, the literature still reveals limitations in the operational articulation of these elements.

Taken together, these findings support the need for a conceptual model capable of coherently organizing the key components involved in ESG risk management, thereby providing the theoretical foundation for the development of the ESG Risk Canvas.

Unified matrix of theoretical findings and required conceptual domains

Based on the synthesized findings, a conceptual matrix was developed to make explicit the principal domains required for integrated ESG risk management. The matrix organizes the conceptual domains recurrently identified in the literature and demonstrates how different theoretical bodies contribute to the understanding of ESG risk in complex organizational contexts.

Its purpose is not to provide an operational description of the ESG Risk Canvas, but rather to consolidate the elements that the literature identifies as essential for systematically structuring the identification, analysis, and response to ESG risks. In this sense, the matrix serves as a mechanism for theoretical synthesis and conceptual traceability, linking the findings of the literature review to the components that subsequently underpin the design of the artifact.

The analysis reveals the recurrence of domains associated with business logic and strategy, stakeholders and value chains, ESG materiality, environmental, social, and governance risks, organizational response mechanisms, the regulatory environment, resource allocation, auditing, and visual models for support.

Table 1
Conceptual Foundations of the ESG Canvas

Conceptual mastery required	Theoretical foundation identified	Key Relevant Authors
Business logic analysis	ESG risks depend on internal workings, value model, and structure of activities	Yao et al. (2026); Osterwalder (2004); Business Architecture Guild (2018);
Strategy and value drivers	ESG factors change strategy, cost of capital and resilience	Lee (2025); Carnevale & Drago (2024)
Stakeholders and legitimacy	Risks influenced by external expectations and social pressures	Gallucci et al. (2022); Boiral et al. (2025); Wong & Zhang (2024)
Value chain and third-party risks	Risks emerge outside the focal firm; Dependence on suppliers	Ivanov (2025); OECD (2023)
Materiality	Mechanism for prioritizing and selecting critical topics	Wit & Pylak (2020); Garcia-Zavala et al. (2023)
Environmental risks	Physical, transitional, ecological, and climate events	International Energy Agency [IEA] (2021); Garcia-Zavala et al. (2023)
Social risks	Work, health, conflicts, community, reputation	Nurrizkiana et al. (2024); Wit & Pylak (2020)
Governance risks	Ethics, compliance, controls, regulatory risks	Uyar et al. (2023); Cambridge Centre for Risk Studies (2020)
Risk responses	Mitigation, contingency, adaptive governance	Nilsen (2015); Birken et al. (2017)
Regulation and transparency	Regulatory pressures and disclosure obligations	OECD (2023); Gallucci et al. (2022)
Resource allocation	ESG investment decisions	Song et al. (2026); Carnevale & Drago (2024)
Auditing, Metrics, and Monitoring	Need for validation, traceability and measurement	Comoglio & Botta (2012) Dobrowolski et al. (2022)
Visual thinking	Cognitive representation and complexity reduction	Joyce & Paquin (2016)
Ontologies and formal models	Conceptual frameworks for organizing and relating information	Osterwalder (2004); Kornyshova & Deneckère (2010)

Source: Prepared by the authors.

Table 1 summarizes these conceptual domains by relating them to their respective theoretical foundations and to the principal authors identified in the literature. This systematization establishes the conceptual basis required for deriving the design requirements presented in the following section.

Design requirements derived from literature

Based on the conceptual matrix presented above, the theoretical findings were translated into design requirements to guide the development of the ESG Risk Canvas. Consistent with the principles of Design Science Research (DSR), this stage sought to translate theoretical foundations into design criteria applicable to the modeling of the artifact.

The design requirements derive directly from the domains identified in the literature, including strategy, business model, stakeholders, value chain, materiality, ESG risks, governance, the regulatory environment, risk response, resource allocation, and monitoring and auditing mechanisms. In addition, they incorporate principles of visual thinking and conceptual organization aimed at reducing ambiguity and supporting decision-making in complex contexts.

Based on these requirements, the ESG Risk Canvas was conceived as an integrated visual framework capable of articulating, within a single analytical logic, the principal elements involved in the identification, analysis, and response to ESG risks. This derivation ensures consistency between the reviewed theoretical foundations and the structural components of the proposed model.

DESIGN METHODOLOGY OF THE ESG RISK CANVAS

Design Science Research (DSR) was adopted as the methodological approach to guide the development of the ESG Risk Canvas as a conceptual artifact. The methodological process comprised three main stages: (i) identifying the limitations in the ESG risk literature; (ii) systematizing the theoretical constructs required for the model; and (iii) organizing these constructs into an integrated visual framework based on the principles of Canvas models (Hevner et al., 2004; van Capelleveen et al., 2019).

Problem identification and definition

The first stage focused on identifying the principal limitations in the ESG risk literature by examining academic studies, regulatory frameworks, materiality practices, governance models, and ESG assessment instruments. The analysis revealed conceptual fragmentation, methodological divergences, and difficulties in articulating risk, materiality, strategy, and organizational governance (Gallucci et al., 2022; Uyar et al., 2023). In addition, a predominance of approaches oriented towards disclosure and measurement was observed to the detriment of models designed to integrate diagnosis and decision-making (Boiral et al., 2025). These findings support the central research problem of this study: the absence of an integrated conceptual framework capable of connecting strategy, materiality, ESG risks, and organizational responses.

The literature review adopted a critical and integrative perspective, prioritizing studies relevant to the domains of risk management, ESG materiality, governance, stakeholders, value chains, and visual models. The selection of the literature was guided by conceptual relevance, thematic recurrence, and explanatory power for developing the model's constructs, consistent with integrative approaches associated with DSR (van Capelleveen et al., 2019).

Table 2 summarizes the principal limitations identified in the literature, serving as the empirical-conceptual foundation for defining the design requirements discussed in the previous section.

Table 2
Problem identification: Identified limitations

Element	Identified evidence	Supporting authors
Conceptual fragmentation	Each ESG dimension has evolved independently, without a common ontology.	Gallucci et al. (2022)
Methodological divergences	ESG ratings, ERM, and materiality rely on distinct epistemological approaches.	Uyar et al. (2023)
Disproportionate emphasis on disclosure	ESG is treated primarily as a reporting exercise rather than as a decision-support instrument.	Boiral et al. (2025)
Lack of a systemic perspective	Insufficient integration among business, risk, and value chain.	OECD (2023); Du et al. (2024)

Source: Prepared by the authors.

The consolidation of this evidence establishes the conceptual foundation of the research problem and justifies the need for an integrative artifact.

Systematization of theoretical constructs

The second stage focused on systematizing the theoretical foundations required to develop the constructs of the ESG Risk Canvas. Studies addressing risk management, ESG materiality, corporate governance, stakeholders, value chains, and visual models were integrated to identify recurring elements and conceptual relationships relevant to structuring the model. The analysis demonstrated that ESG risks are inherently interdependent and require mechanisms capable of connecting strategy, materiality, governance, and organizational response within a single analytical framework.

The constructs were developed through the identification and consolidation of recurring conceptual categories found in the literature, thereby ensuring coherence across the different theoretical domains underpinning the model (Hevner et al., 2004). Table 3 summarizes the principal constructs derived from this theoretical systematization, associating each construct with its central idea and the authors supporting its incorporation into the model.

Table 3
Development of theoretical constructs

Construct	Central idea	Supporting authors
ESG risk	Interdependent and systemic risks	Du et al. (2024); Cambridge Centre for Risk Studies (2020)
Materiality	Identification and prioritization of relevant issues	Wit & Pylak (2020); Garcia-Zavala (2023)
Governance	Oversight and control mechanisms	Uyar et al. (2023); Lokuwaduge et al. (2022)
Stakeholders	Social and institutional pressures	Gallucci et al. (2022); Wong & Zhang (2024)
Ontology	Coherent organization of the domain	Vijaya et al. (2025); Kiren & Shoaib (2016)
Visual thinking	Reduction of ambiguity and knowledge synthesis	Joyce & Paquin (2016); Akkerman & Bakker (2019)

Source: Prepared by the authors.

The constructs summarized in Table 3 provided the conceptual foundation for structuring the ESG Risk Canvas.

Methodological principles of Canvas models and design consolidation of the ESG Risk Canvas

The third stage focused on analyzing the methodological principles underlying Canvas-based visual models, particularly those intended to organize complex domains and support decision-making. The analysis identified recurring characteristics, including modularity, integration across analytical dimensions, the use of guiding questions, and visual synthesis (Joyce & Paquin, 2016; Poeppelbuss & Durst, 2019; Osterwalder, 2004).

These principles were reinterpreted considering the characteristics of ESG risks, particularly their systemic and multidimensional nature. Modularity enabled the organization of the model into distinct analytical fields, while visual synthesis was adopted to facilitate interdisciplinary communication and reduce cognitive complexity in decision-making contexts characterized by uncertainty and interdependence (Akkerman & Bakker, 2019; Brown et al., 2021).

Table 4
Methodological principles derived from Canvas models

Principle	Methodological contribution	Supporting authors
Modularity	Enables ESG to be decomposed into distinct analytical fields	Osterwalder (2004)
Horizontal coherence	Ensures integration across analytical dimensions	Joyce & Paquin (2016)
Vertical coherence	Connects different levels of analysis	van Capelleveen et al. (2019)
Guiding questions	Structure analytical reasoning	Lopes & Silva (2021)
Boundary object	Facilitates interdisciplinary collaboration	Akkerman & Bakker (2019)
Visual synthesis	Reduces cognitive complexity	Brown et al. (2021)

Source: Prepared by the authors.

Based on the principles presented in Table 4, the ESG Risk Canvas was structured as an integrated visual framework in which the theoretical constructs and design requirements are organized into interrelated analytical fields. This organization seeks to ensure consistency between the reviewed theoretical foundations and the structural components of the proposed artifact.

Unified matrix of theoretical findings and ESG Risk Canvas fields

Based on the theoretical findings and constructs consolidated in the previous stages, a matrix was developed to make explicit the relationship between the fields of the ESG Risk Canvas and their respective theoretical foundations (Table 5).

Table 5
Unified matrix relating the ESG Risk Canvas fields to their theoretical foundations

ESG Risk Canvas field	Main theoretical foundation	Principal references
Business line	Business model as the logic of value creation and capture; integration of resources, activities, and stakeholders; systemic view of the business	Osterwalder (2004); Business Architecture Guild (2018); Dobrowolski & Sułkowski (2021); Mendoza (2015)
Strategic objectives	Strategy linked to organizational capabilities, processes, and value creation; ESG impacts on costs, competitive advantage, and resilience	Lee (2025); Carnevale & Drago (2024); Osterwalder (2004); Nilsen (2015)
Stakeholders and shareholders	Stakeholder theory; social legitimacy; public perception; external ESG performance assessment; impacts on the social license to operate	Gallucci et al. (2022); Wit & Pylak (2020); Boiral et al. (2025); Wong & Zhang (2024); OECD (2023)
Materiality – Environmental	Environmental risks, climate, resource use, ecosystems, physical and transition impacts, ecological dependencies	Ivanov (2025); Garcia-Zavala et al. (2023); Joyce & Paquin (2016); IEA (2021)
Materiality – Social	Labor, communities, conflicts, safety, reputation, legitimacy, and direct and indirect social impacts	Wit & Pylak (2020); Garcia-Zavala et al. (2023); Boiral et al. (2025); IEA (2021)
Materiality – Governance	Governance, transparency, controls, incentives, ethics, internal and regulatory risks, institutional pressures	Uyar et al. (2023); Lokuwaduge et al. (2022); Comoglio & Botta (2012)

(Continue)

ESG Risk Canvas field	Main theoretical foundation	Principal references
Environmental risks	Environmental risk taxonomies, interdependent risks, complex system scenarios, physical events	Cambridge Centre for Risk Studies (2020); IEA (2021); Garcia-Zavala (2023)
Social risks	Social risks, health and safety, human risks across the value chain, reputational impacts	IEA (2021); Wit & Pylak (2020); Nurrizkiana et al. (2024)
Governance risks	Regulatory, ethical, compliance, and governance risks; influence of corporate behavior on ESG risk	Cambridge Centre for Risk Studies (2020); Nilsen (2015); Birken et al. (2017); Song et al. (2026)
Risk responses (containment/contingency)	Implementation science, barriers and facilitators, mitigation strategies, adaptive governance	Nilsen (2015); Birken et al. (2017); Costa & Terentim (2017)
Regulatory environment	Sectoral regulation, public policies, global guidelines, mandatory transparency, institutional mandates	Dobrowolski & Sułkowski (2021); IEA (2021); OECD (2023); Gallucci et al. (2022)
Third parties	Global value chains, extended risk, supplier dependence, partner auditing	Ivanov (2025); Wit & Pylak (2020); IEA (2021); vom Brocke & Mendling (2018)
Investments and expenditures	Capital allocation decisions under ESG risk; impacts on cost of capital; mitigation costs	Lee (2025); Song et al. (2026); Carnevale & Drago (2024); vom Brocke & Mendling (2018)
Measurement and auditing	ESG metrics, performance auditing, monitoring, Triple Bottom Line (TBL), compliance, lack of comparability	Comoglio & Botta (2012); Wit & Pylak (2020); Dobrowolski et al. (2022); Bax et al. (2023)

Source: Prepared by the authors.

The matrix reinforces the conceptual foundation of the ESG Risk Canvas by relating each field of the model to the corresponding theoretical domains identified in the literature. The empirical validation of the artifact represents an opportunity for future research.

PROPOSED ARTIFACT: THE ESG RISK CANVAS

The ESG Risk Canvas is a conceptual, visual, and modular artifact designed to support the identification, analysis, and response to ESG risks in complex organizational contexts. The model organizes, within a single analytical framework, elements related to strategy, materiality, stakeholders, governance, risks, and organizational responses. The Canvas was developed as a decision-support tool, enabling multidisciplinary teams to systematically identify ESG risks and make explicit the relationships among organizational context, risk exposure, and organizational response. Its structure seeks to reconcile conceptual robustness, interpretability, and flexibility for application across different organizational contexts.

Reading principles and the integrated logic of the ESG Risk Canvas

The ESG Risk Canvas was conceived to support the organization of analytical reasoning concerning ESG risks. Its reading logic articulates elements related to organizational context, stakeholders, materiality, risks, responses, and monitoring mechanisms.

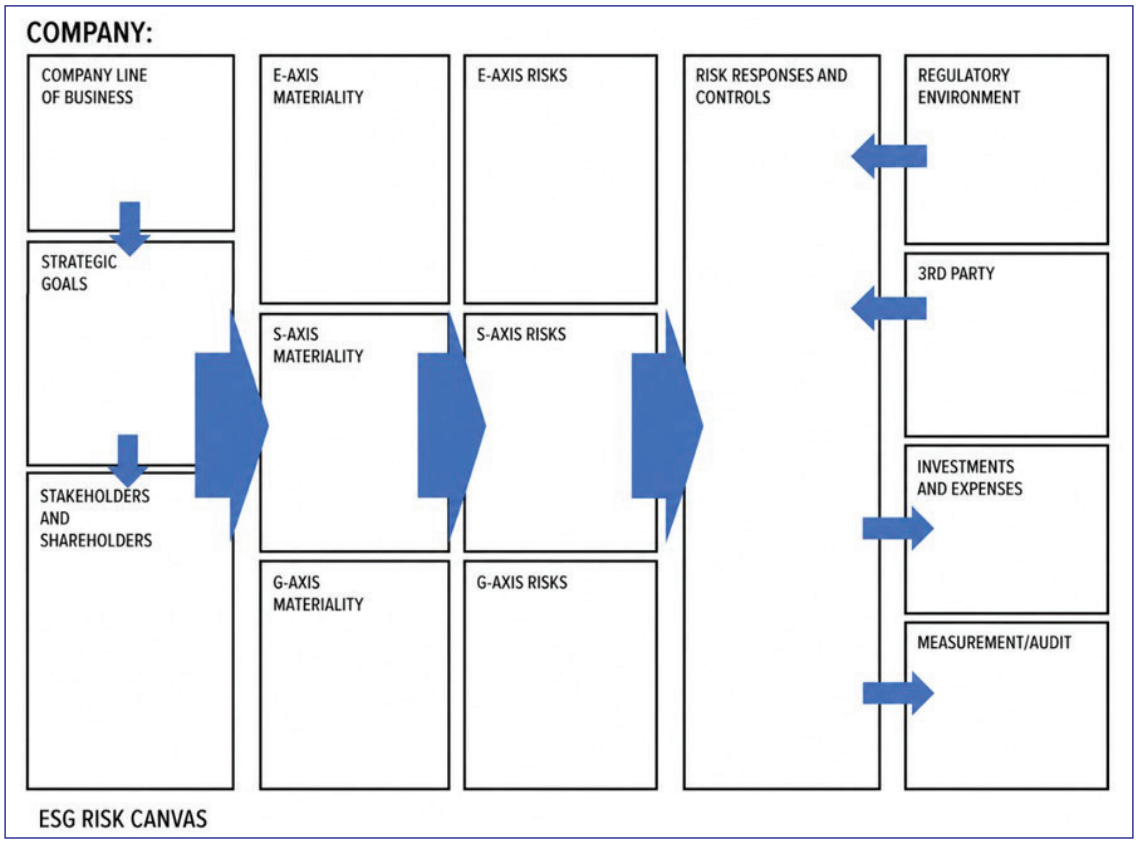
The model is organized into modular and interrelated blocks, making it possible to connect strategy, operations, and governance within a single visual framework. This organization is intended to foster a shared understanding across different organizational functions and to support decision-making processes in contexts characterized by high levels of complexity.

Epistemological analogies and the centrality of visual representation

The decision to develop a structured visual artifact is supported by well-established traditions of cognitive support for decision-making. The literature on the A3 Report, originating from the Toyota Production System, provides a relevant epistemological analogy by demonstrating that the visual organization of information contributes to improving analytical thinking and problem solving (Figure 2).

The value of the A3 Report lies not in its format, but in its ability to enforce synthesis, objectivity, and focus by condensing the essential elements of a problem into a single visual structure. This cognitive function of promoting alignment, shared understanding, and decision support directly inspired the conception of the ESG Risk Canvas.

Figure 2
Structure of the A3 Report as a reference for the development of the ESG Risk Canvas



Source: Prepared by the authors

Like the A3 Report, the ESG Risk Canvas does not seek documentary completeness but rather structural coherence. The integrated visualization of its elements enables users to understand the system, identify interdependencies, and make informed decisions while reducing interpretative ambiguity and cognitive asymmetries among participants in the decision-making process.

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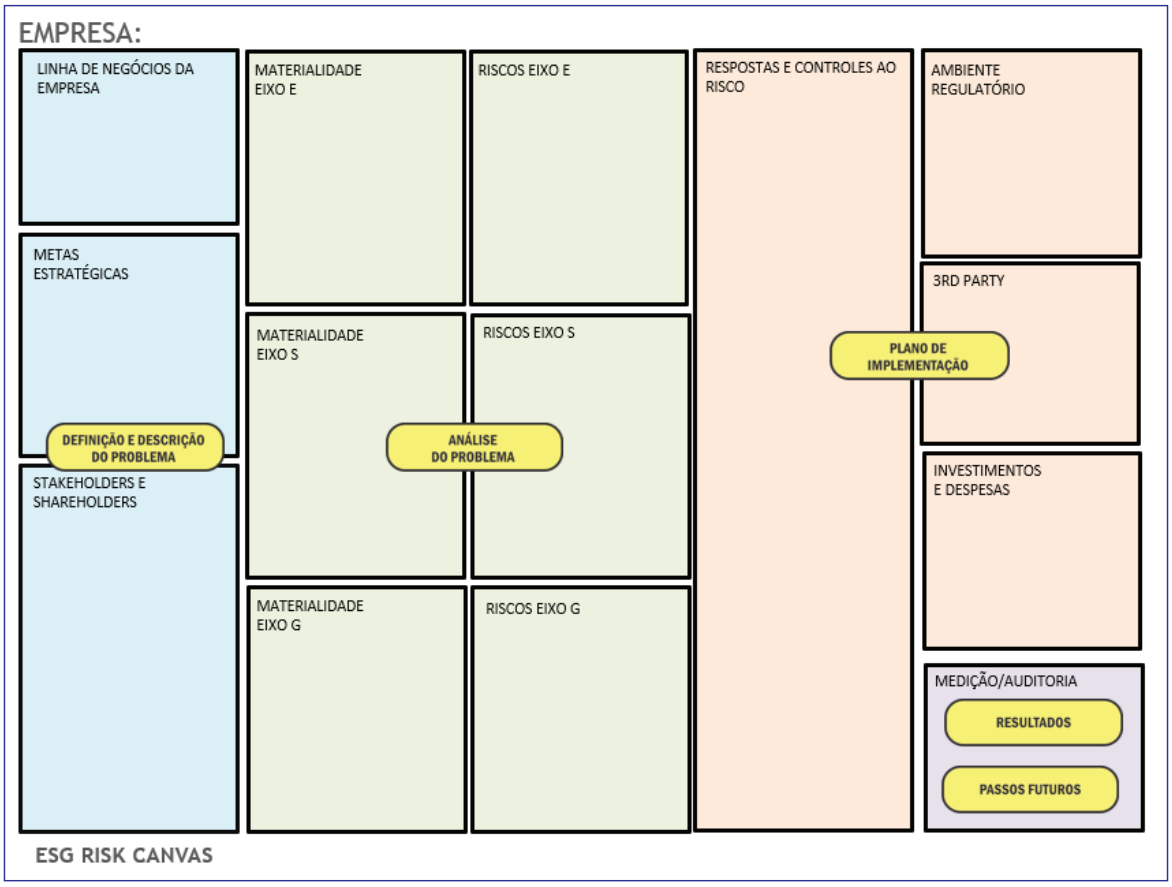
Conceptual structure of the ESG Risk Canvas

The structure of the ESG Risk Canvas was conceived to reflect a logical reasoning process for ESG risks rather than merely providing a graphical organization of information. The model organizes its blocks into functional groups associated with different stages of the analytical process: context, risk manifestation, prioritization, response, and decision support.

The Canvas comprises 12 blocks, organized into five analytical groups. Each block is defined by its conceptual purpose and by a guiding question that structures the decision-making process. These groups represent different cognitive functions: the context in which risk originates; the actors and organizational boundaries through which it manifests itself; the analytical core of materiality and risk; the response mechanisms; and the supporting elements related to evidence generation and organizational learning.

It is important to emphasize that the ESG Risk Canvas is not intended to represent the entire risk management cycle, as described in normative frameworks. Rather, its purpose is to structure the critical stage that translates diagnosis into action. Accordingly, the model focuses on the integrated organization of the elements required to identify, systematize, and prioritize ESG risks and, most importantly, to connect them with organizational responses, investment decisions, and evidence-generation mechanisms. Elements such as information, consultation, and monitoring are therefore not treated as isolated stages but are incorporated transversally into the measurement, auditing, and governance blocks, which sustain the continuous cycle of review and organizational learning (Figure 3).

Figure 3
ESG Risk Canvas



Source: Prepared by the authors.

The organization of the Canvas into analytical groups reinforces its interpretation as an integrated decision-support system rather than as a thematic checklist.

Summary framework of the artifact

To consolidate the structure of the ESG Risk Canvas and clarify the role of each component, Table 6 presents a summary framework relating the analytical groups, individual blocks, their primary functions, and the corresponding theoretical foundations.

Table 6
Consolidated structure of the ESG Risk Canvas

Group	Block	Primary function	Supporting references
A	Business line	Defines the logic of value creation and the organization's structural risk exposure	Osterwalder (2004)
A	Strategic objectives	Connects ESG risks with strategy and long-term organizational objectives	Song et al. (2026)
A	Regulatory and institutional environment	Defines regulatory boundaries and institutional pressures	OECD (2023)
B	Stakeholders	Structures legitimacy, expectations, and external pressures	Gallucci et al. (2022)
B	Third parties (3rd party)	Represents extended and transferred risks throughout the value chain	Du et al. (2024)
C	Environmental materiality (E)	Assesses environmental relevance and impacts	Wit & Pylak (2020)
C	Social materiality (S)	Assesses social relevance and impacts	Wong & Zhang (2024)
C	Governance materiality (G)	Assesses governance relevance and quality	Lokuwaduge et al. (2022)
D	ESG risks	Identifies and structures priority threats	Cambridge Centre for Risk Studies (2020)
D	Risk responses	Organizes mitigation and risk treatment capabilities	OECD (2023)
E	Investments and expenditures	Relates risk to resource allocation decisions	Carnevale & Drago (2024)
E	Measurement and auditing	Generates evidence, verification, and organizational learning	Dobrowolski et al. (2022)

Source: Prepared by the authors.

Table 6 further reinforces the conceptual traceability of the artifact by demonstrating that each block is directly derived from the theoretical findings and design requirements developed throughout this study.

Scientific contribution and implications of the artifact

The ESG Risk Canvas contributes to literature by integrating, within a single analytical framework, elements that are frequently addressed separately in studies on ESG and risk management. Whereas established frameworks tend to emphasize disclosure, compliance, measurement, or performance assessment, the proposed model seeks to connect strategy, materiality, stakeholders, governance, risks, and organizational responses through a decision-oriented analytical logic.

By organizing these relationships into a visual and modular structure, Canvas promotes a systemic understanding of ESG risks and supports decision-making in complex organizational environments. The model also facilitates interdisciplinary communication among functions such as sustainability, risk management, compliance, strategy, and finance, providing greater analytical clarity in the identification and prioritization of relevant risk exposures.

From a practical perspective, the ESG Risk Canvas provides a flexible framework to support organizations in systematically identifying ESG risks, linking diagnosis to organizational response, and connecting risks with investment decisions and monitoring mechanisms. In addition, recent studies suggest that integrated visual representations of ESG can enhance transparency, systemic understanding, and the organizational usefulness of risk-related information (Nicolò et al., 2025).

DISCUSSION

The ESG Risk Canvas was conceived in response to the limitations identified in the ESG risk literature, particularly the difficulty of integrating strategy, materiality, governance, and organizational response within a single analytical framework. Although established frameworks provide important contributions to the integration of ESG and risk management (Committee of Sponsoring Organizations of the Treadway Commission & World Business Council for Sustainable Development, 2018; OECD, 2023), most existing approaches remain primarily focused on disclosure, compliance, metrics, or performance assessment (Gallucci et al., 2022; Uyar et al., 2023).

In this context, the principal contribution of the ESG Risk Canvas lies in the proposal of a decision-oriented conceptual framework capable of connecting elements that are frequently treated separately in the literature. By integrating strategy, stakeholders, materiality, ESG risks, and organizational responses into a single visual model, Canvas expands the ability to represent ESG risks as interdependent phenomena embedded within their organizational context.

The model also reinforces the understanding that ESG risks are not limited to isolated events or to factors originating exclusively within the organization. A significant proportion of these risk exposures arises from relationships with stakeholders, value chains, regulatory pressures, and reputational dynamics, requiring broader approaches to risk identification and response. In this regard, the ESG Risk Canvas aligns ESG risk management with a systemic perspective consistent with the recent literature on sustainability, governance, and organizational resilience (Du et al., 2024; Khalfi & Bami, 2025).

Another important contribution concerns the explicit connection between strategy and ESG risk. By positioning business logic and strategic objectives as foundational elements of the model, the Canvas reinforces the idea that ESG risks arise from organizations' own strategic choices and value creation processes, rather than solely from external or regulatory factors.

Furthermore, the visual format of the ESG Risk Canvas facilitates analytical alignment and interdisciplinary communication across different organizational functions. By organizing the principal components of ESG risk within a unified structure, the model helps reduce interpretative ambiguities and supports decision-making processes in contexts characterized by high levels of complexity.

Finally, the study contributes to advancing literature by bringing together fields that have traditionally been treated separately—such as sustainability, governance, risk management, and visual thinking—within a conceptual artifact designed to support the identification, analysis, and response to ESG risks.

CONCLUSION

This study proposed the ESG Risk Canvas as a conceptual model designed to support the identification, analysis, and response to ESG risks. Grounded in the principles of Design Science Research and an integrative literature review, the model was developed to connect strategy, materiality, stakeholders, governance, risks, and organizational responses within a single analytical framework.

With regard to the proposed objectives, the study achieved the following: (i) critically examined the limitations of current ESG risk management approaches; (ii) systematized the theoretical foundations related to risk, governance, materiality, sustainability, and visual thinking; (iii) analyzed the methodological principles of Canvas-based visual models; and (iv) developed the ESG Risk Canvas as a decision-oriented conceptual artifact.

From a theoretical perspective, the study's principal contribution lies in proposing an integrated framework to support the articulation of strategy, materiality, governance, and ESG risk. The model contributes to bridging the fields of sustainability, risk management, and corporate governance by providing a conceptual basis for representing ESG risks in complex organizational contexts.

From a practical perspective, the ESG Risk Canvas provides a flexible framework to support organizations in systematically identifying ESG risks, prioritizing relevant risk exposures, and linking diagnosis with organizational responses and monitoring mechanisms. The model also promotes interdisciplinary communication and analytical alignment across different organizational functions.

The study acknowledges limitations inherent to its conceptual nature, particularly the absence of empirical validation of the artifact in specific organizational settings. Future research may therefore explore sector-specific applications of the model, expert evaluations, integration with quantitative risk assessment methods, and the development of digital tools based on the ESG Risk Canvas.

In conclusion, the ESG Risk Canvas provides a structured conceptual foundation for supporting ESG risk management, contributing to greater analytical clarity and improved decision-making in environments characterized by high levels of complexity and multiple institutional pressures.

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RESEARCH DATA AVAILABILITY

The entire dataset supporting the results of this study was published in the article itself.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ARTIFICIAL INTELLIGENCE USAGE

While preparing this paper, the authors used ChatGPT to perform the final editing (grammar and text formatting) and to check for inconsistencies. After using this tool/service, the authors reviewed and edited the content as necessary and assume full responsibility for the published article.

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