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Evaluating corporate social responsibility strategies through a multicriteria decision aiding approach

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Abstract: Corporate Social Responsibility (CSR) has become a central element of organizational strategy, requiring decision-makers to evaluate complex trade-offs among economic, social, and environmental objectives under conditions of uncertainty and imperfect information. Traditional CSR assessment tools often rely on additive aggregation models or single-indicator approaches, which may inadequately capture hierarchical structures, interactions among criteria, and imprecise judgments commonly present in real-world evaluations. This paper proposes a novel framework for the evaluation of CSR strategies, integrating interacting criteria and interval-valued information within a multi-criteria decision analysis perspective. CSR performance is modeled through a hierarchical structure encompassing economic, social, environmental, and governance dimensions, decomposed into operational sub-criteria. Imperfect knowledge regarding criterion evaluations, weights, and decision thresholds is explicitly represented using interval numbers, allowing for a realistic treatment of expert judgment and stakeholder heterogeneity. The proposed approach is illustrated through case studies of organizations implementing alternative CSR strategies, where decision alternatives are evaluated and classified using hierarchical interval outranking relations. The method enables both global CSR assessments and partial evaluations at intermediate levels of the hierarchy, providing insights into organizational strengths and weaknesses across CSR dimensions.

Keywords: *Corporate social responsibility, Case study evaluation, Decision support systems.*

1. Introduction

Corporate Social Responsibility (CSR) has evolved from a discretionary and reputation-driven activity into a central component of corporate strategy and social legitimacy. Organizations are increasingly expected to demonstrate responsible behavior across economic, social, environmental, and governance dimensions, responding not only to shareholders but also to a broad range of stakeholders, including employees, communities, regulators, and society at large. This shift has positioned CSR evaluation as a critical issue within the social sciences, particularly in applied research concerned with organizational performance, accountability, and sustainable development (Carroll, 2015; Freeman, Phillips, & Sisodia, 2020).

Despite its growing importance, CSR evaluation remains a complex and contested task. CSR initiatives are inherently multi-dimensional, involving objectives that are often conflicting and difficult to measure using a single metric. Moreover, CSR dimensions are commonly hierarchically structured:

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high-level constructs such as environmental responsibility or social commitment are operationalized through multiple layers of sub-criteria, indicators, and practices. At the same time, CSR assessments frequently rely on qualitative judgments, expert opinions, and incomplete or uncertain data, particularly when long-term social or environmental impacts are involved (Hahn & Figge, 2011; Kotsantonis & Serafeim, 2019).

Empirical research has further shown that the relationship between CSR and organizational performance is far from straightforward. Meta-analyses and recent empirical studies indicate that CSR effects on financial and non-financial outcomes vary significantly across sectors, institutional contexts, and measurement approaches (Díaz, Solares, de-León-Gómez, & Salas, 2022; Friede, Busch, & Bassen, 2015; Orlitzky, Siegel, & Waldman, 2011). These findings highlight the sensitivity of CSR evaluation results to modeling assumptions and reinforce the need for decision-support tools capable of handling uncertainty, heterogeneity, and stakeholder disagreement without imposing unrealistic precision.

In practice, CSR performance is often assessed using scorecards, composite indices, or additive aggregation models. While such approaches are useful for reporting and benchmarking, they typically assume independence among criteria and full compensability, implying that weaknesses in critical CSR dimensions can be offset by strengths in others. From both normative and managerial perspectives, this assumption is problematic: severe deficiencies in labor practices, environmental compliance, or ethical governance cannot be meaningfully compensated by strong economic performance or philanthropic initiatives alone (Fernández et al., 2023; Hubbard, 2009; Michelon, Pilonato, & Ricceri, 2015; Solares et al., 2025).

Within this context, Multi-Criteria Decision Analysis (MCDA) provides a well-established framework for structuring and supporting complex evaluations involving multiple, potentially conflicting criteria. In particular, outranking methods, such as those belonging to the ELECTRE family, are well-suited to CSR evaluation because they rely on the comparison of alternatives through structured arguments "in favor of" and "against" preference statements, rather than through fully compensatory aggregation (Govindan & Jepsen, 2016; Roy, 1991). This logic aligns closely with CSR decision-making, where unacceptable performance in certain dimensions may justifiably block an overall positive evaluation.

Recent methodological advances have further enhanced the relevance of outranking approaches for CSR contexts by addressing two key limitations of traditional models. First, the incorporation of hierarchical criteria structures allows complex evaluation problems to be decomposed into cognitively manageable sub-problems, reflecting how decision-makers conceptualize sustainability and responsibility (Corrente, Greco, & Słowiński, 2016; Fodor & Roubens, 1994; Solares, De-Leon-Gomez, Salas, & Díaz, 2022). Second, the explicit modeling of imperfect information through interval-valued parameters enables the representation of bounded uncertainty, expert disagreement, and imprecision in both criterion evaluations and preference parameters (Fernández, Figueira, & Navarro, 2019; Solares, Salas, De-Leon-Gomez, & Diaz, 2022).

Building on these developments, a hierarchical interval outranking approach with interacting criteria has been proposed to address complex decision problems characterized by hierarchical structures, interaction effects among criteria, and imperfect knowledge (Fernández, Figueira, & Navarro, 2020). This approach allows criterion weights, interaction effects, veto thresholds, and majority thresholds to be expressed as interval numbers, providing a realistic representation of decision-making conditions where precise values are unavailable or unjustified. Importantly, the method supports evaluations not only at the global level but also at intermediate levels of the hierarchy, enabling partial and diagnostic analyses.

This paper applies this hierarchical interval outranking framework to the evaluation of Corporate Social Responsibility strategies, using case studies of organizations implementing alternative CSR approaches. CSR performance is modeled through a hierarchical structure encompassing economic, social, environmental, and governance dimensions, with explicit consideration of interaction effects and interval-valued information derived from expert judgment. The framework supports both comparative

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evaluation and classification of decision alternatives, offering insights into overall CSR positioning as well as dimension-specific strengths and weaknesses.

The applied and evaluative orientation of this study emphasizes case-based analysis, organizational evaluation, and decision-oriented research in social and economic contexts (Farahatan & Wibisiono, 2025; Istanbouli, 2025). By integrating a rigorous decision-aiding methodology with applied CSR assessment, this paper contributes to the social sciences literature on corporate responsibility and provides actionable guidance for managers, policymakers, and stakeholders.

The remainder of the paper is organized as follows. Section 2 reviews relevant literature on CSR evaluation and multi-criteria decision approaches, presenting the hierarchical CSR model and the interval outranking methodology. Section 3 describes the case study design and data collection process. Section 4 discusses the evaluation results and their implications. Finally, Section 5 concludes with directions for future research.

2. Materials and Methods

2.1. Research Design

This study adopts an embedded multiple–case study design to evaluate CSR decision alternatives under realistic conditions (e.g., incomplete information, heterogeneous stakeholders, and interacting sustainability criteria). Case study research is appropriate when the phenomenon is context-dependent and when "how" and "why" questions are central to explanation and evaluation (Yin, 2018). To maximize external analytic generalization, we follow a replication logic by selecting cases that enable both literal replication (similar contexts) and theoretical replication (contrasting contexts expected to produce different CSR trade-offs) (Yin, 2018).

The methodological core is a hierarchical interval outranking approach with interacting criteria, which is suitable when: (i) criteria are naturally structured in multiple levels, (ii) criteria interact (synergy or redundancy), and (iii) imperfect knowledge must be explicitly represented via interval parameters (Fernández, Navarro, & Solares, 2022).

2.2. Unit of Analysis and Decision Alternatives

The unit of analysis is the organization (or business unit) as a CSR-performing entity within its social and institutional environment. Decision alternatives are defined as comparable CSR options, depending on data availability:

1. Organization alternatives: firms $A_1, \ldots, A_n$ evaluated on a common CSR hierarchy (benchmarking).
2. Strategy alternatives within a firm: CSR programs (e.g., "compliance-driven," "community partnership-driven," "supply-chain ethics-first," "net-zero acceleration") evaluated ex ante.
3. Project portfolio alternatives: candidate CSR initiatives competing for funding.

2.3. Case Selection and Sampling Logic

Cases are selected purposively to ensure:

1. sector relevance (e.g., manufacturing or services with material externalities),
2. variation in CSR maturity (basic, intermediate, advanced), and
3. information richness (availability of sustainability reports, interviews, or compliance records).

A typical configuration is 3–6 cases, which balances methodological depth and cross-case interpretability (Navarro, Fernández, Solares, Flores, & Díaz, 2023; Yin, 2018). Where possible, each case includes at least two stakeholder perspectives (e.g., internal management + external/community viewpoint) to reduce single-source bias.

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2.4. CSR Evaluation Model: Hierarchical Criteria Structure

CSR is operationalized through a hierarchical criteria tree. At the top level, we adopt four dimensions widely used in practice and reporting:

- Economic/operational responsibility
- Social responsibility
- Environmental responsibility
- Governance and ethics

The hierarchy is grounded in established CSR guidance and disclosure frameworks, including ISO 26000 (International Organization for Standardization, 2010) and the GRI Standards (Global Reporting Initiative, 2021).

To ensure the evaluation is compatible with newer sustainability disclosure expectations, we also allow criteria mapping to IFRS/ISSB disclosure logic (IFRS Foundation, 2023), particularly when sustainability risks or opportunities are materially connected to enterprise value.

Intermediate levels decompose each top-level dimension into sub-dimensions (e.g., under Social: labor practices, health & safety, community impact, customer responsibility; under Governance: compliance, transparency, anti-corruption, grievance mechanisms). Elementary criteria are measurable or assessable indicators used for outranking comparisons.

2.5. Modeling Interactions among CSR Criteria

CSR criteria often display interaction effects. For example, transparent governance can increase the credibility of environmental disclosures (synergy), while two indicators might partially measure the same construct (redundancy). The adopted outranking framework explicitly represents interacting pairs of criteria through interaction weights, allowing synergy and antagonism effects in concordance computations (Fernandez, Figueira, Navarro, & Solares, 2022).

Interaction candidates are identified through:

1. stakeholder workshops (elicitation of "reinforcing" or "overlapping" criteria),
2. documentary evidence (e.g., audit findings that are in performance),
3. cross-case pattern matching.

2.6. Data Sources and Measurement Protocol

Each case is documented using multiple sources to strengthen construct validity:

- Documentary evidence: sustainability reports, GRI content indexes, codes of conduct, supplier policies, audit summaries, and incident records.
- Semi-structured interviews with key informants (CSR/ESG managers, operations leaders, HR, compliance).
- Stakeholder inputs: community representatives, customers, or relevant external experts when feasible.
- Public disclosures aligned with CSR standards (ISO 26000 guidance topics; GRI universal and topic standards).

To remain faithful to real decision contexts, criterion evaluations are expressed as interval numbers whenever precision is not justified (e.g., "community satisfaction is between 3 and 4 on a 5-point scale," or "scope-1 emissions reduction is between 12% and 16% given measurement uncertainty"). Interval numbers represent bounded imprecision rather than ignorance (Fernandez et al., 2022; Fernández et al., 2022; Moore, 1962).

2.7. Preference Modeling: Interval Parameters and Pseudo-Criteria

Consistent with later ELECTRE-style modeling, elementary criteria may be represented as:

- interval-valued criteria using indifference/preference thresholds (Roy, 1991; Roy, Figueira, & Almeida-Dias, 2014).

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Model parameters are elicited as intervals when stakeholder judgments are imprecise or conflicting. In particular, the hierarchical interval outranking approach supports interval weights (including interaction weights), interval veto thresholds, and an interval majority threshold, reflecting imperfect knowledge and bounded uncertainty (Diaz, Fernández, Figueira, Navarro, & Solares, 2024; Fernández et al., 2022).

This parameterization is justified because decision-makers frequently face cognitive difficulties and practical constraints when specifying exact thresholds and weights, especially in interactions (Fernández et al., 2022).

2.8. Hierarchical Interval Outranking Computation

For each non-elementary criterion g_h, the method computes an outranking credibility index $\sigma_h(x, y)$ for each s (x, y), enabling analysis at multiple levels of the CSR hierarchy (Fernández et al., 2022).

Key outputs include:

1. a valued outranking relation at each relevant hierarchy node, and
2. a corresponding crisp outranking relation for a chosen credibility threshold

An advantage of this proposal is that the method supports partial (dimension-level) CSR diagnosis, not only a global score, which is valuable for accountability-oriented CSR evaluation (Fernández et al., 2022).

3. Case Study Design and Data Collection

3.1. Case Study Rationale

The objective of the case study component is to empirically demonstrate the applicability and decision-support value of the hierarchical interval outranking approach in evaluating Corporate Social Responsibility (CSR). Given the contextual, organizational, and stakeholder-dependent nature of CSR, a case study methodology is particularly suitable, as it enables in-depth analysis of real decision settings while preserving the complexity of social, environmental, and governance interactions (Yin, 2018).

Rather than seeking statistical generalization, the study follows an analytic generalization logic, where theoretical propositions related to hierarchical evaluation, interacting criteria, and imperfect information are examined through empirical instances (Yin, 2018).

3.2. Case Selection and Context

The study examines multiple organizational cases within the same broad sector to ensure comparability, allowing variation in CSR maturity and strategic orientation. The selected cases meet three criteria:

1. Material CSR exposure, meaning that organizational activities generate relevant social, environmental, or governance impacts.
2. Availability of CSR-related information, including internal documents, public disclosures, and access to key informants.
3. Diversity in CSR strategies, enabling meaningful comparison among decision alternatives.

To preserve confidentiality and encourage candid participation, organizations are anonymized and labeled as Case A, Case B, and Case C. Each case represents a distinct CSR approach (e.g., compliance-driven, stakeholder-oriented, or innovation-driven), allowing for theoretical replication and contrast across decision alternatives (Rodríguez-Cándido, Espin-Andrade, Solares, & Pedrycz, 2021; Yin, 2018).

3.3. Unit Of Analysis and Decision Alternatives

The unit of analysis is the organization as a CSR-performing entity. In the decision-aiding framework, each organization constitutes a decision alternative evaluated within a common CSR hierarchical model.

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This configuration reflects a realistic managerial problem: assessing which organization (or strategy) demonstrates higher CSR performance under uncertainty and stakeholder heterogeneity. The same structure could be adapted to evaluate CSR strategies or projects within a single organization; however, inter-organizational comparison is adopted here to enhance interpretability and external relevance.

3.4. CSR Hierarchical Model Specification

CSR performance is structured as a hierarchical criteria system composed of three levels:

- Level 0 (Global criterion): Overall Corporate Social Responsibility.
- Level 1 (Main dimensions): Economic responsibility, Social responsibility, Environmental responsibility, and Governance & ethics.
- Level 2 (Sub-dimensions and elementary criteria): Operational indicators capturing practices, outcomes, and controls associated with each main dimension.

The hierarchical decomposition reflects how CSR is conceptualized in widely recognized standards and reporting practices (Global Reporting Initiative, 2021; International Organization for Standardization, 2010) and aligns with the need to decompose complex evaluation problems into cognitively manageable components (Corrente et al., 2016).

Importantly, the model allows interaction effects among criteria, such as:

- Synergy between governance transparency, environmental credibility, and
- Redundancy exists between overlapping social indicators, such as workforce training and employability programs.

These interactions are explicitly modeled in the outranking framework rather than implicitly assumed away.

Figure 1 explicitly justifies the hierarchical aggregation logic required by the hierarchical interval outranking approach (Corrente et al., 2016; Fernández et al., 2020).

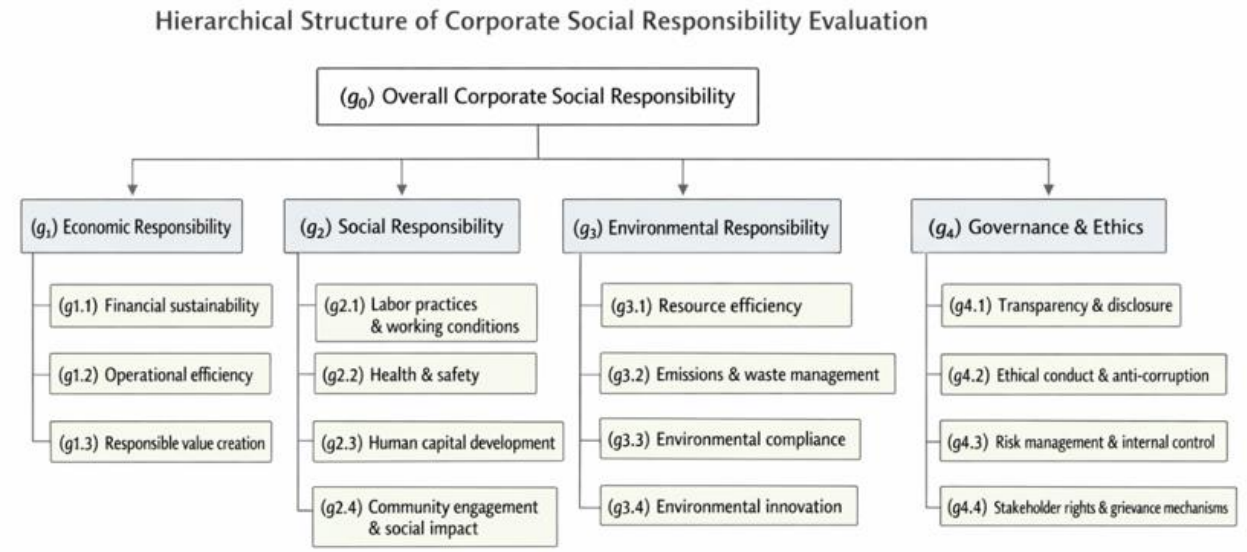

Figure 1.
Hierarchical Framework for Corporate Social Responsibility (CSR) Evaluation.

Figure 1 illustrates the hierarchical structure adopted for the evaluation of Corporate Social Responsibility (CSR) in this study. Overall CSR performance constitutes the global criterion at the top level of the hierarchy. This criterion is decomposed into four main dimensions: economic responsibility, social responsibility, environmental responsibility, and governance and ethics. which represent the

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primary pillars of CSR. Each dimension is further operationalized through a set of elementary criteria capturing specific organizational practices and outcomes. The hierarchical structure enables evaluation at both global and intermediate levels and supports the explicit modeling of interactions and uncertainty within the hierarchical interval outranking framework.

Note that the following holds for Figure 1:

- *g0* is the global criterion.
- *g1–g4* are non-elementary criteria.
- *g1.i–g4.i* are elementary criterion, evaluated using interval values or pseudo-criteria.
- Interaction effects are allowed within each group g1–g4 (e.g., synergy between transparency and environmental credibility, redundancy between social indicators).

Table 1 summarizes the CSR evaluation criteria used in the case study, along with their descriptions, primary data sources, and measurement types. The table clarifies how each CSR dimension is operationalized and indicates whether criteria are assessed using interval-valued evaluations or pseudo-criteria. This structured overview supports transparency, replicability, and consistency in data collection and evaluation across cases.

Table 1.
CSR Evaluation Criteria and Data Sources.

Level	Criterion	Description	Main Data Sources	Measurement Type
g1	Economic responsibility	Long-term economic viability aligned with responsible practices	Financial reports, internal KPIs, and management interviews	Interval / pseudo-criterion
g1.1	Financial sustainability	Ability to maintain stable operations and investments	Financial statements, budgets	Interval
g1.2	Operational efficiency	Efficient use of resources in operations	Operational reports, audits	Interval
g1.3	Responsible value creation	Integration of CSR into core business value	Strategy documents, interviews	Interval
g2	Social responsibility	Impacts on employees, communities, and society	CSR reports, HR records, interviews	Interval / pseudo-criterion
g2.1	Labor practices	Fair wages, working conditions, labor rights	HR policies, employee surveys	Interval
g2.2	Health and safety	Occupational health and accident prevention	Safety records, audits	Interval
g2.3	Human capital development	Training, skills development, and employability	Training logs, HR metrics	Interval
g2.4	Community engagement	Social programs and community relationships	CSR reports, stakeholder interviews	Interval
g3	Environmental responsibility	Environmental performance and risk management	Environmental reports, audits	Interval / pseudo-criterion
g3.1	Resource efficiency	Energy, water, and material efficiency	Environmental KPIs	Interval
g3.2	Emissions and waste	Emissions reduction and waste management	Environmental data, audits	Interval
g3.3	Environmental compliance	Compliance with environmental regulations	Compliance reports	Pseudo-criterion
g3.4	Environmental innovation	Adoption of eco-innovations	R&D reports, interviews	Interval
g4	Governance and ethics	Ethical conduct and accountability mechanisms	Governance reports, codes of conduct	Interval / pseudo-criterion
g4.1	Transparency	Quality and credibility of disclosures	Sustainability reports	Interval
g4.2	Ethical conduct	Anti-corruption and integrity practices	Compliance records	Pseudo-criterion
g4.3	Risk management	Internal controls and risk oversight	Audit reports	Interval

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g4.4	Stakeholder rights	Grievance and participation mechanisms	Policies, interviews	Interval

3.5. Data Sources

Data collection follows a triangulated design, combining multiple sources to enhance construct validity and reduce single-source bias (Yin, 2018). The primary data sources include:

1. Documentary evidence

- Sustainability and CSR reports
- Codes of conduct and ethics policies
- Environmental and safety records
- Internal CSR dashboards and audit summaries

2. Semi-structured interviews were conducted with key organizational informants, including CSR managers, operations managers, human resources representatives, and compliance officers. When feasible, external stakeholders (e.g., community representatives or consultants) were also consulted.
3. Publicly available CSR disclosures and sectoral benchmarks were used to contextualize organizational performance and validate internal claims.

3.6. Interview Protocol and Expert Judgment Elicitation

Semi-structured interviews followed a common protocol to ensure consistency across cases while allowing contextual adaptation. Interview questions focused on:

- CSR objectives and strategic priorities
- Perceived strengths and weaknesses across CSR dimensions
- Trade-offs and conflicts among economic, social, and environmental goals
- Areas of uncertainty, disagreement, or incomplete information

Expert judgments derived from interviews were used to:

- assess performance on qualitative CSR criteria, and
- support the elicitation of interval-valued evaluations, reflecting bounded imprecision rather than forced precision (Roy et al., 2014).

When multiple experts provided differing assessments, divergence was represented through wider evaluation intervals, preserving information rather than averaging conflicting views.

3.7. Measurement and Interval Representation

Elementary criteria were evaluated using either:

- interval-valued scores, or
- pseudo-criteria with indifference and preference thresholds, depending on the nature of the indicator.

Interval representations were adopted when:

- data were incomplete or subject to estimation error,
- indicators were qualitative or perception-based, or
- stakeholder judgments differed meaningfully.

This approach reflects the realistic conditions under which CSR decisions are made and aligns with interval-based extensions of outranking methods designed to handle imperfect knowledge (Fernández et al., 2020; Fernández et al., 2019).

3.8. Preference Parameters and Interaction Modeling

Model parameters, including criterion weights, interaction effects, veto thresholds, and majority thresholds, were elicited through facilitated expert discussions. To reflect uncertainty and cognitive difficulty, parameters were expressed as interval values whenever precise specification was not justified.

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Interaction effects among criteria were identified through:

- explicit stakeholder statements ("this criterion reinforces that one"), and
- logical analysis of CSR processes (e.g., governance failures undermining social credibility).

These interactions were incorporated using the formal mechanisms of the hierarchical interval outranking approach, ensuring internal consistency and transparency (Fernández et al., 2020).

3.9. Data Validation and Reliability Measures

Several measures were adopted to enhance the reliability and credibility of the data:

- Triangulation across documents, interviews, and secondary sources
- Case study protocol standardization, ensuring comparable procedures across cases
- Member checking, where preliminary interpretations were discussed with selected informants
- Explicit representation of uncertainty, avoiding artificial consensus or overconfidence

Rather than treating uncertainty as a weakness, the methodology integrates it directly into the evaluation model, strengthening the realism and robustness of the analysis.

The data collected through this process provides the inputs required to construct the hierarchical interval outranking relations and to classify CSR performance across cases.

Section 4 presents the results of the case study, including global CSR evaluations, dimension-level diagnostics, and robustness analysis of the assignments obtained through the hierarchical interval outranking framework.

4. Results

4.1. Overview of the CSR Evaluation Outcomes

This section presents the results obtained from applying the hierarchical interval outranking framework to the case study data described in Section 3. The analysis focuses on the comparative evaluation and classification of decision alternatives (Cases A, B, and C), both at the global CSR level and at the level of individual CSR dimensions. The results are organized to highlight (i) overall CSR positioning, (ii) dimension-level diagnostic insights, and (iii) robustness and stability of the assignments under uncertainty.

Rather than producing a single aggregated score, the methodology yields outranking-based classifications and dominance relations, enabling a nuanced interpretation of CSR performance that accounts for hierarchy, interaction effects, and imperfect information (Fernández et al., 2020; Roy, 1991)

4.2. Global CSR Classification

Using the HI-INTERCLASS-nC procedure, three ordered CSR performance classes were defined:

- C1: Basic CSR performance
- C2: Developing CSR performance
- C3: Advanced CSR performance

Based on the global criterion (overall CSR), the results indicate the following assignments:

- Case A is assigned to class C3 (Advanced CSR)
- Case B is assigned to class C2 (Developing CSR)
- Case C is assigned to class C1 (Basic CSR)

The assignment of Case A to the highest class is supported by strong outranking credibility over the representative actions of lower classes, particularly due to consistent performance across governance, environmental, and social dimensions. In contrast, Case C fails to outrank the representative profile of class C2 due to weak performance in governance and social responsibility, which exerts blocking effects through veto-like mechanisms.

These results illustrate the non-compensatory nature of the approach: deficiencies in critical CSR dimensions prevent upward classification, even when acceptable performance is observed in isolated economic or operational criteria.

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4.3. Dimension-Level CSR Performance

Beyond the global CSR classification, the hierarchical interval outranking framework enables a detailed dimension-level analysis, providing insight into how each case performs across the main CSR pillars. This intermediate-level evaluation is essential for CSR decision-making, as it allows decision-makers to identify specific areas of strength and weakness that may not be visible in a single global assignment. The following subsections present the results for each CSR dimension.

4.3.1. Economic Responsibility

The evaluation of economic responsibility indicates that all three cases demonstrate at least a minimum level of economic viability, reflecting their capacity to sustain operations and generate value. Case A and Case B both achieve a developing-to-advanced positioning in this dimension, while Case C remains at the lower bound of the developing class.

Case A slightly outranks Case B due to stronger performance in responsible value creation, where economic objectives are explicitly aligned with long-term social and environmental considerations. Interval-valued evaluations indicate consistent expert agreement regarding Case A's financial sustainability and operational efficiency, with relatively narrow uncertainty ranges. In contrast, Case B exhibits wider evaluation intervals, reflecting variability in performance across business units and some uncertainty regarding the long-term integration of CSR into core economic strategy.

Case C achieves acceptable performance in basic financial sustainability and operational efficiency; however, its economic responsibility is primarily compliance- and cost-driven. The absence of strategic integration between economic objectives and broader CSR goals limits its ability to outrank higher reference profiles. Importantly, the results confirm that economic performance alone is insufficient to drive global CSR classification, reinforcing the methodological principle that CSR evaluation should not be reduced to financial outcomes.

4.3.2. Social Responsibility

Social responsibility emerges as a major differentiating dimension among the cases. Case A is consistently assigned to the advanced class, supported by strong performance across labor practices, health and safety, human capital development, and community engagement. Interval evaluations for Case A are relatively narrow, indicating convergence among expert judgments and stable implementation of social policies.

Case B is classified in the developing class, reflecting partial and uneven implementation of social initiatives. While labor practices and training programs are positively evaluated, weaknesses are observed in occupational health and safety management and in the depth of community engagement. These weaknesses are reflected in wider evaluation intervals and lower outranking credibility against advanced reference profiles.

Case C is assigned to the basic class in the social dimension. Significant deficiencies are identified in health and safety systems and stakeholder engagement mechanisms. Even when certain social initiatives are present, their scope and effectiveness are insufficient to compensate for weaknesses in critical sub-criteria. The results illustrate the non-compensatory logic of the outranking approach: strong performance in isolated social indicators does not offset serious shortcomings in essential social responsibilities.

4.3.3. Environmental Responsibility

Environmental responsibility is a highly discriminating dimension in analysis. Case A clearly dominates others and is robustly classified as advanced. This result is driven by strong performance in resource efficiency, emissions, waste management, and environmental innovation. Experts consistently emphasize proactive environmental strategies, which are reflected in narrow evaluation intervals and high levels of concordance.

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Case B is positioned in the developing class, with acceptable compliance and moderate improvements in resource efficiency, but limited evidence of environmental innovation. Evaluation intervals are wider for innovation-related criteria, indicating uncertainty regarding the continuity and scalability of environmental initiatives. As a result, Case B fails to outrank the advanced reference profiles, despite meeting many regulatory requirements.

Case C remains in the basic class, with environmental practices largely confined to regulatory compliance. Weak performance in emissions management and the absence of innovation-oriented initiatives generate discordant effects that prevent upward classification. These findings underscore the importance of distinguishing between compliance-based and strategic environmental responsibility within CSR evaluations.

4.3.4. Governance and Ethics

Governance and ethics constitute a critical blocking dimension in the overall CSR evaluation. Case A achieves an advanced classification, supported by high transparency, effective risk management systems, and well-functioning grievance mechanisms. Governance-related evaluations exhibit strong internal consistency and narrow uncertainty ranges, reinforcing the credibility of the results.

Case B is classified in the developing class. While formal governance structures are in place, shortcomings are identified in disclosure practices and internal control effectiveness. These weaknesses reduce Case B's ability to outrank higher reference profiles and contribute to its intermediate global CSR classification.

Case C is firmly assigned to the basic class in governance and ethics. Deficiencies in transparency, limited stakeholder rights mechanisms, and weak internal controls generate strong discordance effects. In several simulations, governance criteria act as veto-like elements, preventing Case C from achieving higher global CSR classifications even when acceptable performance is observed in certain economic or environmental indicators.

This dimension-level result highlights the structural role of governance within CSR: weaknesses in governance and ethics undermine the credibility and effectiveness of other CSR initiatives and exert a disproportionate influence on overall evaluation outcomes.

4.3.5. Summary of Dimension-Level Insights

Taken together, the dimension-level results demonstrate the analytical value of hierarchical evaluation. While Case A shows balanced and mutually reinforcing CSR performance across all dimensions, Case B exhibits a mixed profile with identifiable improvement priorities, and Case C displays structural weaknesses, particularly in social responsibility and governance, that constrain its overall CSR positioning.

These findings illustrate how the hierarchical interval outranking approach supports diagnostic CSR assessment, enabling decision-makers to move beyond headline classifications toward targeted, evidence-based improvement strategies.

4.4. Role of Interaction Effects

The inclusion of interaction effects among criteria provides additional explanatory power. In particular, synergy between governance transparency and environmental credibility strengthens the outranking relations for Case A, amplifying its advantage over other cases. Conversely, redundancy among certain social indicators in Case C reduces their effective contribution to concordance, preventing artificial inflation of CSR performance.

These findings confirm that modeling interactions explicitly leads to more realistic evaluations, avoiding double-counting and better reflecting how CSR dimensions reinforce or undermine each other in practice (Corrente et al., 2016; Fernández et al., 2020)

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4.5. Robustness and Stability Analysis

Given the presence of interval-valued evaluations, preference parameters, and interaction coefficients, a robustness and stability analysis was conducted to assess the sensitivity of the CSR classification results to uncertainty and variability in the model inputs. Rather than treating uncertainty as a limitation, the hierarchical interval outranking framework explicitly incorporates it into the evaluation process, making robustness analysis an integral component of result validation.

Robustness was examined through a combination of parameter variation, stakeholder preference scenarios, and Monte Carlo simulation, focusing on the stability of class assignments at both the global CSR level and the dimension level.

4.5.1. Parameter Variation Within Specified Intervals

First, robustness was tested by systematically varying all interval-valued parameters within their specified bounds. These parameters include:

- criterion weights and interaction weights at each level of the hierarchy,
- indifference and preference thresholds for pseudo-criteria,
- veto thresholds associated with critical CSR criteria, and
- the majority threshold governing outranking credibility.

For each simulation run, parameter values were randomly sampled within their admissible intervals, ensuring internal consistency with the hierarchical structure. This process evaluates whether the observed CSR classifications are artifacts of particular parameter choices or remain valid across a plausible range of decision-maker preferences.

The results show that Case A's assignment to the advanced CSR class remains highly stable, with successful assignment in over 90% of the sampled parameter configurations. Case C exhibits similarly high stability at the basic CSR class level, confirming that its classification is driven by structural weaknesses rather than marginal parameter choices. Case B displays lower, but still acceptable, stability, reflecting its intermediate position and sensitivity to changes in preference emphasis.

4.5.2. Stakeholder Preference Scenario Analysis

To further assess robustness, several stakeholder preference scenarios were defined by adjusting weight intervals and interaction intensities to reflect different normative priorities. These scenarios include, for example:

- an economic-priority scenario, emphasizing financial sustainability and operational efficiency,
- a social-priority scenario, increasing the relative importance of labor practices, health and safety, and community engagement, and
- a governance-priority scenario, strengthening veto effects related to transparency, ethics, and risk management.

Across all scenarios, the relative ordering of cases remains largely unchanged. Case A consistently maintains the highest CSR classification, while Case C remains in the lowest class. Case B's classification varies marginally across scenarios but never reaches the advanced class nor falls systematically into the basic class. This behavior confirms that Case B's CSR performance is genuinely intermediate rather than artificially positioned by a particular stakeholder perspective.

4.5.3. Stability of Dimension-Level Classifications

In addition to global CSR assignments, robustness was evaluated at the dimension level (economic, social, environmental, and governance). The results indicate that:

- Governance and ethics classifications are the most stable across simulations, particularly for Case A and Case C.
- environmental responsibility exhibits moderate sensitivity for Case B, primarily due to uncertainty surrounding innovation-related criteria, and

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- economic responsibility shows the least sensitivity overall, reflecting narrower evaluation intervals and more objective data sources.

The stability of governance-related results reinforces governance as a structurally dominant dimension within the CSR hierarchy, while moderate instability in certain dimensions highlights areas where improved measurement or clearer policy commitments could reduce uncertainty.

4.5.4. Assignment Credibility and Borderline Cases

For cases with intermediate performance, particularly Case B, the analysis also examined assignment credibility, defined as the proportion of simulations leading to assignment to each class. Results show that Case B is assigned to the developing class in approximately 75% of simulations, with remaining assignments split between adjacent classes depending on parameter realizations.

Importantly, no simulation assigns Case C directly to the advanced CSR class, nor does any simulation assign Case A to the basic class. This absence of extreme reassignments provides strong evidence that the global classification structure is robust and not driven by random variation.

4.5.5. Implications for Decision Reliability

Overall, the robustness and stability analysis confirm that the hierarchical interval outranking results are structurally grounded and decision-relevant. Stable classifications for Cases A and C indicate clear CSR positioning, while controlled instability for Case B reflects realistic ambiguity rather than methodological weakness. The ability to identify such borderline cases is itself a valuable outcome, as it signals where managerial attention and additional information may have the greatest impact.

These results demonstrate that the proposed framework supports reliable CSR evaluation under uncertainty, providing decision-makers with confidence in both the outcomes and the diagnostic insights derived from the analysis.

Overall, the results demonstrate that the hierarchical interval outranking approach produces stable, interpretable, and socially meaningful CSR evaluations. The method supports:

- Clear global CSR classification
- Dimension-level diagnostic insights
- Explicit handling of uncertainty and stakeholder disagreement
- Transparent identification of blocking weaknesses

These features are particularly valuable for CSR governance, where decision-makers require both accountability-oriented classification and actionable insights into improvement priorities.

The next section discusses the implications of these findings for CSR management, stakeholder governance, and social science research. Particular attention is given to how hierarchical interval outranking enhances the credibility and usefulness of CSR evaluation compared to traditional compensatory approaches.

5. Conclusions

This study addressed the challenge of evaluating Corporate Social Responsibility (CSR) under conditions of multidimensionality, interaction among criteria, and imperfect information. To this end, a hierarchical interval outranking framework was applied to the comparative assessment of organizational CSR performance using multiple case studies. The results demonstrate that the proposed approach provides a robust, transparent, and decision-relevant tool for CSR evaluation, capable of capturing both global performance and dimension-level diagnostics.

From a methodological perspective, the study shows that hierarchical interval outranking methods are particularly well-suited to CSR contexts. The hierarchical structure allows complex CSR concepts to be decomposed into cognitively manageable dimensions while preserving coherence between local and global evaluations. The explicit representation of interaction effects among criteria prevents double-counting and reflects the reinforcing or blocking relationships commonly observed between governance,

social, and environmental practices. Moreover, the use of interval-valued evaluations and parameters enables realistic modeling of uncertainty, expert disagreement, and data limitations without forcing artificial precision.

Empirically, the case study results illustrate clear differentiation among organizations with distinct CSR profiles. The analysis confirms that strong governance and ethical practices play a central role in shaping overall CSR performance and can exert veto-like effects when deficiencies are present. At the same time, the results show that economic performance, while necessary, is insufficient to drive high CSR classification in the absence of credible social and environmental responsibility. The dimension-level analysis provides actionable insights by identifying specific areas where organizations can prioritize improvements to enhance their overall CSR positioning.

The robustness and stability analysis further strengthen the credibility of the findings. Stable class assignments for clearly high- and low-performing cases indicate that the results are structurally grounded rather than driven by particular parameter choices. Controlled instability for intermediate cases reflects realistic ambiguity and highlights the value of interval-based modeling for supporting informed and transparent decision-making under uncertainty.

From a practical standpoint, the proposed framework offers meaningful implications for managers, policymakers, and stakeholders. By supporting non-compensatory reasoning and explicit treatment of uncertainty, the approach enhances the legitimacy of CSR evaluation processes and supports accountability-oriented decision-making. The ability to perform both global classification and dimension-level diagnosis makes the framework suitable for benchmarking, strategic planning, and monitoring CSR progress over time.

Several limitations should be acknowledged. The case study design, while appropriate for methodological illustration and analytic generalization, does not aim at statistical generalization. In addition, the quality of results depends on the availability and reliability of input data and expert judgments. Future research could extend this work by applying the framework to larger samples, integrating longitudinal data, or combining the approach with participatory decision-making processes involving a broader range of stakeholders. Further methodological extensions could also explore the integration of scenario-based analysis or dynamic CSR evaluation over time.

In conclusion, this study contributes to the CSR and social sciences literature by bridging advanced multi-criteria decision-aiding methods with applied CSR evaluation. The hierarchical interval outranking approach offers a rigorous yet flexible framework for supporting responsible decision-making in complex organizational and societal contexts, and it provides a promising foundation for future research and practice in CSR assessment.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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