SCIENTIFIC MAPPING AND IDENTIFICATION OF THE LATENT DIMENSIONS OF ROI MEASUREMENT IN ESG-RELATED PROJECTS

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Comunicação:
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Objetivo do estudo
This study aims to map the scientific structure of research on ROI measurement in ESG-related projects and identify the latent dimensions underlying its financial and non-financial value components through bibliometric analysis, bibliographic coupling, and Exploratory Factor Analysis.

Relevância/originalidade
This study advances the literature by empirically identifying a multidimensional architecture of sustainable ROI, integrating financial and non-financial value through four latent dimensions and bridging fragmented research streams on ESG, sustainability, project evaluation, governance, investment appraisal, and value creation.

Metodologia/abordagem
A mixed bibliometric and exploratory approach was employed, combining performance analysis, science mapping, bibliographic coupling, and Exploratory Factor Analysis. A final corpus of 497 articles was analyzed, including 385 empirical studies used to construct the article-by-construct matrix.

Principais resultados
The analysis identified four latent dimensions of sustainable ROI: strategic capabilities for sustainable value creation; governance, disclosure, and corporate performance; integrated impact and investment appraisal; and operational optimization and economic value creation, supporting a multidimensional architecture of financial and non-financial value.

Contribuições teóricas/metodológicas
The study contributes theoretically by conceptualizing sustainable ROI as a multidimensional value architecture comprising value enablement, governance, appraisal, and realization. Methodologically, it integrates bibliometric mapping, bibliographic coupling, and Exploratory Factor Analysis to uncover latent structures across fragmented research streams.

Contribuições sociais/para a gestão
The findings provide managers with a structured basis for evaluating ESG-related projects beyond conventional financial metrics, integrating economic, environmental, social, and organizational value. This approach can support project selection, resource allocation, investment decisions, and performance monitoring while strengthening value-based sustainability practices.

Palavras-chave: ESG Projects, Sustainable ROI, Sustainable Value Creation, Exploratory Factor Analysis, Project Evaluation

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1 Introduction

There is growing recognition that the return on investment (ROI) of ESG-related projects cannot be adequately understood through financial metrics alone. Sustainable projects may generate multidimensional value through economic performance, socio-environmental impacts, governance, organizational legitimacy, and stakeholder value creation (Martens & Carvalho, 2017; Ranta et al., 2018). ESG practices may therefore influence not only regulatory compliance and corporate reputation, but also risk mitigation, competitiveness, organizational resilience, and long-term performance (Currás-Pérez et al., 2018; García-Sánchez et al., 2021; Jorgensen et al., 2022). However, translating these heterogeneous financial and non-financial benefits into structured and comparable evaluation mechanisms remains a significant challenge.

This challenge is also evident in organizational practice. Recent reports indicate that organizations increasingly recognize ESG-related benefits in areas such as reputation, operational efficiency, risk management, investment attraction, innovation, and competitiveness, while still facing difficulties in demonstrating their financial contribution and incorporating them consistently into strategic decision making (Amcham & Humanizadas, 2026; UN Global Compact Brazil, 2026; Stanford Social Innovation Review Brazil, 2025). This tension reinforces the need to move beyond the assessment of isolated ESG outcomes toward approaches capable of representing the multiple forms of value generated by sustainability-related investments.

Despite the growing literature connecting ESG, sustainability, project management, and organizational performance, knowledge remains fragmented across different conceptual and measurement perspectives. Existing research provides evidence on financial performance, socio-environmental impact, stakeholder value, governance, and sustainable value creation, but these elements remain only partially integrated, particularly at the project level. Consequently, it remains unclear how the scientific literature organizes the financial and non-financial dimensions associated with ROI measurement in ESG-related projects and whether common latent structures can be identified across these dispersed research streams.

Accordingly, this study addresses the following research question: How is the scientific field of ROI measurement in ESG-related projects structured, and what latent dimensions underlie its conceptual organization?

To address this question, the study aims to map the scientific structure of research on ROI measurement in ESG-related projects and identify the latent dimensions underlying its financial and non-financial value components. Methodologically, the study combines bibliometric analysis and bibliographic coupling with Exploratory Factor Analysis (EFA), enabling the intellectual and conceptual structure of the field to be examined alongside the empirical identification of its latent dimensions.

2. Theoretical Framework

2.1 Sustainable Development and Sustainable Project Management

Sustainable development extends organizational decision making beyond short-term economic outcomes by incorporating environmental, social, and intergenerational consequences (WCED, 1987). In this context, projects constitute important vehicles for translating sustainability strategies into organizational change and value creation, leading Sustainable Project Management (SPM) to broaden conventional project concerns beyond cost,

time, and scope toward environmental, social, economic, and governance considerations throughout the project life cycle (Martens & Carvalho, 2016, 2017; Huemann & Silvius, 2017).

Accordingly, project benefits may be financial or non-financial, tangible or intangible, and realized across different time horizons and stakeholder groups (Keeys & Huemann, 2017). Sustainable project evaluation therefore requires a broader understanding of performance that connects investment decisions with stakeholder interests, socio-environmental impacts, organizational capabilities, risks, and long-term value creation (Martens & Carvalho, 2017; Alves de Carvalho et al., 2022).

2.2 Stakeholder Theory and Sustainable Value Creation

Stakeholder Theory provides a foundation for understanding organizational value as a multidimensional construct created through relationships with groups that affect or are affected by organizational activities (Freeman, 1984; Donaldson & Preston, 1995; Parmar et al., 2010). In ESG-related projects, different stakeholders may prioritize distinct forms of value, including financial performance, operational efficiency, environmental protection, social outcomes, transparency, and long-term resilience.

Consequently, stakeholder participation can influence which benefits are recognized, how they are translated into indicators, and how trade-offs among economic, environmental, and social outcomes are addressed. From this perspective, sustainable project benefits are better understood as co-created outcomes involving multiple actors rather than as results defined exclusively by the investing organization (Keeys & Huemann, 2017)..

2.3 Sustainable Investment, Impact Assessment and Financial Performance

Sustainable investment expands conventional investment appraisal by incorporating environmental and social consequences alongside financial return and risk. ESG criteria and impact-investment approaches therefore broaden the assessment of value by considering measurable socio-environmental outcomes, risks, opportunities, and organizational practices that may affect long-term performance (De Lucia et al., 2020). Evidence also indicates associations between corporate sustainability performance and financial outcomes, although results vary across contexts and measurement approaches (Waddock & Graves, 1997; Orlitzky et al., 2003; Eccles et al., 2014; Friede et al., 2015).

However, corporate financial performance, profitability, investment appraisal, and project-level economic return represent related but distinct analytical concepts. Evaluating ESG-related projects therefore requires approaches capable of integrating financial performance with environmental and social impacts, risk, and feasibility without reducing sustainability value to conventional financial measures. This distinction reinforces the need to understand not only whether sustainability is associated with financial performance, but how financial and non-financial value can be jointly incorporated into project investment appraisal.

2.4 Sustainable and Shared Value Creation

Sustainable value broadens organizational performance beyond financial outcomes by incorporating environmental and social dimensions. The Triple Bottom Line conceptualizes performance across economic, environmental, and social dimensions (Elkington, 1997), while Shared Value emphasizes the potential alignment between economic competitiveness and societal value creation (Porter & Kramer, 2011). Sustainable business-model research extends this perspective by examining how value propositions, value creation and delivery, and value capture can incorporate multiple forms of value for organizations, society, and the environment (Bocken et al., 2014, 2016). Together, these perspectives support an understanding of sustainable value as multidimensional, in which economic outcomes coexist with environmental and social benefits rather than being evaluated in isolation.

However, these perspectives address different aspects of the value-creation process and remain only partially integrated with project-level investment evaluation. Stakeholder Theory helps explain for whom value is created, the Triple Bottom Line broadens what constitutes value, Shared Value connects economic and societal value creation, and Sustainable Project Management provides the context in which these forms of value can be operationalized through projects. Investment and impact-assessment perspectives, in turn, address how value enters evaluation and decision processes. This conceptual fragmentation leaves unresolved how financial and non-financial forms of value can be jointly structured for the evaluation of ESG-related projects.

3. Research Design

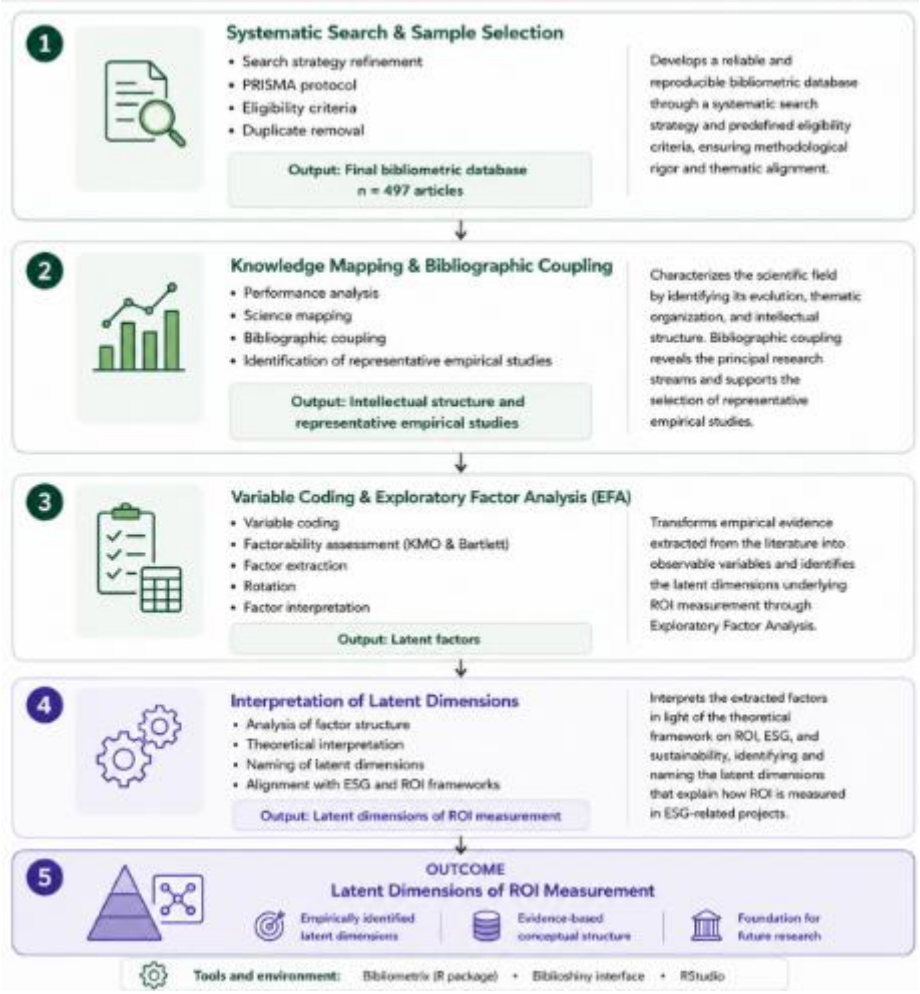
This study adopted a sequential quantitative design integrating bibliometric analysis, bibliographic coupling, and Exploratory Factor Analysis (EFA). Bibliometric methods were used to map the scientific structure of the field, while EFA was subsequently applied to identify latent relationships among the constructs extracted from the empirical literature. This integrated design enabled the study to move from the macro-level organization of the research field to the identification and interpretation of its underlying conceptual dimensions (Zupic & Čater, 2015; Watkins, 2018).

3.1 Systematic Search & Sample Selection

The literature search was conducted in Web of Science and Scopus, covering publications from 2014 to 2026. The search strategy combined five conceptual blocks related to ESG, projects, ROI, financial and non-financial value, and measurement. Records were filtered according to publication period, document type, language, research areas, and thematic relevance. Database consolidation and duplicate removal were subsequently performed following an adapted PRISMA protocol (Page et al., 2021).

The selection process resulted in a final bibliometric corpus of 497 peer-reviewed articles. From this corpus, 385 empirical studies containing observable and codifiable evidence were retained for the construction of the article-by-construct matrix and subsequent EFA. The complete variable-preparation and coding procedures were systematically documented to ensure methodological traceability.

Figure 1.
Study Identification, Screening, and Selection Process

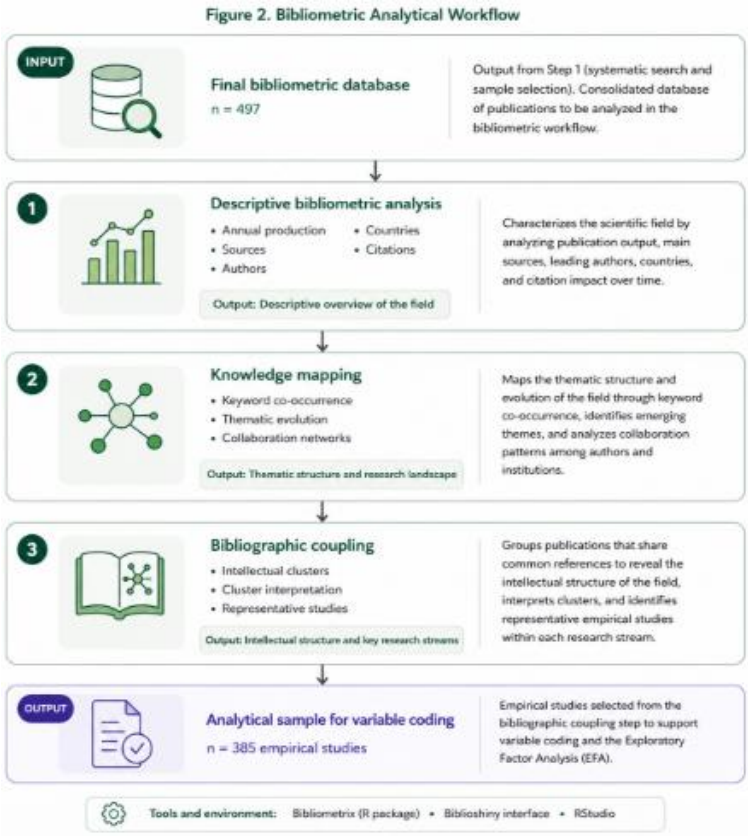


Note. Elaborated by author

3.2 Bibliometric and Bibliographic Coupling Analysis

Bibliometric analysis was used to characterize the development and structure of the research field through performance indicators and science-mapping techniques. The analysis examined publication trends, sources, authors, conceptual relationships, and thematic patterns. Bibliographic coupling was subsequently employed to identify contemporary research streams based on shared references, enabling publications with common intellectual foundations to be grouped into research clusters (Zupic & Čater, 2015). Analyses were conducted in R using Bibliometrix/Biblioshiny, complemented by VOSviewer for network visualization. The analytical sequence is summarized in Figure 2.

Figure 2.
Bibliometric Analytical Flow



Note. Elaborated by author

3.3 Construction of the Article-by-Construct Matrix

The 385 empirical studies were coded into an article-by-construct binary matrix representing the presence (1) or absence (0) of constructs related to ESG and sustainable value measurement. Initially identified terms underwent frequency screening and semantic harmonization, including the merging of conceptually equivalent expressions and removal of redundant or analytically unsuitable terms.

This procedure reduced 79 initial terms to 46 analytical variables, resulting in a 385 × 46 binary matrix. Because the variables were dichotomous, tetrachoric correlations were used for the subsequent factor analysis. The complete variable-preparation and coding procedures were systematically documented to ensure methodological traceability.

3.4 Exploratory Factor Analysis

Factorability was assessed using the Kaiser–Meyer–Olkin (KMO) measure, Bartlett's test of sphericity, individual Measures of Sampling Adequacy (MSA), communalities, and uniqueness. Leave-one-out and sensitivity analyses were additionally performed to assess whether removing individual variables materially improved matrix adequacy.

Factor retention followed a multi-criterion approach combining parallel analysis, the Kaiser criterion, scree-plot inspection, comparison of alternative factor solutions, loading structure, cross-loadings, parsimony, and substantive interpretability. Four-, five-, six-, and fourteen-factor solutions were examined rather than relying on a single statistical criterion. The final EFA was estimated using minimum residual extraction (MINRES) and oblimin rotation, allowing correlations among latent factors. Factor adequacy and interpretation considered loading structure, communalities, and cross-loadings, following established recommendations

for exploratory factor analysis (Fabrigar et al., 1999; Hair et al., 2019; Watkins, 2018). Detailed diagnostic outputs were systematically documented as part of the analytical protocol.

3.5 Factor Interpretation and Triangulation

Factor interpretation followed a triangulation procedure combining three sources of evidence: factor-loading patterns, representative empirical articles associated with each factor, and recurrent theoretical references within those studies. Factor labels were assigned only after examining convergence across the statistical structure, empirical research streams, and theoretical foundations, reducing reliance on factor loadings alone and strengthening the substantive interpretation of the latent dimensions. The triangulation procedure was systematically documented to ensure transparency and reproducibility of factor interpretation..

4. Results

The results follow the sequential analytical design of the study. Descriptive bibliometric analysis first characterizes the scientific field, followed by bibliographic coupling to identify its contemporary research structure. The empirical corpus is then examined through Exploratory Factor Analysis (EFA) to identify the latent dimensions underlying ROI measurement in ESG-related projects.

4.1 Descriptive Bibliometric Analysis

The bibliometric corpus comprised **497 peer-reviewed articles** published between 2014 and 2026 across 322 scientific sources. Scientific production increased at an average annual rate of **16.42%**, with marked acceleration after 2019, indicating growing scholarly attention to the integration of financial and non-financial value in ESG-related initiatives. The corpus involved 1,739 authors, averaged 15.06 citations per article, and contained 1,935 author keywords, reflecting both the interdisciplinary character and conceptual breadth of the field. Figure 4 summarizes the main bibliometric indicators.

Figure 4.
Main Bibliometric Indicators of the Analyzed Database



Note. Developed by the author using the Bibliometrix/Biblioshiny package within the R environment.

The temporal evolution of publications demonstrates a marked acceleration after 2019, suggesting that ROI measurement in ESG projects has become an increasingly important research topic.

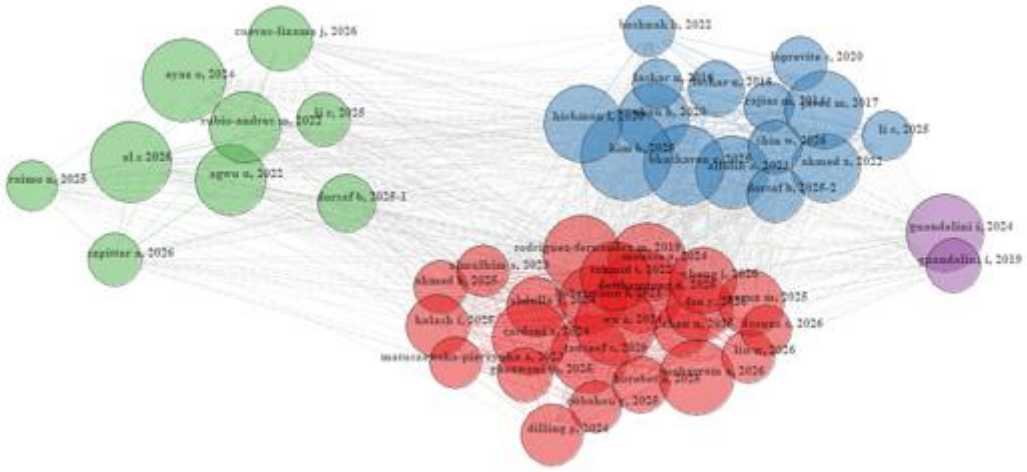
Consequently, structural analyses are required to identify the intellectual organization of the literature and the latent dimensions underlying ROI measurement in ESG-related

projects. This objective is addressed in the following sections through bibliographic coupling analysis and Exploratory Factor Analysis (EFA).

4.2 Bibliographic Coupling and Contemporary Research Structure

Bibliographic coupling of the empirical corpus revealed **four interconnected research clusters**, indicating that ROI measurement in ESG-related projects has developed through distinct but complementary research streams (Figure 5). The largest cluster concentrates on ESG integration, financial performance, corporate disclosure, and governance; a second addresses organizational performance and sustainable corporate strategies; a third focuses on environmental and socio-environmental impacts; and a fourth emphasizes value measurement, investment, and decision-making. Although thematically differentiated, the connections among clusters indicate a shared intellectual foundation and reinforce the fragmented yet interconnected structure of the field.

Figure 5.
Bibliographic Coupling Network of Empirical Studies



Note. Developed by the author using the Bibliometrix/Biblioshiny package within the R environment.

The bibliographic coupling network exhibits a moderately fragmented structure composed of four interconnected clusters, indicating that the literature on ROI measurement in ESG-related projects has developed through multiple, yet complementary, research streams. Although each cluster emphasizes distinct aspects of ESG-related value creation, the observed interconnections reveal a shared intellectual foundation across the field. To facilitate the interpretation of these research streams, Table 4 summarizes the main characteristics of the identified clusters. Beyond describing the contemporary intellectual structure of the literature, these clusters provided the conceptual basis for the selection of representative empirical studies and the subsequent variable coding process used in the Exploratory Factor Analysis (EFA).

Table 4.
Main research streams identified through bibliographic coupling

Cluster (Color)	Primary Research Focus	Representative Studies
Red Cluster *(largest cluster)*	ESG integration, financial performance, corporate disclosure and governance	Oubahou et al. (2025); Chen (2025); Ahmad (2025); Liu (2026)
Blue Cluster	Organizational performance and sustainable corporate strategies	Laskar (2016, 2018); Hickman et al. (2020); Ahmed et al. (2022)

Cluster (Color)	Primary Research Focus	Representative Studies
Green Cluster	Environmental impacts, applied sustainability and socio-environmental assessment	Ayaz et al. (2024); Rubio-Andrés et al. (2022); Szpitter et al. (2026)
Purple Cluster	Specialized governance and sustainability measurement	Guandalini (2019, 2024)

Note. Developed by author based on table data generated by Bibliometrix/Biblioshiny package within the R environment

Overall, the bibliographic coupling analysis demonstrates that ROI measurement in ESG-related projects is investigated from multiple complementary perspectives, including governance, financial performance, environmental impact, and sustainable value creation. More importantly, the identified clusters guided the selection of representative empirical studies used during the variable coding process. Consequently, the analytical matrix employed in the Exploratory Factor Analysis was grounded in the most representative contemporary research streams rather than in isolated studies, strengthening the methodological robustness of the subsequent Exploratory Factor Analysis.

4.3 Factorability and Variable Diagnostics

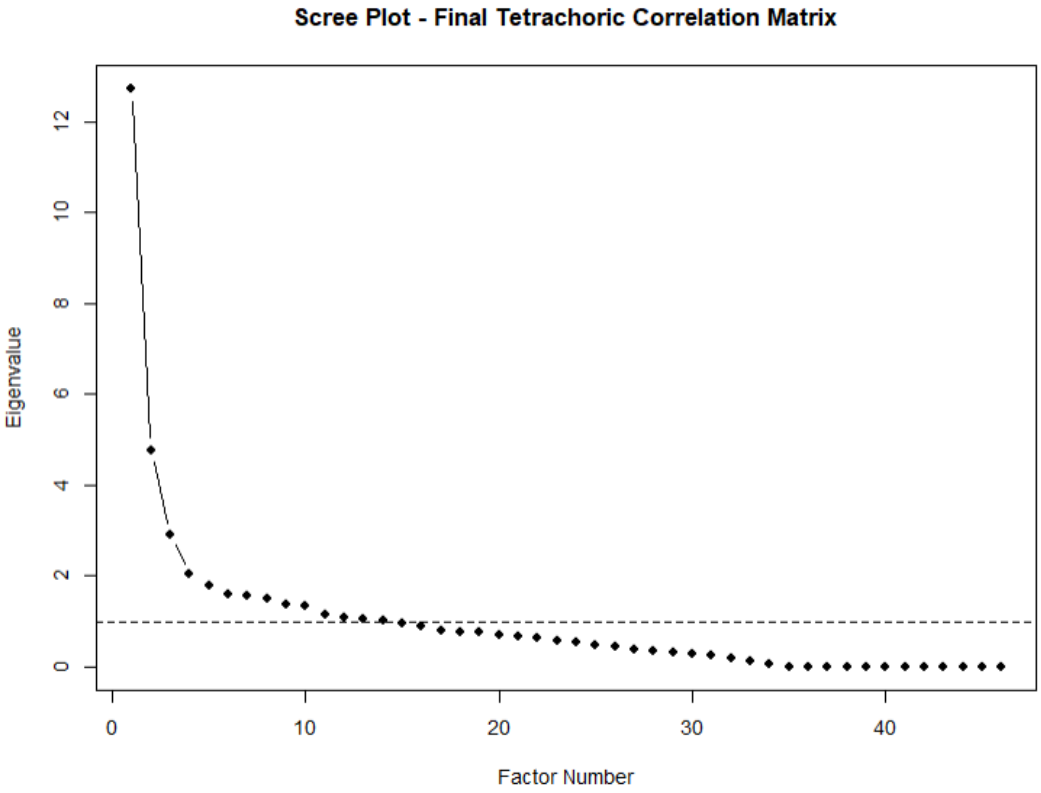
The final article-by-construct matrix comprised 385 empirical studies and 46 binary variables. The tetrachoric correlation matrix yielded an overall KMO of 0.5535, exceeding the minimum threshold for exploratory analysis, while Bartlett's test of sphericity was significant, $\chi^2(1035) = 105{,}285.6$, $p < .001$, supporting the presence of systematic relationships among the variables. Individual MSA values showed heterogeneous sampling adequacy, with 21 variables below .50, 10 between .50 and .59, nine between 0.60 and 0.69, and six between .70 and .79.

Communalities ranged from 0.148 to 0.843 (M = 0.445), while uniqueness ranged from 0.158 to 0.852 (M = .555). Seven variables presented communalities below .30, indicating that some constructs were only weakly represented by the common-factor structure. Sensitivity analyses nevertheless showed that removing individual low-performing variables did not materially improve overall factorability. For example, excluding *Environmental Performance* reduced KMO to 0.529, while excluding *Sustainability* resulted in KMO = 0.535. The triangulation procedure was systematically documented to ensure transparency and reproducibility of factor interpretation.

4.4 Factor Retention and Final EFA Solution

Factor retention was evaluated through parallel analysis, the Kaiser criterion, scree-plot inspection, and comparison of alternative solutions. Parallel analysis and the Kaiser criterion suggested a substantially more complex structure, with 14 eigenvalues above 1.0, while the scree plot showed a steep decline across the first factors followed by progressive flattening (Figure 6). Because these statistical criteria did not yield a sufficiently parsimonious representation, 4-, 5-, 6-, and 14-factor solutions were compared in terms of loading structure, cross-loadings, statistical fit, parsimony, and substantive interpretability.

Figure 6.
Scree Plot of the Final Tetrachoric Correlation Matrix



Note. Developed by the author based on the final tetrachoric correlation matrix using R.

Increasing the number of factors produced greater fragmentation without sufficient improvement in interpretability. The **four-factor solution** was therefore retained as the most parsimonious representation of the dominant conceptual relationships. An oblimin rotation was adopted because the factors were expected to correlate. The strongest interfactor association occurred between MR3 and MR4 ($r = .475$), while the remaining correlations ranged from .013 to .330, indicating partially overlapping but empirically distinguishable dimensions.

The final rotated solution explained **38.8% of total variance**, with contributions of 12.4% (MR1), 10.1% (MR3), 7.9% (MR4), and 8.3% (MR2). Mean primary loadings ranged from .495 to .603, and seven variables presented cross-loadings according to the adopted criterion. These results support an exploratory four-factor structure while indicating that the solution should not be interpreted as a confirmatory measurement model.

4.5 Latent Dimensions of ROI Measurement

The interpretation of the four-factor solution was based on the convergence of three complementary sources of evidence: the magnitude and pattern of factor loadings, the thematic content of the empirical articles most strongly associated with each factor, and the recurrent theoretical references identified within these studies. Rather than assigning labels solely from the highest-loading variables, this triangulation enabled the factors to be interpreted in relation to the broader conceptual structures represented in the literature. This approach is consistent with recommendations that factor interpretation should consider both statistical structure and substantive and theoretical coherence (Fabrigar et al., 1999; Watkins, 2018).

The statistical structure was interpreted through triangulation of factor-loading patterns, representative empirical articles, and recurrent theoretical references. This procedure resulted in four substantively distinct but complementary latent dimensions of ROI measurement in ESG-related projects (Table 5).

Table 5.
Interpretation of the Latent Dimensions of ROI Measurement in ESG-Related Projects

Factor / Proposed dimension	Dominant constructs (factor loading)	Evidence from representative studies	Theoretical anchors	Interpretive meaning
MR1 – Strategic Capabilities for Sustainable Value Creation	Capabilities (.716); Adoption (.676); Life-Cycle Assessment (.660); Technology (.577); Strategy (.511)	Organizational and digital capabilities; sustainability adoption; circularity and LCA; sustainable business-model innovation; technology and innovation	Freeman (1984); Elkington (1997); Bocken et al. (2014); Parmar et al. (2010)	Organizational capabilities and mechanisms through which sustainability is embedded in strategy, technologies, processes, and business models and converted into value-creating practices.
MR2 – Governance, Disclosure and Corporate Performance	Corporate Social Responsibility (.851); Governance (.729); Financial Performance (.729); Disclosure (.697); Orientation (.585)	ESG/CSR practices; corporate governance; board characteristics; disclosure; firm value and financial performance	Freeman (1984); Donaldson & Preston (1995); Waddock & Graves (1997); Orlitzky et al. (2003); Eccles et al. (2014); Friede et al. (2015)	Governance and accountability mechanisms through which ESG responsibilities are managed, disclosed, and associated with corporate and financial performance.
MR3 – Integrated Impact and Investment Appraisal	Investment (.867); Environmental Impact (.839); Sustainable Development (.623); Economics (.610); Economic Analysis (.543); Economic and Social Effects (.538)	Investment and feasibility assessment; environmental and socioeconomic impacts; economic analysis; risk; optimization and decision support	Freeman (1984); Orlitzky et al. (2003); Eccles et al. (2014); Surroca et al. (2010)	Integration of investment appraisal with environmental, social, and economic impacts to support decisions involving financial and non-financial value.
MR4 – Operational Optimization and Economic Value Creation	Supply Chain (.809); Integer Programming (.772); Profitability (.756); Cost (.654); Value Creation (.432)	Supply-chain network design; multi-objective optimization; sustainable manufacturing; cost and profitability analysis; sensitivity analysis	Porter & Kramer (2011); Bocken et al. (2016); Freeman (1984); Orlitzky et al. (2003)	Operational mechanisms through which sustainability-related choices are optimized in terms of resources, costs, profitability, competitiveness, and economic value creation.

Note. Factor labels were derived through triangulation of factor-loading patterns, the thematic content of representative empirical studies, and recurrent substantive theoretical references. Only dominant constructs are displayed.

MR1, Strategic Capabilities for Sustainable Value Creation, represents the organizational capacity through which sustainability moves from strategic intention to organizational practice. The convergence of capabilities, adoption, life-cycle assessment, technology, strategy, innovation, business models, and circular-economy concepts suggests that sustainable value depends not only on environmental or social objectives, but also on the ability of organizations to mobilize resources, technologies, processes, and stakeholder relationships. This interpretation is consistent with stakeholder-oriented approaches to value creation and with research on sustainable business-model innovation (Freeman, 1984; Parmar et al., 2010; Bocken et al., 2014). MR1 therefore represents an enabling dimension: the organizational architecture required to embed sustainability and convert it into value-creating practices.

MR2, Governance, Disclosure and Corporate Performance, reflects the mechanisms through which ESG responsibilities are governed, communicated, and associated with organizational outcomes. The convergence of CSR, governance, disclosure, financial performance, board-related constructs, ownership, and stakeholders is consistent with research connecting corporate responsibility and governance structures with firm performance and accountability (Waddock & Graves, 1997; Orlitzky et al., 2003; Eccles et al., 2014; Friede et al., 2015). Particularly relevant is the positioning of *Financial Performance* within this dimension rather than within the operational-economic factor. This distinction suggests that the literature treats corporate financial performance associated with governance and ESG practices differently from the direct economic consequences of operational decisions.

MR3, Integrated Impact and Investment Appraisal, provides the most explicit connection between conventional investment evaluation and the broader assessment of sustainable outcomes. Investment and environmental impact form its strongest statistical core, complemented by sustainable development, economics, economic analysis, economic and social effects, decision making, finance, optimization, and risk assessment. Representative studies similarly combine investment decisions with environmental and socioeconomic impacts, feasibility assessment, and decision-support mechanisms. MR3 therefore suggests an integrative appraisal logic in which financial and non-financial consequences are considered jointly rather than as independent evaluation domains. In the context of ESG projects, this dimension provides the clearest latent connection between conventional investment appraisal and an expanded understanding of return that incorporates environmental and social value.

MR4, Operational Optimization and Economic Value Creation, captures how sustainability-related choices are translated into operational and economic outcomes. Its concentration around supply-chain design, integer programming, profitability, cost, value creation, competition, and sensitivity analysis reveals a decision-optimization orientation in which resources and operational configurations are evaluated according to their economic consequences. This differs from MR2, where financial performance is embedded in a corporate governance context. MR4 instead concerns the operational mechanisms through which sustainability decisions can affect efficiency, costs, profitability, competitiveness, and value creation, connecting operational optimization with broader perspectives on sustainable and shared value (Porter & Kramer, 2011; Bocken et al., 2016).

Taken together, the four dimensions indicate that ROI measurement in ESG-related projects is better represented as an interconnected value architecture than as a single financial metric or a simple aggregation of environmental, social, and governance indicators. MR1 captures the capabilities that enable sustainable value creation; MR2 the governance and accountability mechanisms that connect ESG practices with corporate performance; MR3 the appraisal mechanisms that integrate investment with financial and non-financial impacts; and MR4 the operational mechanisms through which these choices are translated into economic value. Conceptually, these dimensions can therefore be understood as complementary functions of value enablement, governance, appraisal, and value realization. This interpretation does not imply a causal sequence among the factors; rather, it synthesizes the distinct functions revealed by the exploratory structure. The resulting architecture provides an empirical basis for understanding sustainable ROI as a multidimensional value construct in which financial and non-financial returns jointly inform the evaluation of ESG-related projects.

5 Discussions

The findings indicate that the conceptual fragmentation surrounding ROI measurement in ESG-related projects does not reflect an absence of common foundations, but rather the coexistence of partially connected mechanisms of sustainable value creation and evaluation. The four latent dimensions reveal an architecture in which organizational capabilities,

governance and corporate performance, integrated impact-investment appraisal, and operational-economic value creation coexist as complementary components. Rather than reproducing environmental, social, governance, and financial categories as separate domains, the factorial structure suggests that sustainable value is organized through the mechanisms by which it is enabled, governed, appraised, and realized.

This structure extends existing perspectives on sustainable value. Stakeholder Theory broadens value creation beyond shareholder returns by recognizing multiple actors as contributors to and recipients of organizational value (Freeman, 1984; Donaldson & Preston, 1995; Parmar et al., 2010). The Triple Bottom Line expands organizational performance across economic, environmental, and social dimensions (Elkington, 1997), while Shared Value emphasizes the potential alignment between economic and societal value creation (Porter & Kramer, 2011). Sustainable business-model research further demonstrates how organizations can redesign value propositions, value creation and delivery, and value capture to incorporate broader sustainability outcomes (Bocken et al., 2014, 2016). The present findings complement these perspectives by suggesting that sustainable value differs not only in what value is created and for whom, but also in the organizational mechanisms through which different forms of value enter evaluation and decision processes.

A particularly relevant finding concerns the fragmentation of the concept of return itself. *Financial Performance* emerged within governance, disclosure, and corporate performance (MR2), whereas *Investment* and *Economic Analysis* were associated with integrated impact and investment appraisal (MR3), and *Profitability* and *Cost* with operational optimization and economic value creation (MR4). This differentiation suggests that financial performance, investment appraisal, and operational-economic return represent related but conceptually distinct manifestations of value. Previous research has demonstrated relationships between sustainability and financial outcomes (Waddock & Graves, 1997; Orlitzky et al., 2003; Eccles et al., 2014; Friede et al., 2015; Surroca et al., 2010), but the present findings indicate that understanding where and through which mechanisms financial value emerges is also critical for ESG project evaluation. This distinction offers a possible explanation for the persistent fragmentation of sustainable ROI research across different analytical levels and measurement traditions.

The findings also reinforce the relevance of Project Management as a context for integrating these otherwise dispersed forms of value. Sustainable Project Management has challenged conventional definitions of project success by incorporating environmental, social, economic, and stakeholder considerations throughout the project life cycle (Martens & Carvalho, 2017; Huemann & Silvius, 2017; Keeys & Huemann, 2017). The latent structure identified here suggests that ESG project evaluation requires more than broader success criteria: it requires mechanisms capable of connecting organizational capabilities, governance, impact and investment appraisal, and operational-economic outcomes. The research gap therefore lies less in the absence of ESG indicators than in the limited integration of existing mechanisms for identifying, evaluating, and incorporating financial and non-financial value into project decision making.

5.1 Theoretical Contributions

This study contributes theoretically by providing empirical evidence that sustainable ROI is better understood as a multidimensional value construct rather than as an extension of conventional financial ROI or an aggregation of ESG and financial indicators. The four latent dimensions reveal complementary mechanisms of strategic capability, governance and corporate performance, integrated impact-investment appraisal, and operational-economic value creation, while distinguishing corporate financial performance, investment appraisal, and operational-economic return as related but distinct manifestations of value. Together, these findings conceptualize sustainable ROI as a value architecture comprising value enablement,

governance, appraisal, and value realization, extending existing multidimensional perspectives by showing that sustainable value differs not only in the outcomes generated but also in the mechanisms through which they are produced and assessed. These functions represent a conceptual synthesis rather than a causal sequence and provide a theoretical basis for integrating financial and non-financial value in ESG-related project evaluation.

5.2 Practical and Sustainability Implications

From a managerial and sustainability perspective, the findings indicate that evaluating ESG-related projects exclusively through conventional financial indicators may overlook important mechanisms of value creation. The four-dimensional structure provides a broader decision logic encompassing organizational capabilities, governance and accountability, integrated assessment of financial and non-financial impacts, and operational-economic outcomes, helping organizations identify which forms of value should be considered, where they emerge, and how they can inform project evaluation and investment decisions. Rather than prescribing a universal metric, this structure supports a shift from compliance, disclosure, and isolated ESG indicators toward value-based sustainability, integrating economic, environmental, social, and organizational value into project selection, resource allocation, and performance monitoring over time.

5.3 Research Agenda, Future Studies and Limitations

This study identifies the latent architecture of sustainable value measurement but does not reveal how its dimensions operate within organizational decision processes. Future qualitative research should therefore examine how organizations identify financial and non-financial benefits from ESG projects, who participates in their definition, how benefits are translated into indicators, how these indicators inform project selection and resource allocation, and how outcomes are monitored throughout the project life cycle, including whether the four dimensions operate as distinct, overlapping, iterative, or context-dependent mechanisms. Subsequent research could translate these dimensions into an integrated decision-support framework and test their transferability across organizational sizes, sectors, sustainability maturity levels, and institutional contexts. The findings should nevertheless be interpreted as exploratory: the modest overall KMO does not support treating the four-factor structure as a validated measurement model; construction of the article-by-construct matrix involved semantic harmonization, variable selection, and interpretative decisions, although factor interpretation was triangulated across loading patterns, representative articles, and recurrent theoretical references; and the dimensions represent conceptual associations rather than causal relationships. Future studies should therefore assess their stability across samples and contexts and investigate their organizational operationalization.

6. Conclusion

This study investigated how the scientific field of ROI measurement in ESG-related projects is structured and which latent dimensions underlie its conceptual organization. By integrating bibliometric analysis, bibliographic coupling, and Exploratory Factor Analysis, the findings reveal that sustainable ROI is not organized as a single financial measure or as a simple aggregation of environmental, social, and governance indicators. Instead, four complementary dimensions emerged: Strategic Capabilities for Sustainable Value Creation; Governance, Disclosure and Corporate Performance; Integrated Impact and Investment Appraisal; and Operational Optimization and Economic Value Creation.

Together, these dimensions support the understanding of sustainable ROI as a multidimensional value architecture in which value is enabled, governed, appraised, and realized through distinct but interconnected mechanisms. This perspective helps bridge previously fragmented research streams and provides a conceptual foundation for integrating financial and non-financial value in ESG-related project evaluation. Further research can

advance this architecture by examining how these dimensions are operationalized in organizational decision processes and translated into practical mechanisms for project selection, evaluation, and monitoring.

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Statement on the Use of Generative Artificial Intelligence

Generative artificial intelligence tools were used in the preparation of this work to support writing revision, text organization, and the verification of formatting and references. Their use was conducted under the full supervision and responsibility of the authors, who reviewed and validated all content. The theoretical conceptualization, data collection and analysis, and conclusions are entirely the work of the researchers.