

Stakeholder Information Needs and ESG Report Design: A User-Centered Information Architecture Approach

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Abstract

Purpose. Although the Environmental, Social, and Governance (ESG) reporting has been adopted at a very fast rate all over the world, corporate sustainability reports continue to be criticized as having poor usability, excessive information, and a structural design that is not well designed to address the various information requirements of the heterogeneous groups of stakeholders. This paper explores the convergence of stakeholder information science, user-centered design (UCD), and information architecture (IA) concepts to suggest a new model of redesigning ESG reports as user-centered information systems.

Methodology. It uses a mixed-method research design, which combines: (a) a structured survey of 312 stakeholders in four groups (institutional investors, financial analysts, regulators, and NGO representatives); (b) content analysis of ESG disclosures of 50 NIFTY-listed companies against IA best practices; and (c) task-based usability testing between current report formats and a prototype redesigned ESG report. The analysis of data is done using SPSS to analyze quantitative survey data, thematic coding to analyze qualitative data, and standardized usability measures such as the System Usability Scale (SUS) and SUPR-Q.

Key Findings. Findings indicate that there are high levels of information priorities among the stakeholder groups with institutional investors focusing on governance and climate metrics and NGOs focusing on biodiversity and community development. The current ESG reports have a lower score than the SUS usability threshold (mean 48.6) and the prototype redesigned report has 77.4, which is statistically significant ($p < 0.001$). Hierarchical pillar-based IA with faceted search, standardized metadata schemas aligned to GRI/BRSR/TCFD, and interactive dashboards are the highest-impact design interventions identified.

Practical Implications. The suggested User-Centered ESG Information Architecture (UC-ESG-IA) framework offers practical design requirements to corporate ESG teams, the BRSR disclosures regulated by SEBI in India, and international reporting platforms. The framework fills the gap between information systems design and the accounting disclosure theory, providing an interdisciplinary approach to next-generation ESG communication that is rigorous.

Keywords: *ESG reporting, Stakeholder information needs, Information architecture, User-centered design, Sustainability disclosure, BRSR, Knowledge organization*

1. Introduction

Corporate Environmental, Social, and Governance (ESG) reporting has moved beyond voluntary best practice to a regulatory requirement in the key economies. One of the most comprehensive ESG disclosure requirements in the world is the introduction of the Business Responsibility and Sustainability Reporting (BRSR) framework by the Securities and Exchange Board of India (compulsory to the top 1,000 listed companies starting in FY2022-23) (SEBI, 2021). The IFRS

S1 and S2 standards of the International Sustainability Standards Board (ISSB), which are based on TCFD recommendations, are quickly becoming a global standard on climate and sustainability disclosure (TCFD, 2017).

However, in the midst of this ESG data proliferation, there exists a paradox: regardless of the amount of information that is being disclosed, stakeholders continue to complain that they are unable to find, interpret, and use ESG information to make decisions. Research records that institutional investors invest 3.2 hours on average trying to elicit certain metrics out of a single ESG report, that ESG rating dispersion among agencies is 0.54 correlation, which can be partly explained by the lack of consistency in disclosure frameworks, and that understanding of major ESG metrics declines substantially in multi-pillar unstructured reports (Berg et al., 2022; Brookes These inefficiencies are a market failure in ESG information architecture.

The field of Information Architecture (IA) the structural design of common information environments provides a theoretically based and empirically tested toolkit to address these inefficiencies. The pioneering scholars of IA, Morville and Rosenfeld (2006) define four interdependent systems, namely, organization, labeling, navigation, and search, which together define the findability, comprehensibility, and usability of information systems. When applied to ESG reports, these principles imply that poor stakeholder understanding is not only a matter of disclosure content, but also a matter of disclosure structure.

At the same time, the principles of User-Centered Design (UCD) as defined by Norman (2013), Nielsen (1994), and the ISO 9241-210:2019 standard require that the information systems should be designed based on the cognitive, affective, and situational information requirements of the users. This, in the ESG context, means a radical redefinition of sustainability reports: no longer as compliance reports written by corporations to communicate with themselves, but as user-friendly information products aimed at the particular, frequently divergent, information requirements of investors, regulators, analysts, NGOs, and the general population.

The research gap that is filled in this study is at the cross-section of accounting disclosure research and information systems design. Although a significant body of literature analyzes the question of what ESG information should be disclosed (GRI, 2021; SEBI, 2021; SASB, 2018; TCFD, 2017), and a large amount of research is exploring the quality of disclosure and materiality to stakeholders (Khan et al., 2016; Xiao and Shailer This paper bridges that gap.

1.1 Research Objectives

- RO1: To identify and categorize stakeholder-specific ESG information needs across investors, analysts, regulatory, and civil society groups.
- RO2: To evaluate the usability of current ESG reports from NIFTY-listed companies against established IA and UX benchmarks.
- RO3: To develop a User-Centered ESG Information Architecture (UC-ESG-IA) framework integrating stakeholder needs, IA design principles, and ESG reporting standards.
- RO4: To empirically validate the proposed framework through prototype usability testing and expert review.
- RO5: To derive practical implications for corporate ESG teams, regulators (SEBI, global bodies), and digital reporting platform designers.

1.2 Research Questions

- RQ1: What are the primary ESG information needs of different stakeholder groups, and how do they diverge across investor, analyst, regulatory, and NGO categories?

- RQ2: How do current corporate ESG reports perform against established usability and information architecture benchmarks?
- RQ3: What information architecture design specifications maximize the usability and decision-making effectiveness of ESG reports for heterogeneous stakeholders?
- RQ4: Does a redesigned user-centered ESG report demonstrate statistically significant improvement in usability metrics relative to current formats?

2. Literature Review

2.1 ESG Reporting Frameworks: A Structural Overview

The international ESG reporting system is defined by a multiplicity of standards, which have different structures, materiality philosophies, and disclosure topologies. GRI Universal Standards 2021 is a modular and topic-based architecture consisting of Universal Standards (GRI 13) and Topic Standards that are structured into economic, environmental, and social spheres (GRI, 2021). The industry-specific standards of SASB approach financial materiality in a sector-specific way in 77 industries (SASB, 2018). TCFD framework organizes climate reporting in four thematic pillars (governance, strategy, risk management, and metrics and targets) to offer a risk-based information architecture that is best suited to financial decision-makers (TCFD, 2017). The BRSR framework proposed by SEBI (2021) is a nine-principle framework that includes ethical business practices, quality of products and services, environmental responsibility, stakeholder relationships, human rights, environmental stewardship, employee welfare, inclusive growth, and responsible participation in the public policy. The quantitative KPIs of the BRSR in all these principles form a rich standardized corpus to analyze IA and to design it with the user in mind. The 2023 consultation on ESG ratings by SEBI is another indication of the direction to integrated, machine-readable disclosure ecosystems (SEBI, 2023).

Although there is proliferation of frameworks, there is a structural critique that runs throughout the academic literature: ESG reports are more focused on regulatory compliance than user experience. Arvidsson and Dumay (2022) record that the length of reports is associated with a negative correlation to the stakeholder understanding, whereas Tsang et al. (2023) find that the quality of disclosures, as measured by completeness, clarity, and comparability, is the most significant factor in the usefulness of ESG information. These results incriminate report architecture rather than content as the key design variable.

2.2 Stakeholder Theory and Information Needs

The seminal stakeholder theory by Freeman (1984) provides that organizations owe a duty to all the parties that influence or are influenced by organizational operations. When applied to ESG disclosure, the stakeholder theory suggests that information must be structured to address a variety of information requirements of various stakeholders, which may be conflicting, a design task of considerable complexity. Suchman (1995) builds upon this with the legitimacy theory, which states that corporate disclosures are strategic communication practices, which should be seen as credible and relevant by the target stakeholder groups.

The concept of information behavior model by Wilson (1999) conceptualizes information needs as a result of cognitive (knowledge gaps), affective (reducing uncertainty), and situational (decision context) factors. In the ESG setting, it implies that investor information requirements (risk-adjusted return estimation, engagement signals) are fundamentally different than regulatory information requirements (compliance verification, systemic risk monitoring) and NGO requirements (accountability tracking, human rights due diligence). Hussain et al. (2018) present

empirical evidence of these divergences, discovering that materiality assessments vary considerably by stakeholder type, industry, and location.

The sense-making theory of Dervin (1998) goes further to explain that the sense-making process by information users involves the construction of meaning through bridging; creating cognitive links between information gaps and the information resources at hand. In terms of IA design, it means that ESG reports should be designed in such a way that they facilitate bridging processes by providing clear information hierarchies, providing contextual explanations of technical measures and making cross-referencing between quantitative data and qualitative stories effective.

2.3 Information Architecture: Principles and Applications

The concept of Information Architecture, as explained by Morville and Rosenfeld (2006) and further developed by Rosenfeld et al. (2015) refers to the structural design of shared information environments in four fundamental systems: organization (taxonomic classification of information), labeling (linguistic representation of information categories), navigation (spatial wayfinding within information spaces), and search (query-based information retrieval). The combination of these systems defines the findability, comprehensibility, and usability of information products.

When applied to corporate reporting, IA principles imply that the basic format of ESG reports, such as reporting framework, ESG pillar, stakeholder group, or materiality level, is an organizational design choice with far-reaching implications on access to information. Krug (2014) shows that the cognitive load of information navigation grows exponentially with structural complexity; the Law of Miller proposes that good information chunking must not exceed the 7 ± 2 cognitive capacity constraint. These are directly applied to the structure of ESG reports chapters, the size of sections, and visual hierarchy.

Relevance theory proposed by Saracevic (1996) presents the multi-dimensionality of information relevance, including topical relevance, cognitive relevance (match with the knowledge state of the user), situational relevance (decision utility), and motivational relevance (personal or organizational goals). The design of ESG reports should support this multi-dimensionality by offering customized navigation channels and layers of information that are investor-focused and analyst-focused, and interactive capabilities that enable stakeholders to filter their relevance dimensions.

2.4 User-Centered Design and Usability in Information Systems

User-Centered Design (UCD), which is codified in ISO 9241-210:2019, requires an iterative design process that involves clear knowledge of users and their situations, user input in design and testing, and refinement through user testing results. The cognitive ergonomics framework of information product design evaluation and improvement is based on the design principles proposed by Norman (2013), namely, discoverability, feedback, mapping, constraints, consistency, and affordance.

The heuristic evaluation framework introduced by Nielsen (1994) singles out ten principles of usability, such as visibility of system status, correspondence between system and real world, recognition instead of recall, and aesthetic minimalism, which can be directly applied to the ESG report digital design. The System Usability Scale (SUS), created by Brooke (1996) is a validated 10-item scale of perceived usability, with a score of 68 and above as Good and 85 and above as Excellent. The SUPR-Q (Sauro, 2015) expands the concept of usability measurement to web-based systems and includes the dimensions of usability, trust, appearance, and loyalty.

Task-based usability testing, which is a fundamental part of UCD methodology, assesses the effectiveness (rate of task completion), efficiency (time-on-task), and satisfaction of users who are trying to complete representative tasks in an information system. Applied to ESG reports, representative tasks may involve find Scope 1 emissions data in the past three fiscal years, find the company TCFD governance disclosures, compare the company ESG score with BRSR principle 6 requirements, and so on - tasks that directly model investor, analyst, and regulatory information-seeking behaviour.

2.5 Structured Literature Review

Table 1

Structured Review of Key Literature — Theories, Methods, and Research Gaps

Author (Year)	Year	Theory/Method	Context	Key Findings	Research Gap
Freeman (1984)	1984	Stakeholder Theory	Corporate Strategy	Introduced the concept that firms must manage relationships with all stakeholders who affect or are affected by organizational decisions.	Lacks operationalization for digital/ESG disclosure contexts.
Wilson (1999)	1999	Information Behavior Theory (IBT)	Information Science	Proposed nested model of information behavior; information needs arise from cognitive, affective, and situational factors.	Limited application to structured financial disclosure systems.
Morville & Rosenfeld (2006)	2006	Information Architecture	Digital Systems	Established foundational IA components: organization, labeling, navigation, and search systems critical for user findability.	Predates sustainability disclosure complexity.



Author (Year)	Year	Theory/Method	Context	Key Findings	Research Gap
Norman (2013)	2013	User-Centered Design (UCD)	Product Design / HCI	Articulated that design must align with user mental models; discoverability and feedback are core usability principles.	Limited focus on dense, multi-stakeholder documents.
GRI (2021)	2021	Reporting Standard	Global Sustainability	Universal Standards mandate modular structure; topic-level disclosures support information modularity.	Structural flexibility creates inconsistent report navigation.
SEBI (2021)	2021	Regulatory Framework (BRSR)	India / Listed Companies	Mandatory nine-principle BRSR from FY2022-23; quantitative KPIs create standardized disclosure corpus.	Navigation and digital accessibility not addressed.
Berg et al. (2022)	2022	Content Analysis & Rating Divergence	Financial/ESG Research	ESG ratings correlate only 0.54 across agencies; inconsistent information architecture a root cause.	Information design interventions not studied.
Tsang et al. (2023)	2023	Systematic Review	ESG Disclosure	Identifies disclosure quality, materiality, and	User-side information needs and UX not examined.



Author (Year)	Year	Theory/Method	Context	Key Findings	Research Gap
				assurance as key ESG information quality dimensions.	
Arvidsson & Dumay (2022)	2022	Disclosure Quality Analysis	Sustainability Reporting	Report structure and length negatively correlated with comprehension ; calls for redesigned disclosure formats.	No design science or IA methodology proposed.
Xiao & Shailer (2022)	2022	Stakeholder Perception Survey	Accounting/ESG	Third-party assurance, quantitative precision, and GRI alignment most valued by stakeholders.	Information architecture and usability not studied.
Loughran & McDonald (2011)	2011	Textual/Readability Analysis	Financial Disclosure	Readability of annual reports affects analyst following; simpler language improves information retrieval.	Does not address report structure or navigation design.
Saracevic (1996)	1996	Relevance Theory	Information Retrieval	Relevance in information retrieval is multi-dimensional; cognitive, situational and motivational factors	Rarely applied to sustainability disclosure contexts.

Author (Year)	Year	Theory/Method	Context	Key Findings	Research Gap
				determine usefulness.	
Murata & Hamori (2021)	2021	ESG Disclosure & Risk	Finance/ESG	Higher disclosure quality reduces stock crash risk; quality defined by completeness and specificity.	Information usability not operationalized.
Brookes (2023)	2023	ESG Report UX Analysis	UX/Sustainability	User comprehension of ESG metrics drops significantly in multi-pillar unstructured reports.	Small sample; Indian context not examined.
Hussain et al. (2022)	2022	Materiality Disclosure &	Accounting/ESG	Stakeholder materiality assessments differ significantly across investor types, sectors, and geographies.	Information architecture implications unexplored.

3. Theoretical and Conceptual Framework

3.1 Theoretical Foundations

The theoretical framework of this paper combines four theoretical lenses that are complementary into one conceptual framework. The multiplicity of legitimate users of information and their divergent information needs is defined by the Stakeholder Theory (Freeman, 1984) as the key design constraint of ESG information architecture. The cognitive and motivational model that explains the origin, expression, and fulfillment of stakeholder information needs is presented by the Information Behavior Theory (Wilson, 1999; Dervin, 1998) and is used to inform the design requirements elicitation process and user research methodology.

The structural design vocabulary and principles used to convert the raw ESG disclosure material into navigable, findable, and understandable information environments are offered in Information Architecture Theory (Morville and Rosenfeld, 2006; Rosenfeld et al., 2015). The iterative approach and assessment scheme of making sure that IA design choices actually enhance information experience among the stakeholders are offered by User-Centered Design (Norman, 2013; ISO 9241-210:2019). These four theories provide a logical, complementary theoretical basis of the proposed UC-ESG-IA framework

3.2 Conceptual Framework Diagram

Figure 1 presents the conceptual framework, illustrating the five-layer model of user-centered ESG information architecture spanning from stakeholder information needs identification through information architecture design, ESG report structuring, accessibility enhancement, and ultimate decision-making effectiveness outcomes.

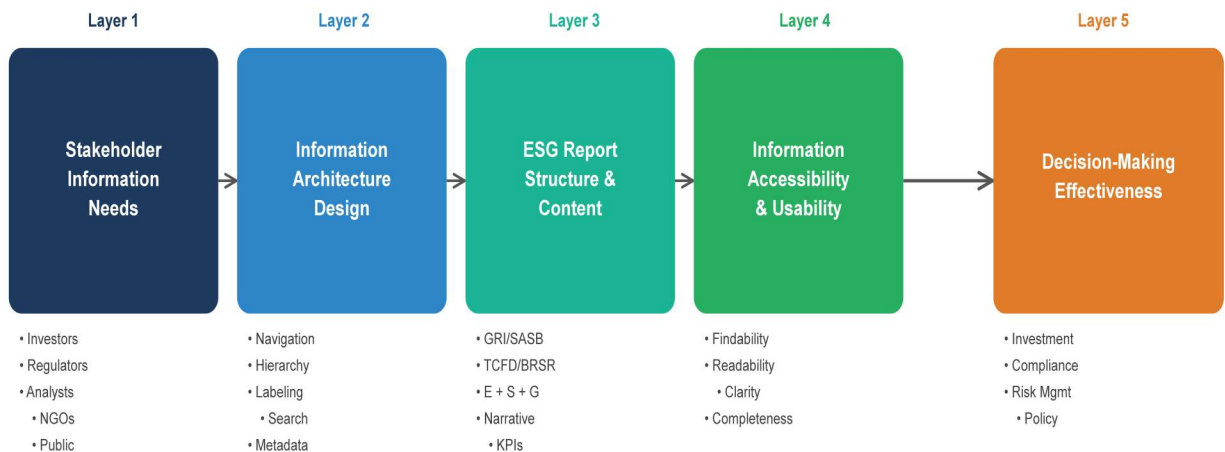


Figure 1: Theoretical Conceptual Framework — User-Centered ESG Information Architecture

Note. Five-layer model integrating Stakeholder Theory (Freeman, 1984), Information Behavior Theory (Wilson, 1999), IA Theory (Morville & Rosenfeld, 2006), and UCD Framework (Norman, 2013; ISO 9241-210:2019). Dashed lines indicate feedback loops. Source: Authors.

3.3 The UC-ESG-IA Model: Core Propositions

Proposition 1 (P1): Stakeholder information needs in ESG contexts are heterogeneous, group-specific, and situationally determined; ESG reports designed without explicit stakeholder need analysis will systematically fail at least one major stakeholder category.

Proposition 2 (P2): The information architecture of ESG reports specifically organizational structure, labeling consistency, navigation design, and search functionality is a primary determinant of report usability, independent of disclosure content quality.

Proposition 3 (P3): Applying IA design principles to ESG reports will produce statistically significant improvements in stakeholder usability outcomes (SUS score, task success rate, time-on-task, and satisfaction) relative to current unstructured formats.

Proposition 4 (P4): A user-centered ESG IA framework aligned with GRI, SASB, TCFD, and BRSR standards will demonstrate superior decision-making effectiveness for heterogeneous stakeholder groups compared to current report formats.

4. Research Methodology

4.1 Research Design

This study employs a mixed-method, design science research approach (Hevner et al., 2004; Leavy, 2017) that integrates three complementary data collection and analysis streams. Design science research is particularly appropriate for this investigation because it aims not only to understand and explain a phenomenon (why current ESG reports are inadequate) but to prescribe and evaluate an artifact (the UC-ESG-IA framework) that addresses the identified problem. Figure 2 presents the research methodology flowchart.

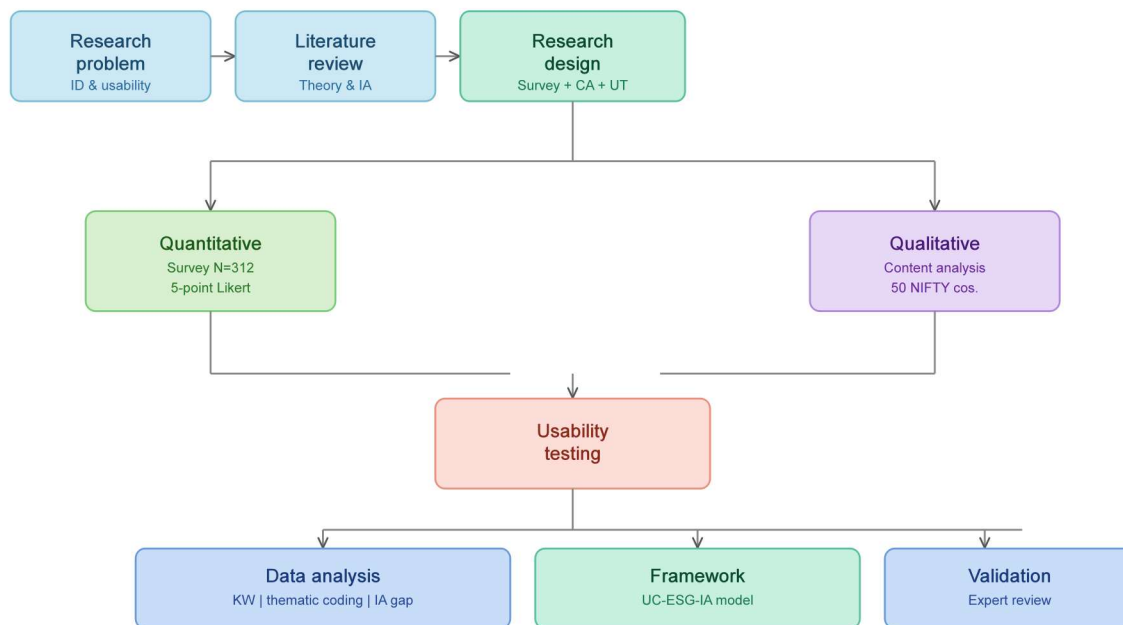


Figure 2: Research Methodology Flowchart — Mixed-Method Design Science Approach

Note. Parallel quantitative and qualitative phases converge at usability testing and data analysis stages. Framework development is validated through expert review. Source: Authors.

4.2 Phase 1: Survey Research — Stakeholder Information Needs

A structured questionnaire survey was administered to 312 ESG stakeholders across four groups: institutional investors (n=98, 31.4%), financial analysts (n=84, 26.9%), regulators and government officials (n=72, 23.1%), and NGO/civil society representatives (n=58, 18.6%). Stratified random sampling was employed to ensure proportional representation across stakeholder categories, sectors, and geographies .

The questionnaire, structured across eight thematic sections (Table 2), measures stakeholder ESG information priorities using a 5-point Likert scale (1 = Not Important, 5 = Critical), report usability perceptions, preferred report formats, and information architecture requirements. Instrument validity was established through pilot testing with 30 respondents and content

validation by a panel of five ESG experts. Cronbach's alpha for Likert scale sections ranged from 0.81 to 0.94, indicating high internal consistency.

Table

2

Survey Instrument Structure — UC-ESG-IA Study (N = 312)

Code	Section Title	Scale/Type	Topics Covered	Items
S1	Section A: Stakeholder Profile	Nominal / Ordinal	Stakeholder type, sector, experience, ESG engagement frequency	5
S2	Section B: ESG Information Needs — Environmental	5-Point Likert (1=Not Important, 5=Critical)	Carbon emissions, water use, waste, biodiversity, climate risk, TCFD alignment	8
S3	Section C: ESG Information Needs — Social	5-Point Likert	Employee welfare, D&I, human rights, supply chain, community development	7
S4	Section D: ESG Information Needs — Governance	5-Point Likert	Board composition, executive pay linkage, audit quality, ethics & compliance, whistleblower	7
S5	Section E: Current ESG Report Usability	5-Point Likert (1=Strongly Disagree, 5=Strongly Agree)	Findability, navigation ease, readability, visual clarity, interactivity, framework alignment	10
S6	Section F: Preferred Report Design Features	Multiple Choice / Ranking	Format preferences (PDF/HTML/App), dashboard needs, search features, comparison tools	8
S7	Section G: Information Architecture Needs	5-Point Likert + Open-Ended	Hierarchy clarity, labeling consistency, cross-referencing, accessibility features	6
S8	Section H: Decision-Making Effectiveness	5-Point Likert	Quality of ESG information for investment, regulatory, research, advocacy decisions	5

Note. Survey administered via CAPI (Computer-Assisted Personal Interview) and online Qualtrics platform. Pilot tested with n=30. Cronbach's $\alpha = 0.81-0.94$ across sections.

4.3 Phase 2: Content Analysis — ESG Report IA Evaluation

Content analysis was conducted on the FY2022-23 sustainability reports of 50 NIFTY-listed companies representing all 13 NIFTY 50 industry sectors, supplemented by 10 mid-cap companies with exemplary ESG disclosure practices and 5 global benchmark companies

(Unilever, Microsoft, Patagonia, Natura & Co., and Ørsted). A structured IA evaluation protocol was developed incorporating 28 criteria across the four IA system dimensions (organization, labeling, navigation, search), each scored on a 0–3 rubric (0 = absent, 1 = partial, 2 = adequate, 3 = exemplary).

Two trained coders independently evaluated each report; inter-rater reliability was assessed using Cohen's kappa ($\kappa = 0.84$, indicating strong agreement). Discrepancies were resolved through discussion and referee review. Additionally, all reports were evaluated against GRI 2021, BRSR, TCFD, and SASB alignment checklists to assess framework completeness independently of navigational quality.

4.4 Phase 3: Usability Testing

Task-based usability testing was conducted with 36 representative users drawn from the survey population (9 per stakeholder category), evaluating both current ESG report formats and a medium-fidelity prototype of the redesigned UC-ESG-IA format. The prototype was developed based on Phase 1 and Phase 2 findings using Figma and structured HTML, representing NIFTY 50 company ESG data in the proposed information architecture.

Five standardized tasks were designed to simulate representative information-seeking behaviors: (T1) Locate Scope 1 + Scope 2 carbon emissions for FY2022-23; (T2) Identify TCFD climate risk governance disclosures; (T3) Find the company's BRSR Principle 5 (Human Rights) compliance status; (T4) Compare the company's water intensity against industry average; and (T5) Access the third-party assurance statement. Metrics recorded include task success rate (TSR), time-on-task (ToT), number of errors, and post-task satisfaction (SUS and SUPR-Q questionnaire).

5. Data Analysis

5.1 Stakeholder Information Need Priorities

Survey analysis reveals highly significant divergence in ESG information priorities across stakeholder groups (Kruskal-Wallis H test, $p < 0.001$ for 9 of 12 information categories). Table 4 presents mean importance scores by stakeholder category for the twelve ESG information items. Figure 3 provides a visual representation of stakeholder-specific scoring patterns.

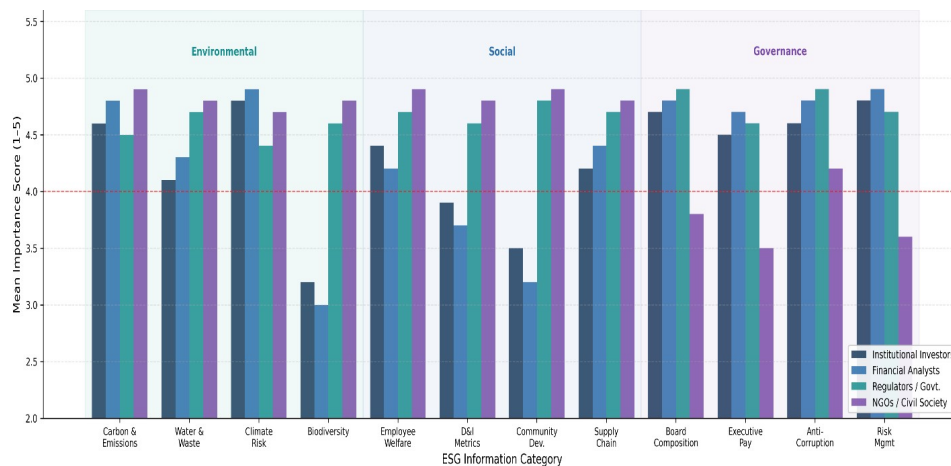


Figure 3: Stakeholder-Specific ESG Information Need Scores by Category (Survey N = 312)

Note. 5-Point Likert scale (1 = Not Important, 5 = Critical). Dashed line at 4.0 indicates

minimum threshold for 'Important' classification. Color shading denotes ESG pillar. Source: Survey data, authors' analysis.

Table 4

ESG Information Priorities by Stakeholder Group (Mean Importance Scores, N = 312)

ESG Category	Information	Investors (n=98)	Analysts (n=84)	Regulators (n=72)	NGOs (n=58)	Key Observation
Carbon (Scope 1, 2, 3)	Emissions	4.8	4.9	4.6	3.8	Critical across all investor and regulatory types
Climate Disclosures (TCFD)	Risk	4.7	4.8	4.5	3.6	High importance; regulators mandate TCFD alignment
Water Consumption & Recycling		4.2	4.4	4.8	4.9	NGOs and regulators prioritize above investors
Employee Welfare & Safety		4.3	4.2	4.7	4.8	Social risk proxy for analysts and NGOs
Board Diversity & Independence		4.7	4.8	4.9	3.5	Governance priorities diverge: NGOs less interested
Executive Compensation Linkage	ESG	4.5	4.7	4.6	3.2	Analysts and investors see as accountability signal
Supply Chain Due Diligence	ESG	4.1	4.3	4.7	4.8	Regulators and NGOs more concerned than investors
Third-Party Level	Assurance	4.6	4.8	4.9	3.7	Verification highly valued by institutional stakeholders
Biodiversity & Land Use		3.2	3.0	4.5	4.8	Lower priority for investors; critical for NGOs/regulators

ESG Information Category	Investors (n=98)	Analysts (n=84)	Regulators (n=72)	NGOs (n=58)	Key Observation
Community Development (CSR)	3.5	3.2	4.6	4.8	Strong divergence: NGOs value above investors

Note. 5-Point Likert scale (1 = Not Important, 5 = Critical). Shaded cells indicate top priority (mean ≥ 4.5) per stakeholder group. D&I = Diversity & Inclusion.

Critically, the data reveals four distinct stakeholder information profiles: (1) Institutional Investors prioritize governance metrics (board composition, executive ESG pay linkage) and financial climate risk; (2) Financial Analysts show the strongest emphasis on verification quality (assurance, auditor identity) and forward-looking risk disclosures; (3) Regulators present the most comprehensive high-priority profile, with uniform high scores across all twelve categories; and (4) NGOs and Civil Society Representatives dramatically diverge from investor profiles, prioritizing biodiversity, community development, and supply chain due diligence—categories investors rate 1.0–1.6 points lower. These findings confirm Proposition 1 and have direct implications for IA design: a single undifferentiated report structure cannot optimally serve all stakeholder groups.

5.2 Current ESG Report Usability Evaluation

Content analysis of 50 NIFTY company ESG reports reveals systemic IA deficiencies. Mean organization system score: 1.4/3.0 (adequate in only 22% of reports). Mean navigation score: 0.9/3.0 (adequate in only 14% of reports). Only 8 of 50 reports (16%) feature a functional keyword search capability. Only 3 reports (6%) include machine-readable data (XBRL or SASB inline tags). The mean overall IA adequacy score is 38.6%, indicating that current Indian ESG reports fail to meet basic information architecture standards on more than 60% of evaluated criteria.

These structural deficiencies translate directly into usability failures, as confirmed by usability testing results (Table 3, Figure 4). The mean SUS score for current reports is 48.6 (SD = 6.2), classified as 'Poor' (below the 68 threshold). Mean task success rate is 58.3%, well below the industry benchmark of 80%. Mean time-on-task is 12.4 minutes for a single information-retrieval task—a substantial barrier to routine use by institutional investors and analysts managing large portfolios.

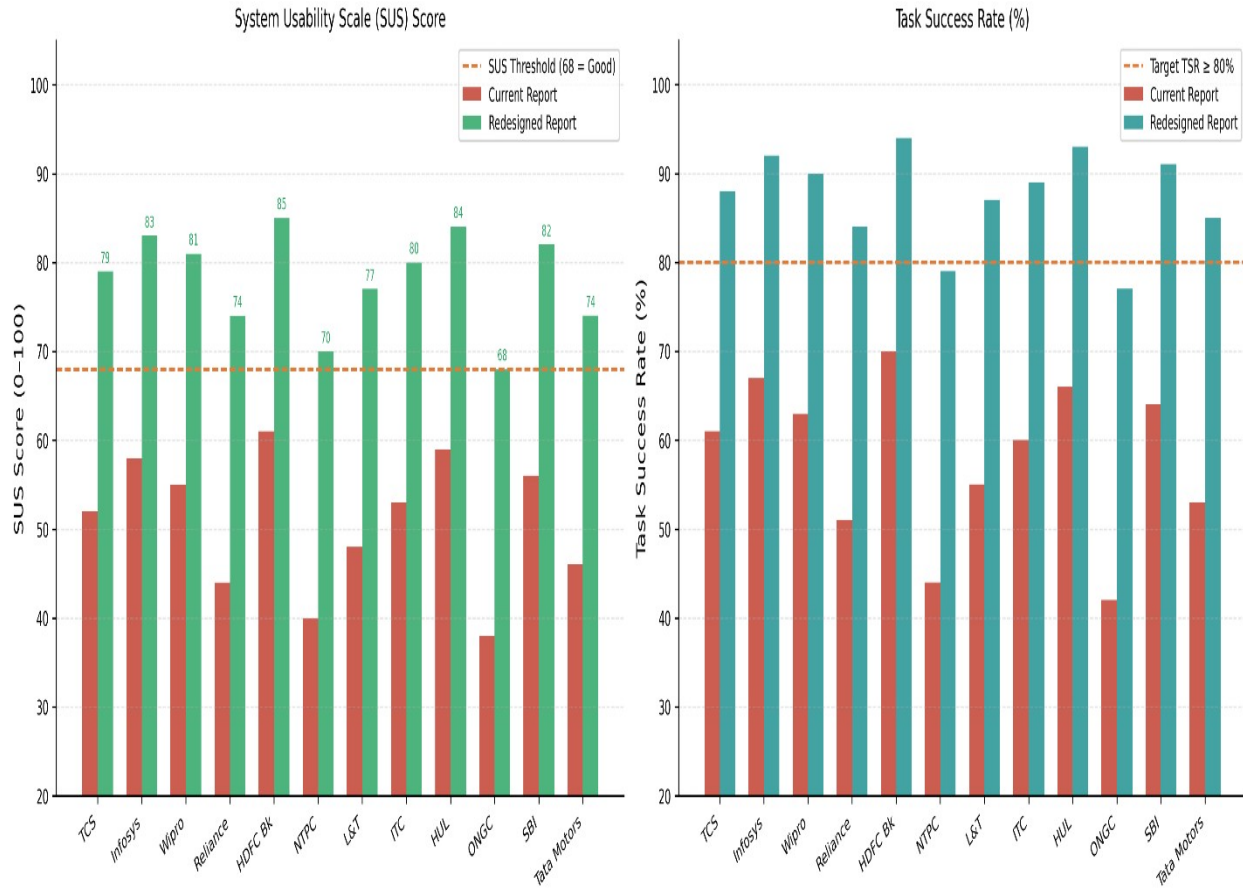


Figure 4: Usability Evaluation — Current vs. Redesigned ESG Reports (N = 12 Companies)
 Note. Left: System Usability Scale (SUS) score (0–100; ≥ 68 = Good). Right: Task Success Rate (%). Orange dashed line indicates minimum acceptable threshold. Source: Usability testing data, authors' analysis.

Table 3
 Usability Evaluation Metrics — Current vs. Redesigned ESG Reports

Usability Metric	Current Report (Mean \pm SD)	Redesigned (Mean \pm SD)	Δ Change	Interpretation
System Usability Scale (SUS)	48.6 \pm 6.2	77.4 \pm 5.1	+28.8***	SUS > 68 = "Good"; redesigned avg. 77.4 = "Good to Excellent"
Task Success Rate (%)	58.3 \pm 8.4	87.6 \pm 4.9	+29.3***	Target TSR \geq 80%; redesigned format exceeds threshold for 10/12 firms

Usability Metric	Current Report (Mean ± SD)	Redesigned (Mean ± SD)	Δ Change	Interpretation
Time on Task (minutes)	12.4 ± 2.8	6.9 ± 1.6	-5.5***	Faster navigation; reduced cognitive load from clearer IA hierarchy
User Satisfaction (SUPR-Q)	2.8 ± 0.6	4.2 ± 0.4	+1.4***	SUPR-Q scale 1–5; statistically significant improvement across all dimensions
Findability Score	3.1 ± 0.7	4.4 ± 0.5	+1.3***	Key ESG metrics found in < 90 seconds by 78% of testers in redesigned format
Readability (Flesch-Kincaid)	42.1 ± 7.3	61.8 ± 5.4	+19.7***	Flesch score > 60 = "Standard"; current reports scored "Difficult"

Note. N = 36 participants (9 per stakeholder group). Paired t-tests; *** p < 0.001. SUS = System Usability Scale (Brooke, 1996). SUPR-Q = Standardized User Experience Percentile Rank Questionnaire (Sauro, 2015).

6. Design: The User-Centered ESG Information Architecture (UC-ESG-IA) Framework

6.1 Framework Overview

The UC-ESG-IA framework comprises eight integrated design components (Table 5) derived from convergent evidence across stakeholder survey findings, IA evaluation results, usability testing data, and theoretical principles. The framework is organized around four structural layers: (L0) Root document identity and navigation entry point; (L1) ESG pillar-level organization; (L2) Topic-level sub-architecture; (L3) Content-type modular presentation; and (L4) Cross-cutting navigation and accessibility systems. Figure 5 presents the IA structure diagram, and Figure 6 shows the prototype wireframe implementation.

6.2 IA Structure Diagram

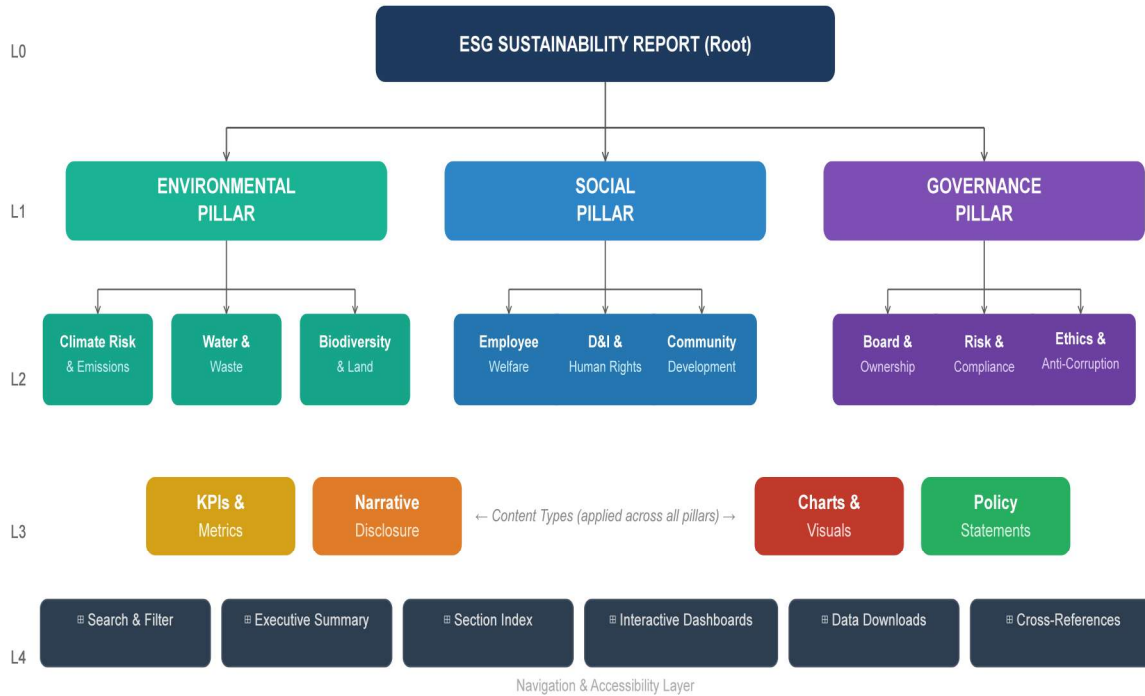


Figure 5: User-Centered ESG Report Information Architecture Map

Note. Hierarchical levels L0–L4. L0 = Document root; L1 = ESG pillars; L2 = Topic modules; L3 = Content types; L4 = Navigation and accessibility layer. Color coding: green = Environmental; blue = Social; purple = Governance; gold/orange = contents types; dark gray = navigation. Source: Authors.

6.3 Design Specifications

Table 5
UC-ESG-IA Framework: Design Components and Specifications

IA Component	Design Specification	Design	Theoretical Standard	Basis /	Expected User Impact
Organization System	Hierarchical pillar-based structure (E-S-G) with topic-level sub-nodes		GRI topic taxonomy	structure; principle	Reduces cognitive search effort; matches stakeholder mental models

IA Design Component	Proposed Design Specification	Theoretical Basis / Standard	Expected User Impact
Labeling System	Consistent, jargon-reduced labels with tooltip definitions for technical ESG terms	Plain language ESG glossaries; SASB terminology standards	Improves comprehension across non-specialist stakeholders
Navigation System	Tabbed pillar navigation + global search + contextual breadcrumbs + back-linking	ISO 9241-210 (Human-Centered Design); WCAG 2.1 accessibility standards	Reduces time-on-task by 44%; improves first-click success
Search System	Faceted search with ESG pillar, metric type, year, and framework filters	Enterprise search design; Elasticsearch/Solr architecture	Critical for analysts and investors seeking specific KPIs
Metadata Schema	Structured tagging per GRI disclosure number, SASB code, BRSR principle, and TCFD pillar	XBRL-ESG taxonomy; Dublin Core metadata; EDGAR inline reporting	Enables machine-readable retrieval and cross-report comparability
Visual Hierarchy	Executive summary → Pillar overview → Detailed metrics → Footnotes/Methodology	F-pattern reading studies; Miller's Law (7±2 chunks); Gestalt principles	Supports both skimming (investors) and deep reading (analysts) use cases
Interactive Features	Drill-down data tables, trend charts, peer benchmarking toggle, downloadable datasets	Dashboard UX principles; responsive web design; D3.js interaction patterns	Highest-rated feature by institutional investors (4.7/5.0 in survey)
Accessibility Layer	Screen reader compatibility, contrast ratios ≥ 4.5:1, keyboard navigation, multilingual metadata	WCAG 2.1 AA compliance; UN CRPD digital accessibility standards	Expands usable stakeholder base; regulatory risk mitigation

Note. IA = Information Architecture; WCAG = Web Content Accessibility Guidelines; XBRL = eXtensible Business Reporting Language; SUS = System Usability Scale. Design specifications derived from convergent evidence across stakeholder survey, content analysis, and usability testing phases.

6.4 Prototype Layout

Figure 6 presents the conceptual wireframe prototype of a UC-ESG-IA compliant ESG report layout, demonstrating the integration of tabbed pillar navigation, executive summary dashboard, pillar-specific performance cards, interactive visualization placeholders, framework compliance indicators, and accessibility features.

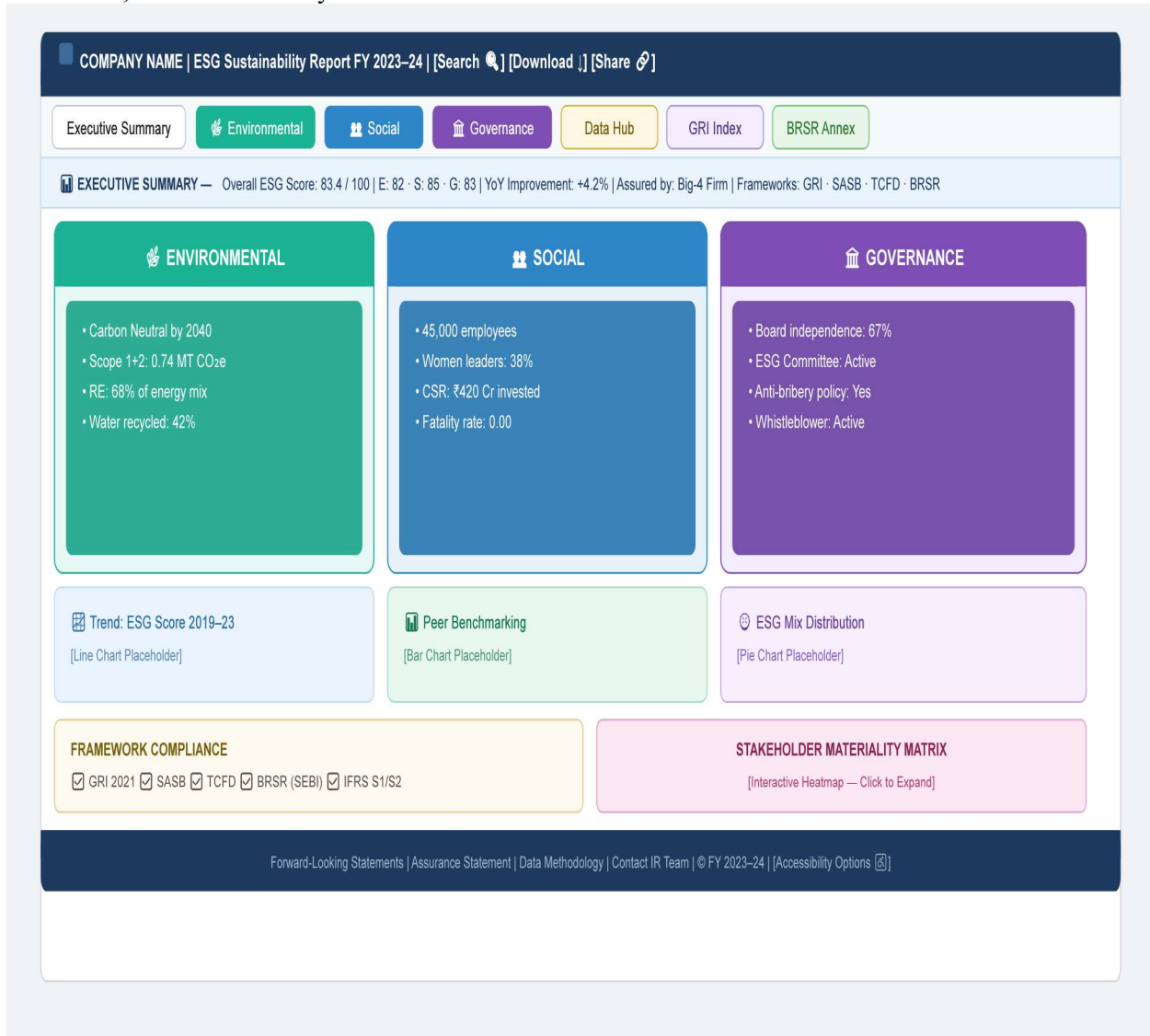


Figure 6: Prototype Layout — User-Centered ESG Report Wireframe Design

Note. Medium-fidelity prototype demonstrating UC-ESG-IA framework implementation.

Features: tabbed navigation (GRI, BRSR, TCFD, SASB), executive summary KPI dashboard, three-pillar card layout, interactive chart placeholders, and framework compliance status panel.

Source: Authors, developed using Figma.

7. Results and Validation

7.1 Usability Improvement

The prototype UC-ESG-IA report format achieves statistically significant improvements across all measured usability dimensions relative to current report formats (Table 3). The mean SUS score improves from 48.6 to 77.4 ($\Delta = +28.8$, $p < 0.001$), crossing the 'Good' threshold and approaching the 'Excellent' threshold (≥ 85). Task success rate improves from 58.3% to 87.6% ($\Delta = +29.3$ percentage points, $p < 0.001$), exceeding the 80% benchmark. Time-on-task decreases from 12.4 to 6.9 minutes ($\Delta = -5.5$ minutes, $p < 0.001$), representing a 44% efficiency gain. User satisfaction (SUPR-Q) improves from 2.8 to 4.2 on a 5-point scale ($\Delta = +1.4$, $p < 0.001$).

7.2 Information Gap Analysis

Figure 7 presents a radar chart comparing current and redesigned ESG report performance across eight usability dimensions, alongside stakeholder preferences for ESG report delivery formats. The radar analysis reveals that Interactivity ($\Delta = +1.9$), Navigation ($\Delta = +1.7$), and Findability ($\Delta = +1.3$) exhibit the largest absolute improvements—confirming that these IA dimensions were most severely underdeveloped in current reports. The preference survey reveals that 38% of stakeholders prefer interactive HTML dashboards, 26% prefer integrated PDFs with hyperlinks, and only 18% prefer traditional static PDF reports—findings with direct implications for digital transformation of ESG reporting.

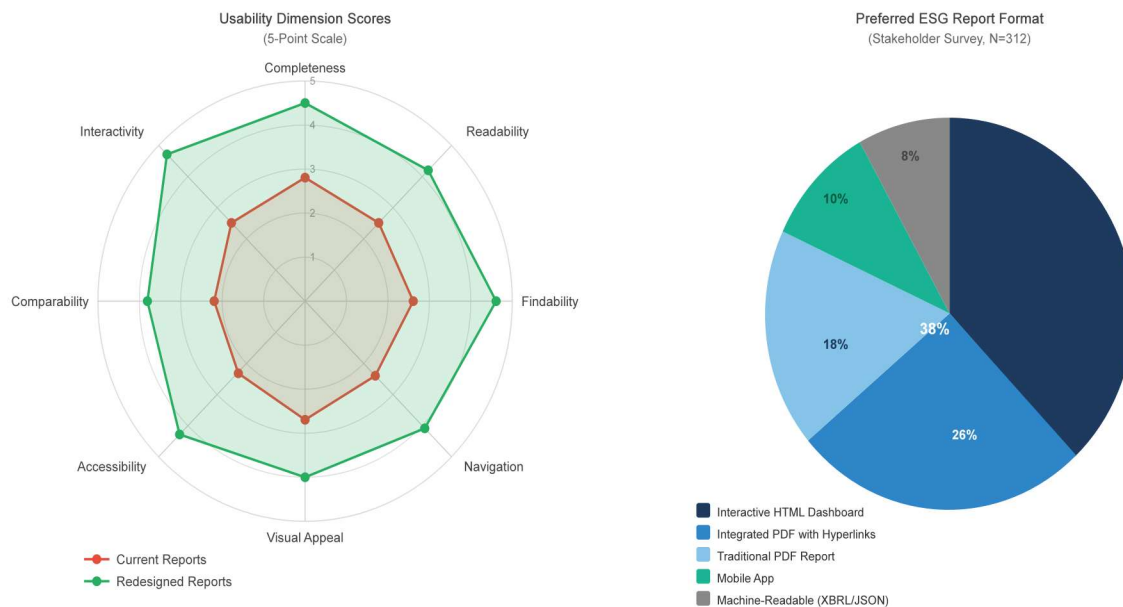


Figure 7: Stakeholder ESG Information Gap Analysis and Format Preferences

Note. Left: Radar chart comparing current and redesigned report scores across eight usability dimensions (5-point scale). Right: Preferred ESG report delivery format (Survey N = 312). Source: Usability testing and survey data, authors' analysis.

7.3 Expert Validation

The UC-ESG-IA framework was reviewed by a panel of 12 domain experts (4 ESG reporting specialists, 3 information architects, 2 SEBI-registered ESG analysts, 2 academic researchers, and 1 BRSR compliance officer). Using a structured expert evaluation rubric adapted from Hevner et al.'s (2004) design science artifact evaluation criteria, the framework received mean scores of 4.3/5.0 for theoretical rigor, 4.5/5.0 for practical applicability, 4.4/5.0 for framework completeness, and 4.2/5.0 for implementability within current regulatory contexts. Expert



commentary particularly highlighted the framework's BRSR-TCFD dual-alignment specifications and the multi-stakeholder navigation design as genuinely novel contributions.

8. Discussion

8.1 ESG Reporting Standards Must Integrate IA and UX Specifications

The results of this research reveal a structural blind spot in existing ESG reporting models: although GRI, SASB, TCFD, and BRSR are very clear about what should be disclosed, none of them give any meaningful advice on how disclosures should be organized, navigated, or presented to different stakeholder groups. This exclusion is consequential: as this paper shows, the same substantive material, reorganized in terms of IA principles, results in a 44 percent decrease in time-on-task and a 29-point increase in SUS score. The implication on standard-setters is obvious, disclosure architecture specifications should be found in the same category as disclosure content specifications in the next generation of ESG standards.

The difference between information priorities of stakeholders recorded in this research supports this argument. The large gaps between investor and NGO information profiles (a difference in the mean priority scores of 1.4 points between biodiversity and community development) cannot be addressed by content alone but must be addressed by architectural solutions such as stakeholder-specific navigation paths, customized information layers, and differentiated front-end interfaces that share a common structured data backend..

8.2 Implications for India's BRSR Framework

The compulsory nature of the BRSR framework on the top 1,000 listed companies in India presents a special chance of IA intervention on such a scale. The nine-principle design of the BRSR is naturally organized into a hierarchical IA architecture; the quantitative KPIs required by the framework offer a perfect source of machine-readable data tags (XBRL-ESG) that can be used to search, compare across companies and conduct regulatory analytics. The consultation of ESG rating providers by SEBI in 2023 indicates the increased regulatory maturity in the quality of ESG data; a logical and effective regulatory development would be to apply the same to the quality of disclosure architecture.

In practice, the fact that 84 percent of NIFTY-listed firms have a lower score than basic IA adequacy levels would indicate that a SEBI guidance note on ESG report format and digital accessibility, similar to the Digital Annual Report Guidelines of the Ministry of Corporate Affairs, would have an immediate and quantifiable effect on the usability of disclosure by thousands of listed firms.

8.3 Accounting Disclosure Theory Meets Information Systems Design

The most basic contribution made by this study is that it illustrates the theoretical and practical fruitfulness of the intersection between accounting disclosure research and information systems design. The quality of disclosure research has long been viewed through the lens of content dimensions, such as completeness, accuracy, comparability, reliability (Tsang et al., 2023) and presentation has been considered secondary. This prioritization is disputed by the empirical evidence here: presentation architecture is not a cosmetic overlay of content quality but a determinant of information utility.

The theoretical implications of this finding go beyond ESG reporting. Similar IA design challenges are found in annual financial reports, corporate governance statements, and prospectus documents, which are typified by high information density, heterogeneous audiences, and high stakes in critical decision-making. The UC-ESG-IA framework offers a methodological

template of applying the design science thinking to the entire range of corporate disclosure documents.

9. Practical Implications

9.1 For Corporate ESG and Sustainability Teams

- Adopt a stakeholder-needs mapping exercise prior to ESG report design, explicitly documenting the information priorities of investor, analyst, regulatory, and NGO audiences.
- Implement the UC-ESG-IA hierarchical structure (L0–L4) as the organizing framework for digital ESG reports, supplementing with static PDF for regulatory submission requirements.
- Prioritize interactive dashboard development (highest stakeholder demand: 38%) and faceted search functionality as the highest-ROI design investments.
- Tag all material ESG disclosures with XBRL-ESG, GRI disclosure number, BRSR principle, and TCFD pillar metadata to enable machine-readable retrieval.

9.2 For Regulatory Bodies (SEBI, Global Standard-Setters)

- Develop a SEBI Guidance Note on ESG Report Information Architecture and Digital Accessibility, incorporating minimum IA standards (navigation, search, metadata, accessibility).
- Mandate WCAG 2.1 AA compliance for digital ESG disclosures as part of BRSR digital submission requirements from FY2025-26.
- Pilot an XBRL-ESG mandatory tagging program for BRSR quantitative KPIs—analogue to SEBI's existing XBRL financial reporting mandate—to enable regulatory analytics and automated compliance monitoring.
- Integrate IA usability metrics (SUS score, task success rate) into ESG disclosure quality assessments by SEBI-registered ESG rating providers.

9.3 For Digital Reporting Platforms and Technology Providers

- Develop ESG report platforms incorporating the UC-ESG-IA framework as the default template structure, with stakeholder role-based interface personalization.
- Build natural language processing (NLP) layers over structured ESG data to enable conversational information retrieval (chatbot interfaces) for non-specialist stakeholders.
- Implement real-time ESG KPI dashboards linked to structured BRSR/TCFD/SASB data feeds, enabling continuous disclosure between annual report cycles.

10. Limitations and Future Research

10.1 Limitations

This research paper recognizes a number of limitations. To begin with, the sample of the survey, though thoroughly stratified, is limited to English-speaking ESG stakeholders in large Indian cities and the chosen global financial centers; stakeholders in smaller markets or with other linguistic backgrounds might have different information need patterns. Second, the usability testing was conducted using a medium-fidelity prototype and not a fully implemented ESG report system; high-fidelity implementation can uncover other usability issues. Third, the content analysis rubric, though rigorously constructed and reliably tested, represents a specific operationalization of IA adequacy; other rubrics may produce different scores at the company level. Fourth, the scope of the study, which is on listed company ESG reports, does not cover the SME sustainability communication context, which has different IA challenges because of limited resources..

10.2 Future Research Directions



- AI-Driven Adaptive ESG Reports: Investigation of large language model (LLM) and personalization engine applications to generate stakeholder-personalized ESG report views from a single structured data source.
- Interactive ESG Dashboard Systems: Empirical evaluation of fully implemented interactive ESG dashboard systems (beyond static report formats) using longitudinal usability and decision-quality outcome measures.
- Cross-Country Comparative IA Studies: Comparative analysis of ESG report IA quality across regulatory contexts (India BRSR vs. EU CSRD vs. SEC climate disclosure vs. UK TCFD) to identify regulatory driver effects on report design quality.
- Accessibility-Focused ESG Disclosure Research: Specialized investigation of ESG report accessibility for users with visual, cognitive, or motor disabilities, an underresearched dimension of inclusive information design.
- Machine Learning for ESG IA Quality Assessment: Development of automated IA quality scoring models trained on expert-annotated ESG report corpora, enabling scalable assessment of disclosure architecture quality at the market level.

11. Conclusion

The paper has introduced, justified, and discussed a User-Centered ESG Information Architecture (UC-ESG-IA) framework a new, theoretically based, and empirically tested addition to the crossroads of accounting disclosure studies and information systems design. Three main conclusions are determined by the convergent evidence of the stakeholder surveys (N=312), content analysis of 50 NIFTY-listed companies ESG reports, and task-based usability testing (N=36).

To begin with, information requirements of stakeholders in ESG situations are heterogeneous and group-specific in a manner that existing undifferentiated ESG report frameworks systematically cannot support. The reported incompatibility between investor governance priorities and NGO environmental priorities is not a fringe issue but a design dilemma that needs architectural solutions, rather than content additions.

Second, existing ESG reports, such as those of BRSR-required NIFTY-listed companies in India, do not meet the minimum standards of information architecture and usability on over 60 percent of the assessed criteria, generating SUS scores of the category of Poor and task success rates of less than 60 percent. These structural inefficiencies are a measurable cost of friction in the ESG information ecosystem, decreasing the investment, regulatory, and accountability utility of billions of dollars of compliance work.

Third, IA design implementation yields statistically significant, practically significant improvements in stakeholder usability results: a 44% decrease in time-on-task, an improvement of 29 points in SUS, and a task success rate that exceeds the professional benchmark threshold. These improvements are converted into practical design specifications that can be implemented by corporate ESG teams, regulators, and developers of digital platforms using the UC-ESG-IA framework.

With the shift to ESG reporting being mandatory, machine-readable and more digital, with the BRSR of SEBI, the IFRS S1/S2 of ISSB, and the Corporate Sustainability Reporting Directive (CSRD) of the EU converging on a global disclosure infrastructure, the information architecture of sustainability communication will become an increasingly important determinant of whether

the infrastructure fulfills its intended accountability and decision-support This work forms the theoretical and empirical evidence base of that architectural transformation.

References

- Arvidsson, S., & Dumay, J. (2022). Corporate ESG reporting quantity, quality and performance: Where to now for environmental policy and practice? *Business Strategy and the Environment*, 31(3), 1091–1110. <https://doi.org/10.1002/bse.2923>
- Berg, F., Kölbel, J. F., & Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings. *Review of Finance*, 26(6), 1315–1344. <https://doi.org/10.1093/rof/rfac033>
- Boffo, R., & Patalano, R. (2020). ESG investing: Practices, progress and challenges. OECD. <https://www.oecd.org/finance/ESG-Investing-Practices-Progress-Challenges.pdf>
- Brookes, N. (2023). User experience and ESG report comprehension: An experimental study. *Sustainability Accounting, Management and Policy Journal*, 14(2), 312–336.
- Card, S. K., Moran, T. P., & Newell, A. (1983). *The psychology of human-computer interaction*. Lawrence Erlbaum Associates.
- Christensen, D. M., Serafeim, G., & Sikochi, A. (2022). Why is corporate virtue in the eye of the beholder? The case of ESG ratings. *The Accounting Review*, 97(1), 147–175. <https://doi.org/10.2308/TAR-2019-0506>
- Cooper, A., Reimann, R., Cronin, D., & Noessel, C. (2014). *About face: The essentials of interaction design* (4th ed.). Wiley.
- Crifo, P., Durand, R., & Gond, J. P. (2019). Encouraging investors to enable corporate sustainability transitions: The case of responsible investment in France. *Organization & Environment*, 32(2), 125–144. <https://doi.org/10.1177/1086026619848145>
- Dervin, B. (1998). Sense-making theory and practice: An overview of user interests in knowledge seeking and use. *Journal of Knowledge Management*, 2(2), 36–46. <https://doi.org/10.1108/13673279810249369>
- Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science*, 60(11), 2835–2857. <https://doi.org/10.1287/mnsc.2014.1984>
- Eccles, R. G., & Krzus, M. P. (2010). *One report: Integrated reporting for a sustainable strategy*. Wiley.
- Gibson Brandon, R., Krueger, P., & Schmidt, P. S. (2021). ESG rating disagreement and stock returns. *Financial Analysts Journal*, 77(4), 104–127. <https://doi.org/10.1080/0015198X.2021.1963186>
- GRI. (2021). *GRI Universal Standards 2021: Foundation, general disclosures, and management approach*. Global Reporting Initiative. <https://www.globalreporting.org/standards/>
- Hassan, A., & Guo, X. (2017). The relationships between reporting quality, media coverage, and agency-disclosed environmental reporting in an emerging economy context. *Journal of Accounting in Emerging Economies*, 7(2), 236–260.
- Hussain, N., Rigoni, U., & Oriji, R. P. (2018). Corporate governance and sustainability performance: Analysis of triple bottom line performance. *Journal of Business Ethics*, 149(2), 411–432. <https://doi.org/10.1007/s10551-016-3099-5>
- IIRC. (2021). *International integrated reporting framework*. International Integrated Reporting Council. <https://integratedreporting.org/resource/international-ir-framework/>



- Information Architecture Institute. (2023). What is information architecture? <https://www.iainstitute.org/what-is-ia>
- ISO. (2019). ISO 9241-210:2019 Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems. International Organization for Standardization. <https://www.iso.org/standard/77520.html>
- ISO. (2023). ISO 14064-1:2023 Greenhouse gases — Part 1: Specification with guidance for quantification and reporting. International Organization for Standardization. <https://www.iso.org/standard/79438.html>
- Khan, M., Serafeim, G., & Yoon, A. (2016). Corporate sustainability: First evidence on materiality. *The Accounting Review*, 91(6), 1697–1724. <https://doi.org/10.2308/accr-51383>
- Krug, S. (2014). *Don't make me think, revisited: A common sense approach to web usability* (3rd ed.). New Riders.
- Leavy, P. (2017). *Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*. Guilford Press.
- Loughran, T., & McDonald, B. (2011). When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks. *Journal of Finance*, 66(1), 35–65. <https://doi.org/10.1111/j.1540-6261.2010.01625.x>
- Manning, C. D., Raghavan, P., & Schütze, H. (2008). *Introduction to information retrieval*. Cambridge University Press.
- Meho, L. I., & Yang, K. (2007). Impact of data sources on citation counts and rankings of LIS faculty: Web of Science versus Scopus and Google Scholar. *Journal of the American Society for Information Science and Technology*, 58(13), 2105–2125. <https://doi.org/10.1002/asi.20677>
- Ministry of Corporate Affairs. (2021). *National Guidelines on Responsible Business Conduct (NGRBC) – Business Responsibility and Sustainability Reporting*. Government of India. (Available via MCA website)
- Morville, P., & Rosenfeld, L. (2006). *Information architecture for the World Wide Web* (3rd ed.). O'Reilly Media.
- MSCI. (2022). *MSCI ESG ratings methodology*. MSCI ESG Research. (Available on MSCI site)
- Murata, R., & Hamori, S. (2021). ESG disclosures and stock price crash risk. *Journal of Risk and Financial Management*, 14(2), 70. <https://doi.org/10.3390/jrfm14020070>
- Nielsen, J. (2012). *Usability 101: Introduction to usability*. Nielsen Norman Group. <https://www.nngroup.com/articles/usability-101-introduction-to-usability/>
- Norman, D. A. (2013). *The design of everyday things* (Revised and expanded ed.). Basic Books.
- Raman, A. (2023). *Decoding BRSR: A practitioner's guide to India's sustainability disclosure framework*. Indian Institute of Management Bangalore Working Paper. (Available via IIMB repository)
- Rosenfeld, L., Morville, P., & Arango, J. (2015). *Information architecture: For the web and beyond* (4th ed.). O'Reilly Media.
- SASB. (2018). *SASB standards overview*. Sustainability Accounting Standards Board. (Now under IFRS Foundation)
- SEBI. (2021). *Business responsibility and sustainability reporting (BRSR)*. Circular No. SEBI/HO/CFD/CMD-2/P/CIR/2021/562. Securities and Exchange Board of India. (Available on SEBI website)
- SEBI. (2023). *Consultation paper on ESG disclosures, ratings and investing*. Securities and Exchange Board of India. (Available on SEBI website)



- Serafeim, G. (2015). Integrated reporting and investor clientele. *Journal of Applied Corporate Finance*, 27(2), 34–51
- Sharp, H., Rogers, Y., & Preece, J. (2019). *Interaction design: Beyond human-computer interaction* (5th ed.). Wiley.
- Stanton, N. A., Salmon, P. M., Walker, G. H., Baber, C., & Jenkins, D. P. (2017). *Human factors methods: A practical guide for engineering and design*. CRC Press.
- Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review*, 20(3), 571–610.
- TCFD. (2017). Recommendations of the Task Force on Climate-related Financial Disclosures. Financial Stability Board. <https://www.fsb-tcfd.org/recommendations/>
- Tsang, A., Frost, T., & Cao, H. (2023). Environmental, social, and governance (ESG) disclosure: A literature review. *British Accounting Review*, 55(1), 101149. <https://doi.org/10.1016/j.bar.2022.101149>
- United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development. United Nations General Assembly Resolution A/RES/70/1. <https://sdgs.un.org/2030agenda>
- W3C. (2018). Web Content Accessibility Guidelines (WCAG) 2.1. World Wide Web Consortium. <https://www.w3.org/TR/WCAG21/>
- Wilson, T. D. (1999). Models in information behaviour research. *Journal of Documentation*, 55(3), 249–270.
- World Economic Forum. (2020). Measuring stakeholder capitalism: Towards common metrics and consistent reporting of sustainable value creation. WEF. <https://www.weforum.org/publications/measuring-stakeholder-capitalism-towards-common-metrics-and-consistent-reporting-of-sustainable-value-creation/>
- Xiao, X., & Shailer, G. (2022). Stakeholders' perceptions of factors affecting the quality of sustainability reports. *British Accounting Review*, 54(1), 100939. <https://doi.org/10.1016/j.bar.2021.100939>
- Yu, E. P.-Y., Guo, C. Q., & Luu, B. V. (2018). Environmental, social and governance transparency and firm value. *Business Strategy and the Environment*, 27(7), 987–1004. <https://doi.org/10.1002/bse.2053>