

Identifying the Dimensions and Components of Sustainability Reporting with a Digital Innovation Approach in Iran's Capital Market

Moosa Samsam Heydari ¹, Mehdi Zeynali ^{2,*}, Ahmad Mohammdi ³, Younes Badavar Nahandi ⁴ and Yaghoub Pourkarim ⁵



Citation: Samsam Heydari, M., Zeynali, M., Mohammdi, A., Badavar Nahandi, Y., & Pourkarim, Y. (2026). Identifying the Dimensions and Components of Sustainability Reporting with a Digital Innovation Approach in Iran's Capital Market. *Business, Marketing, and Finance Open*, 3(1), 1-22.

Received: 10 September 2025

Revised: 13 January 2026

Accepted: 20 January 2026

Published: 30 January 2026



Copyright: © 2026 by the authors. Published under the terms and conditions of Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.

Pourkarim ⁵

¹ Department of Accounting, Ta.C., Islamic Azad University, Tabriz, Iran; 

² Department of Accounting, Ta.C., Islamic Azad University, Tabriz, Iran; 

³ Department of Accounting, Ta.C., Islamic Azad University, Tabriz, Iran; 

⁴ Department of Accounting, Ta.C., Islamic Azad University, Tabriz, Iran; 

⁵ Department of Accounting, Ta.C., Islamic Azad University, Tabriz, Iran; 

* Correspondence: Dr.zeynali@iau.ac.ir

Abstract: This study aimed to identify the dimensions and components of sustainability reporting with a digital innovation approach and to develop a context-specific conceptual model for Iran's capital market. This qualitative, exploratory-developmental study was conducted using the systematic grounded theory approach of Strauss and Corbin. The participants consisted of 24 academic and professional experts in accounting, financial and sustainability reporting, capital markets, auditing, financial technologies, and digital transformation. Participants were selected through purposive theoretical sampling, supplemented by snowball sampling, and data collection continued until theoretical saturation was achieved. Data were gathered through in-depth semi-structured interviews supported by a focused review of relevant literature, reporting frameworks, and regulatory documents. Interviews were recorded with informed consent, transcribed verbatim, and analyzed concurrently with data collection. Analysis followed open, axial, and selective coding, together with constant comparison and theoretical memoing, to identify concepts, categories, relationships, and the core phenomenon. The analysis identified the structural transformation of sustainability disclosure from narrative-oriented reporting toward digitally data-driven reporting as the core category. Causal conditions included institutional pressure from capital-market actors, the need to improve information quality, emerging regulatory pressures, and economic incentives. Contextual conditions comprised heterogeneous disclosure structures, the absence of a national sustainability reporting standard and taxonomy, fragmented technological infrastructure, uneven digital maturity, and limited assurance capacity. Intervening conditions included organizational resistance, implementation costs, limited specialist capabilities, market incentives, and regulatory technological capacity. The principal strategies were digital standardization of disclosure, ESG data governance, information-system integration, application of emerging technologies, phased implementation, and intelligent regulatory supervision. The anticipated consequences included improved transparency, comparability, and reliability; reduced information asymmetry and information risk; enhanced investor confidence and valuation processes; strengthened assurance and supervision; and potential reductions in the cost of capital. Digital sustainability reporting in Iran's capital market should be understood as an institutional and structural transformation requiring the coordinated development of standards, data governance, technological infrastructure, professional capabilities, assurance mechanisms, and regulatory supervision rather than merely the adoption of digital reporting tools.

Keywords: Sustainability Reporting; Digital Innovation; ESG; Capital Market; Grounded Theory; Digital Transformation; Iran

1. Introduction

Sustainability reporting has evolved from a largely voluntary communication practice into an increasingly important component of corporate accountability, capital-market transparency, and organizational legitimacy. Contemporary investors, regulators, creditors, analysts, and other stakeholders increasingly expect firms to explain not only their financial performance but also the environmental, social, and governance implications of their operations. This evolution reflects a broader transformation in the conception of corporate reporting, according to which traditional financial statements alone are no longer sufficient to portray the long-term risks, opportunities, externalities, and value-creation mechanisms associated with business activity. Sustainability reporting therefore functions as an informational bridge between companies and stakeholders by communicating how environmental responsibilities, social impacts, governance practices, and strategic sustainability considerations are incorporated into organizational decision-making. The growing literature on the field shows that sustainability reporting has developed into a multidimensional research domain encompassing disclosure quality, institutional pressures, corporate performance, governance, assurance, stakeholder expectations, methodological approaches, and regulatory development [1, 2]. More broadly, the movement beyond conventional sustainability disclosure toward more substantive corporate social responsibility demonstrates that reporting increasingly constitutes part of an organization's broader accountability architecture rather than merely a supplementary communication exercise [3].

The growing significance of sustainability information is particularly evident in capital markets, where the usefulness of corporate disclosure depends on its capacity to reduce information uncertainty and enable informed assessments of firm value, risk, and future performance. Recent evidence indicates that sustainability reporting can influence investor perceptions and market responses because stakeholders increasingly incorporate environmental, social, and governance information into investment judgments. Research on listed firms has demonstrated a meaningful connection between sustainability disclosure and investor sentiment, suggesting that sustainability-related information can shape how market participants evaluate corporations and their long-term development prospects [4]. This relationship becomes even more important when corporate reputation is considered, since investor sentiment may condition the extent to which sustainability reporting contributes to reputational outcomes [5]. Evidence from ASEAN+3 markets similarly indicates that sustainability reporting quality is associated with firm value and that the strength of this association depends on contextual and moderating mechanisms [6]. Accordingly, the value of sustainability reporting in capital markets is not determined simply by whether a report is published; rather, it depends on the quality, reliability, comparability, accessibility, and decision usefulness of the information disclosed.

The economic relevance of sustainability reporting has also generated considerable interest regarding its implications for financial and non-financial organizational outcomes. Studies in emerging markets have generally suggested that sustainability disclosure may contribute to improved corporate performance, although the magnitude and form of the relationship differ across institutional settings, sectors, reporting systems, and organizational characteristics. Evidence from emerging-market companies indicates that sustainability reporting can be associated with corporate financial performance, reinforcing the argument that sustainability practices may have economic as well as social value [7]. Comparable findings have been reported for industrial firms in emerging markets, where stronger sustainability reporting has been associated with financial outcomes [8]. Studies of non-financial companies have likewise examined sustainability reporting as a potential determinant of financial performance [9], while evidence from banking institutions has demonstrated the importance of sustainability

reporting for organizational performance and accountability in financially sensitive sectors [10]. Research focusing on manufacturing and non-manufacturing listed companies further suggests that different dimensions of sustainability reporting may influence both financial and non-financial performance, illustrating the multidimensional nature of its organizational consequences [11]. At the same time, broader analyses of the relationship between sustainability reporting and corporate financial performance indicate that the economic implications of reporting depend heavily on reporting quality, organizational context, and the mechanisms through which sustainability information is translated into stakeholder responses [12].

One of the major explanations for these economic effects lies in the quality of information provided to market participants. Sustainability reporting can improve the broader corporate information environment when disclosures are relevant, accurate, standardized, comparable, and integrated with organizational decision processes. Recent research has shown that sustainability reporting may enhance accounting information quality, thereby strengthening the informational foundation available to investors and other users of corporate reports [13]. In the Iranian context, sustainability reporting disclosure and accounting information comparability have also been linked with earnings persistence, suggesting that sustainability-related information may interact with conventional accounting characteristics in ways that affect assessments of financial performance and continuity [14]. Environmental accounting represents another important aspect of this development because credible sustainability reporting increasingly requires measurable environmental data rather than general narrative statements. Research on green accounting and environmental disclosure emphasizes the need for firms to systematically recognize and report their environmental impacts [15]. Similarly, evidence concerning environmental accounting and sustainability report quality shows that improved environmental measurement practices can contribute to more credible and informative sustainability reports [16]. These developments indicate that the quality of sustainability reporting depends increasingly on the quality of the underlying data-generation and measurement infrastructure.

Nevertheless, sustainability reporting continues to face significant problems of heterogeneity, inconsistency, selective disclosure, and weak comparability. Organizations frequently differ in the indicators they report, the measurement techniques they employ, the level of detail they provide, and the formats through which sustainability information is communicated. Sustainability performance indicators themselves may be difficult to define and institutionalize, particularly when organizations lack stable measurement infrastructures or when reporting requirements remain ambiguous [17]. Institutional pressures are therefore critical in shaping both the adoption and the content of sustainability reporting. Evidence demonstrates that regulatory, normative, and stakeholder pressures can significantly influence organizations' reporting behavior and their willingness to institutionalize sustainability practices [18]. Organizational culture and contingency factors may also determine how sustainability reporting is interpreted and implemented, especially when economic performance remains an important managerial consideration [19]. Consequently, sustainability reporting should be understood as an institutionally embedded practice whose quality depends on the interaction of organizational capabilities, stakeholder expectations, regulatory structures, and reporting norms.

The global regulatory environment has intensified this transition by moving sustainability reporting away from predominantly voluntary disclosure toward increasingly formalized and mandatory systems. Research on large multinational corporations demonstrates that the shift from voluntary to mandatory reporting can significantly alter the transparency and comprehensiveness of sustainability-related disclosures [20]. The European Corporate Sustainability Reporting Directive and the European Sustainability Reporting Standards represent prominent examples of this regulatory transformation by requiring more systematic, comparable, and detailed sustainability

information [21, 22]. These developments reflect a broader reconsideration of the purpose, scope, and institutional position of corporate sustainability reporting, particularly as regulators attempt to connect sustainability disclosure more closely with capital allocation, corporate accountability, and public policy [23]. At the same time, global experience shows that the implementation of such requirements cannot be separated from technological infrastructures, reporting frameworks, and national institutional characteristics, especially in emerging markets where reporting systems and digital capacities may remain uneven [24].

The Iranian capital market faces these challenges within a distinctive institutional and regulatory environment. Although sustainability-related concerns have increasingly entered academic and professional discourse, the development of a coherent reporting architecture remains incomplete. A comparison between Tehran Stock Exchange requirements and internationally recognized sustainability reporting standards has demonstrated important areas of divergence and has highlighted the need for a context-sensitive reporting model appropriate to Iran's institutional environment [25]. This gap is especially consequential because sustainability reporting in an emerging capital market must simultaneously respond to international developments and domestic regulatory, organizational, technological, and economic conditions. The effective development of sustainability reporting in Iran therefore cannot be achieved simply by transferring foreign standards without adaptation. Instead, it requires identifying the specific dimensions and components that are compatible with the reporting needs, regulatory capabilities, digital infrastructures, and organizational realities of the Iranian capital market.

Digital innovation adds a further and increasingly decisive dimension to this problem. The rapid development of artificial intelligence, automated data processing, digital platforms, integrated databases, cloud technologies, Internet of Things infrastructures, and advanced analytical systems is transforming how corporate information can be generated, verified, analyzed, and communicated. Digitalization can potentially shift sustainability reporting from periodic, document-based, and predominantly narrative disclosure toward structured, data-driven, more timely, and machine-readable reporting. Technology can also facilitate the integration of sustainability information with internal corporate systems and external regulatory platforms, thereby improving traceability and enabling automated monitoring. The intersection between technology and sustainability reporting has therefore become a major frontier of accounting and disclosure research. The literature emphasizes that technological development may help bridge persistent sustainability reporting gaps by supporting standardization, data accessibility, and more integrated reporting systems [24]. However, the benefits of digitalization are contingent on appropriate reporting frameworks, data governance mechanisms, organizational readiness, and institutional support.

Artificial intelligence is particularly important in this transformation. AI-based systems can potentially assist in extracting, classifying, comparing, validating, and interpreting large volumes of sustainability information, while generative AI may reshape both the production and the processing of sustainability reports. At the same time, these technologies introduce risks relating to data reliability, opacity, bias, accountability, and the credibility of generated disclosures. Accordingly, the impact of AI on sustainability reporting must be considered not merely as an efficiency issue but as a question of governance and reporting quality [26]. Iranian evidence similarly suggests that the use of generative artificial intelligence in accounting data analysis can improve digital sustainability reporting quality, particularly when appropriate green sustainability internal control systems operate as an organizational mechanism linking technological capacity with reporting reliability [27]. These findings indicate that digital innovation is not simply an external technological tool added to sustainability reporting; instead, it can transform the internal processes through which sustainability data are collected, controlled, analyzed, and ultimately disclosed.

Digital transformation also changes the competencies required from accounting and reporting professionals. Sustainability reporting increasingly demands an interdisciplinary combination of accounting expertise, sustainability knowledge, technological literacy, data-management capability, and strategic judgment. Professional development among accountants can therefore play a significant role in strengthening the organizational effectiveness of sustainability reporting and linking disclosure practices with broader investment and resource-allocation outcomes [28]. Knowledge management becomes equally important because organizations must be able to capture, organize, validate, transfer, and use sustainability-related knowledge across organizational units and technological systems [29]. These requirements are particularly relevant when digital sustainability reporting involves multiple data owners, diverse organizational departments, and automated information flows. Without adequate human competencies and knowledge-governance structures, sophisticated technology may merely digitize existing weaknesses rather than improve reporting quality.

The reliability of digitally enabled sustainability reporting also depends heavily on internal controls, external assurance, and the governance of sustainability information. Evidence indicates that corporate integrity and external assurance contribute to higher sustainability reporting quality, underscoring the importance of mechanisms capable of validating disclosed information [30]. Yet sustainability assurance remains a developing professional field, and the involvement of auditors in clients' sustainability reporting creates new challenges regarding competence, responsibilities, independence, and the boundaries of assurance practice [31]. Digitalization may both complicate and facilitate this process. On the one hand, new technologies generate large quantities of heterogeneous data whose origins and processing mechanisms may be difficult to verify. On the other hand, structured digital records, automated controls, traceable data flows, and analytical tools can strengthen assurance when they are embedded within an appropriate governance framework. Thus, the development of digital sustainability reporting requires simultaneous attention to technology, internal control, professional competencies, and assurance architecture.

Another significant dimension concerns innovation and investor behavior. Sustainability reporting is increasingly embedded in a dynamic system in which green innovation, corporate strategy, and investor sentiment interact. Research indicates that green innovation and investor sentiment can mediate or shape the relationship between ESG practices and sustainability reporting, illustrating how technological and environmental innovation may influence both reporting processes and market interpretation [32]. This is particularly relevant for capital markets because digital sustainability information can potentially be analyzed more rapidly by institutional investors, analysts, rating agencies, and regulatory authorities. Consequently, digital innovation may amplify the capital-market effects of sustainability reporting by improving accessibility, comparability, and analytical usefulness, but it may also increase expectations regarding timeliness, accuracy, and verification. In sectors such as banking, where information transparency and risk monitoring are particularly important, evidence from emerging economies further confirms the strategic significance of sustainability disclosure and the institutional conditions surrounding its development [33].

Despite the rapid expansion of sustainability reporting research, significant conceptual gaps remain concerning how its multiple dimensions should be integrated in digitally transforming capital markets. Existing studies have generated important evidence concerning corporate performance, investor sentiment, reporting quality, institutional pressures, assurance, regulatory development, green accounting, and technological change, but these dimensions are frequently examined separately. The bibliometric and systematic literature confirms both the rapid diversification of sustainability reporting scholarship and the continued need for integrative research capable of

connecting institutional, technological, governance, and market perspectives [1, 2]. In particular, digital sustainability reporting requires a conceptualization that moves beyond viewing technology as merely a reporting channel. It is necessary to identify how digital innovation changes the architecture of sustainability information itself, including the processes of data generation, standardization, integration, control, assurance, disclosure, and regulatory supervision.

This need is especially pronounced in Iran, where the institutional characteristics of the capital market, variation in corporate digital maturity, emerging sustainability requirements, and the absence of a fully institutionalized national sustainability reporting architecture create conditions that differ substantially from those of mature reporting environments. International regulatory experiences and technological developments provide important guidance, but their implementation requires contextual adaptation. Moreover, the relationship between sustainability reporting and organizational outcomes indicates that reporting reforms can generate consequences that extend beyond compliance, potentially influencing information quality, investment decisions, financial performance, corporate reputation, and market efficiency [6, 13]. The strategic importance of these effects makes it necessary to understand which components must be present for a digitally enabled sustainability reporting system to function effectively within Iran's capital-market ecosystem.

Accordingly, a contextually grounded investigation is required to identify the causal pressures encouraging digital sustainability reporting, the institutional and technological conditions within which it develops, the barriers and facilitating factors affecting implementation, the strategies necessary for operationalization, and the informational, regulatory, and capital-market consequences that may follow. Such an inquiry can help bridge the gap between international advances in sustainability reporting and the specific requirements of Iran's capital market while simultaneously recognizing the transformative role of digital innovation. Therefore, the aim of this study was to identify the dimensions and components of sustainability reporting with a digital innovation approach in Iran's capital market and to develop an integrated conceptual model grounded in expert perspectives.

2. Methodology

This study employed a qualitative, exploratory, and developmental research design to identify and conceptualize the dimensions and components of sustainability reporting from a digital innovation perspective within the specific institutional and technological context of Iran's capital market. Given the multidimensional and context-dependent nature of sustainability reporting and the emerging role of digital technologies in corporate disclosure, a qualitative methodology was considered appropriate for developing an in-depth understanding of the phenomenon from the perspectives of knowledgeable academic and professional experts. The methodological strategy of the study was grounded theory, following the systematic approach proposed by Strauss and Corbin. This approach was selected because a coherent and context-sensitive framework explaining digitally enabled sustainability reporting in Iran's capital market has not yet been sufficiently established, making it necessary to derive the relevant concepts, categories, relationships, and explanatory structure inductively from empirical data rather than imposing a predetermined conceptual model. Accordingly, the research process was based on an iterative interaction between data collection and analysis, through which emerging concepts progressively guided subsequent interviews and theoretical sampling. The study was cross-sectional in terms of the general period of data collection, although the qualitative data collection and analytical procedures developed progressively and concurrently until theoretical saturation was achieved.

The participant population consisted of academic and professional experts with substantial knowledge and experience in accounting, financial reporting, sustainability reporting, capital markets, digital technologies, financial technology, auditing, corporate governance, and assurance of non-financial information. Particular attention was given to individuals whose academic, professional, managerial, regulatory, or research activities provided them with direct familiarity with disclosure mechanisms, sustainability-related information, digital transformation, and the institutional characteristics of Iran's capital market. Eligibility criteria included holding a doctoral degree in accounting, finance, or a closely related discipline; holding an academic rank of assistant professor or higher or possessing substantial managerial or professional experience in financial and capital-market institutions; having documented research or executive experience in sustainability reporting, non-financial disclosure, corporate governance, digital transformation, or related areas; and demonstrating adequate conceptual and practical familiarity with the structure and reporting environment of Iran's capital market. Participants were initially selected through purposive theoretical sampling according to their capacity to contribute information relevant to the emerging categories. As data analysis progressed, subsequent participants were selected on the basis of conceptual gaps identified during coding and category development. Snowball sampling was also used when appropriate, with interviewed experts recommending other individuals possessing specialized knowledge relevant to the developing conceptual framework. Sampling continued until theoretical saturation was reached, meaning that additional interviews no longer generated substantively new concepts, properties, dimensions, or relationships among the emerging categories. Theoretical saturation was achieved after 24 in-depth interviews, and these 24 experts constituted the final participant group of the study.

The principal data collection tool was an in-depth semi-structured interview developed to explore experts' experiences, perceptions, interpretations, and professional judgments regarding sustainability reporting and the role of digital innovation in its development within Iran's capital market. Prior to the fieldwork, a focused review of the relevant literature and documentary sources was undertaken to establish conceptual sensitivity and support the development of the interview guide. The reviewed materials included scholarly publications on sustainability reporting, digital innovation, digital transformation in financial markets, corporate disclosure, and non-financial reporting, as well as relevant sustainability reporting frameworks, regulatory documents relating to Iran's capital market, and publicly available corporate reporting materials. This documentary review was used as a supporting source for identifying major conceptual areas and formulating broad interview questions; however, the empirical foundation of the study was the qualitative evidence generated through the expert interviews. Consistent with grounded theory methodology, the interview guide was deliberately flexible rather than rigidly standardized. Initial questions addressed participants' understanding of the principal requirements, dimensions, mechanisms, opportunities, barriers, institutional conditions, technological infrastructures, governance requirements, and consequences associated with sustainability reporting under conditions of increasing digitalization. During each interview, probing and follow-up questions were used to clarify meanings, explore examples, identify causal and contextual relationships, and examine newly emerging ideas in greater depth.

Data collection and preliminary analysis were conducted concurrently. Consequently, the content and emphasis of later interviews were progressively refined in response to concepts and categories emerging from earlier interviews. This iterative process made it possible to pursue theoretically important issues, explore contradictory perspectives, clarify underdeveloped categories, and investigate relationships requiring additional empirical evidence. The interviews were conducted in an interactive manner that allowed participants sufficient freedom to elaborate on their professional experiences while maintaining a consistent focus on the central research

phenomenon. With participants' informed consent, interviews were recorded and subsequently transcribed in full to preserve the accuracy and richness of the qualitative evidence. Interview transcripts constituted the primary dataset for coding and conceptual development. Field notes and analytical memos were also maintained throughout the data collection process to record emerging interpretations, conceptual questions, potential relationships among categories, methodological decisions, and issues requiring further exploration in subsequent interviews. These memos played an important role in supporting theoretical sensitivity and maintaining an explicit record of the development of the emerging framework.

Methodological rigor was addressed throughout the data collection process by maintaining close correspondence between interview questions and the research purpose, documenting sampling and analytical decisions, repeatedly comparing emerging interpretations with the original interview data, and continuing data collection until conceptual saturation was achieved. The flexible interview format also provided opportunities to clarify participants' intended meanings and reduce the likelihood of superficial or decontextualized interpretation. Particular attention was paid to maintaining the confidentiality of participants and using the interview data exclusively for research purposes. Participation was voluntary, informed consent was obtained prior to data collection, and participants were informed of the purpose of the study and the use of recorded material. Identifying information was treated confidentially during transcription, coding, analysis, and reporting.

Qualitative data were analyzed using the systematic grounded theory approach of Strauss and Corbin. Analysis commenced with the first interviews and proceeded simultaneously with subsequent data collection, allowing insights obtained from the developing analysis to inform theoretical sampling and later interviews. The analytical procedure was iterative rather than linear and involved continuous movement between interview transcripts, emerging codes, categories, conceptual relationships, theoretical memos, and additional empirical evidence. The constant comparative method constituted a central analytical principle throughout the process. Individual statements were compared with other statements, codes were compared across interviews, emerging concepts were compared with previously identified concepts, and categories were continuously assessed in relation to new data. This process enabled the researchers to refine category boundaries, identify conceptual similarities and differences, specify the properties and dimensions of categories, and establish a coherent explanatory structure grounded in participants' accounts.

The analysis began with open coding. Interview transcripts were examined carefully on a line-by-line and paragraph-by-paragraph basis, and meaningful segments were identified and assigned conceptual labels that represented the actions, perceptions, conditions, processes, requirements, challenges, or consequences reflected in participants' statements. At this stage, the analysis remained deliberately open to multiple interpretations so that potentially significant meanings would not be excluded prematurely. Similar initial concepts were compared and progressively grouped into broader preliminary categories. Throughout open coding, analytical questions were continuously directed toward the data, including what phenomenon was being described, what conditions generated or shaped that phenomenon, what actions or interactions were occurring, which actors were involved, how digital technologies affected sustainability disclosure processes, and what outcomes were associated with these processes. Theoretical memos were written alongside coding to document emerging ideas, relationships, inconsistencies, category properties, and areas requiring further empirical investigation.

Open coding was followed by axial coding, during which the initially fragmented concepts and categories were systematically reconnected. The purpose of this stage was to explain relationships between categories and subcategories and to locate them within the broader process through which sustainability reporting with a digital

innovation orientation is shaped in Iran's capital market. The Strauss and Corbin coding paradigm was employed to organize the categories according to causal conditions, the central phenomenon, contextual conditions, intervening conditions, action and interaction strategies, and consequences. Causal conditions represented the principal drivers contributing to the emergence or development of digitally oriented sustainability reporting. Contextual conditions reflected the institutional, regulatory, organizational, governance, and technological environment within which the phenomenon occurred. Intervening conditions represented factors that could facilitate, constrain, intensify, or modify the influence of the identified conditions and strategies. Strategies referred to the actions, mechanisms, practices, and responses through which relevant actors could develop, implement, or enhance sustainability reporting using digital innovation. Consequences represented the organizational, informational, governance-related, regulatory, and capital-market outcomes associated with these strategies. During axial coding, the properties and dimensions of each category were further specified, and analytical propositions concerning relationships among categories were continuously compared with the empirical evidence.

The final analytical stage involved selective coding, through which the categories developed during the preceding stages were integrated around a central or core category possessing the greatest explanatory relevance to the research phenomenon. The core category served as the organizing principle for integrating the identified dimensions and components of sustainability reporting with a digital innovation approach. At this stage, relationships among causal conditions, contextual and intervening conditions, strategies, and consequences were refined and incorporated into a coherent theoretical narrative. The developing explanatory framework was repeatedly compared with the original interview transcripts to ensure that the final interpretation remained firmly grounded in the empirical data rather than reflecting predetermined assumptions. Categories that remained conceptually weak or insufficiently developed were reconsidered in relation to the available evidence, while overlapping concepts were consolidated when their empirical meanings indicated substantial similarity. Theoretical integration continued until the relationships among the major categories were sufficiently dense, coherent, and explanatory.

The criterion for terminating both theoretical sampling and further conceptual development was theoretical saturation. Saturation was considered to have been reached when subsequent interviews no longer produced new substantive categories, important properties, dimensions, or meaningful modifications to the relationships already established among the categories. In the final interviews, the newly collected evidence predominantly reinforced and clarified the existing conceptual structure rather than extending it. Following 24 interviews, the principal categories had achieved sufficient conceptual density and the relationships among them were adequately developed to support theoretical integration. The outcome of the analytical process was therefore a grounded conceptual framework identifying the major dimensions, components, contextual conditions, mechanisms, strategies, and consequences associated with sustainability reporting from a digital innovation perspective in Iran's capital market.

3. Findings and Results

The qualitative sample consisted of 24 academic and professional experts with substantial experience in sustainability reporting, accounting, finance, auditing, capital markets, and digital technologies. Of the participants, 18 (75.0%) were men and 6 (25.0%) were women. Regarding educational background, 11 participants (45.8%) held a PhD in Accounting, 8 (33.3%) held a PhD in Finance, and 5 (20.9%) held a PhD in Management with a technology-related specialization. In terms of academic rank or professional position, 9 participants (37.5%) were associate or

full professors, 7 (29.2%) were assistant professors, 5 (20.8%) were capital-market managers, and 3 (12.5%) were senior auditors. Professional experience was substantial across the sample: 6 experts (25.0%) had 10–15 years of experience, 8 (33.3%) had 16–20 years, and 10 (41.7%) had more than 20 years of professional experience. The principal area of expertise was financial and sustainability reporting for 9 participants (37.5%), capital markets for 6 (25.0%), digital technologies and technological transformation for 5 (20.8%), and auditing for 4 (16.7%). Overall, the participant profile reflected a combination of extensive academic knowledge and long-standing professional experience across the principal domains relevant to sustainability reporting and digital innovation in Iran's capital market.

Table 1. Open Coding Results Derived from the Expert Interviews

Selected Meaning Unit	Open Code
Reports are predominantly narrative rather than data-driven	Narrative-oriented disclosure; lack of data orientation
Reliable and comparable indicators are limited	Weak reliability; weak comparability
Precise energy-consumption figures are not consistently available or reliable	Lack of environmental measurability; insufficient operationalization of environmental indicators
Companies use different formats for disclosure	Heterogeneity of disclosure formats
Sustainability data are not sufficiently structured	Lack of standardized data structure
Data need to be tagged and standardized	Digital data standardization; structured tagging
Sustainability information should be connected to supervisory systems	Integration with regulatory systems
ESG dashboards can be developed	Development of digital ESG dashboards
IoT can be used to record environmental information	Digital capture of environmental data
Artificial intelligence can identify inconsistencies in reported data	Intelligent analysis; anomaly detection
Institutional investors can exert pressure for better disclosure	Institutional investor pressure
Reputational and climate risks influence valuation	ESG risk effects on valuation
Absence of mandatory requirements discourages corporate investment	Regulatory enforcement gap
Information must be structured to support effective supervision	Structured disclosure for analytical supervision
The absence of a national standard is a fundamental challenge	Lack of a domestic sustainability reporting standard
Companies differ considerably in their level of digital maturity	Heterogeneity in digital maturity
Corporate information systems operate in isolated silos	Fragmented information systems
Managerial resistance to digital transformation exists	Organizational resistance to digital transformation
Implementation of digital systems involves substantial costs	High digital implementation costs
Assurance is difficult when sustainability data are not system-generated	Limited assurance capability
ESG ratings can provide incentives for companies	Market incentives through ESG ratings
Data ownership and responsibility should be clearly determined	ESG data ownership and governance
Internal controls should be established for sustainability data	Sustainability data internal controls
Analytical supervision and automated alerts are required	RegTech and intelligent supervision
Gradual implementation is preferable to immediate full-scale adoption	Phased implementation
Digital sustainability reporting can increase market confidence	Increased market trust
Digital reporting can reduce information asymmetry	Reduced information asymmetry
Improved reporting may contribute to lower financing costs	Reduction in cost of capital

The open-coding process revealed that the experts perceived digital sustainability reporting as substantially broader than the digitization of an existing disclosure document. The extracted codes indicated deficiencies in the current reporting environment, particularly narrative-oriented disclosure, limited measurability, heterogeneous reporting formats, weak comparability, fragmented information systems, and insufficient assurance mechanisms. At the same time, the interviews identified technological and institutional mechanisms capable of transforming this situation, including structured data standards, digital tagging, system integration, ESG dashboards, IoT-based data capture, intelligent anomaly detection, internal controls, data governance, and technology-enabled regulatory supervision. Market-related forces, particularly investor pressure and growing sensitivity to ESG-related risks, were also repeatedly identified as drivers of change, while organizational resistance, implementation costs, limited specialist capacity, and regulatory gaps emerged as significant barriers. Through constant comparison and conceptual integration, these codes converged around a central phenomenon defined as the institutionalization of a sustainability reporting system based on digital innovation in Iran's capital market, representing a transition from fragmented and narrative-oriented disclosure toward structured, reliable, digitally generated, and analytically usable sustainability information.

Table 2. Causal Conditions Underlying Digital Sustainability Reporting

Main Causal Category	Subcategories	Conceptual Evidence
Institutional pressure from the capital market	Demand by institutional investors for reliable disclosure	Institutional investor pressure; demand for reliable information
Institutional pressure from the capital market	Market sensitivity to reputational and climate risks	Reputational risk effects on valuation; climate-risk effects on investment decisions
Need to improve information quality	Need for comparable and standardized disclosure	Weak comparability; heterogeneous disclosure formats
Need to improve information quality	Reduction of information risk	Need to reduce information asymmetry and uncertainty
Emerging regulatory pressures	Need for a minimum sustainability disclosure framework	Lack of mandatory requirements; absence of a clear national framework
Economic incentives	Potential reduction in the cost of capital through greater transparency	Lower information risk; increased market trust; potential reduction in financing costs

The causal conditions showed that movement toward digitally enabled sustainability reporting is driven primarily by increasing informational, institutional, regulatory, and economic pressures within the capital-market environment. Participants emphasized that institutional investors increasingly require sustainability information that is sufficiently reliable, comparable, and analytically usable to support investment assessment. At the same time, heightened attention to climate, reputational, and other ESG-related risks has increased the relevance of sustainability information for corporate valuation and risk assessment. The weaknesses of existing disclosure practices, including inconsistent formats and limited comparability, have consequently intensified the need for more structured reporting mechanisms. Participants also identified the absence of a comprehensive mandatory framework as simultaneously a current deficiency and a source of pressure for future regulatory development. Economic considerations reinforced these drivers, because experts associated greater transparency and lower information risk with stronger investor confidence and more favorable financing conditions. Taken together, these causal conditions explain why a transition from conventional sustainability disclosure toward a digitally structured reporting system has become increasingly necessary within Iran's capital market.

Table 3. Contextual Conditions Affecting the Development of Digital Sustainability Reporting

Main Contextual Category	Subcategories	Conceptual Evidence
Heterogeneity in disclosure structures	Differences in corporate reporting formats	Heterogeneous disclosure formats
Heterogeneity in disclosure structures	Limited comparability of sustainability information	Weak comparability
Absence of a national standard and reporting framework	Lack of a domestic sustainability reporting standard	National standardization gap
Absence of a national standard and reporting framework	Lack of an established sustainability data taxonomy	Absence of standardized data structures
Uneven technological infrastructure	Fragmented corporate information systems	Isolated systems and disconnected databases
Uneven technological infrastructure	Lack of integrated data architecture	Dispersion of ESG data across organizational units
Heterogeneity in corporate digital maturity	Differences in technological readiness	Uneven levels of digital maturity
Limited assurance capacity	Weak internal control systems for ESG information	Difficulty assuring non-system-generated sustainability information

The contextual conditions demonstrated that the implementation of digital sustainability reporting takes place within an institutional and technological environment characterized by considerable heterogeneity. Experts repeatedly highlighted differences among companies in the format, scope, and structure of sustainability disclosure, which restrict comparability and make automated analysis difficult. The absence of a national sustainability reporting standard and a common digital taxonomy further limits the possibility of achieving consistent data structures across reporting entities. Technological readiness was also uneven, with some companies possessing relatively advanced information infrastructures while others continued to rely on fragmented and isolated systems in which ESG-related data were distributed among different departments and databases. This fragmentation complicates data aggregation, verification, and digital transmission. Participants further indicated that existing assurance capacity remains constrained because sustainability information is often generated outside integrated systems and is not supported by sufficiently mature internal control mechanisms. Accordingly, the contextual findings indicate that successful development of digital sustainability reporting depends on the simultaneous evolution of reporting standards, data architecture, technological readiness, organizational information systems, and assurance infrastructure.

Table 4. Intervening Conditions Influencing Implementation

Main Intervening Category	Subcategories	Conceptual Evidence
Organizational resistance	Cost-oriented managerial perception of sustainability	Managerial resistance
Organizational resistance	Limited managerial priority assigned to ESG information	Weak managerial motivation
Economic considerations	High cost of implementing digital systems	High implementation expenditure
Economic considerations	Uncertainty regarding return on investment	Doubts concerning economic justification
Limited specialist capacity	Shortage of professionals combining ESG and data expertise	Specialist capacity constraints
Limited specialist capacity	Weak experience in sustainability data controls and governance	Insufficient data-governance expertise
Capital-market incentives	ESG ratings and benchmarking mechanisms	ESG rating incentives
Capital-market incentives	Institutional investor expectations	Investor pressure
Regulatory capacity	Development of analytical and technology-enabled supervision	Intelligent regulatory monitoring

The intervening conditions clarified why similar institutional pressures may lead to different levels of organizational response across companies. Organizational resistance emerged as a major limiting factor, particularly where managers viewed sustainability activities primarily as additional costs rather than as

components of risk management, transparency, and long-term value creation. Financial concerns were similarly important because establishing integrated information systems, digital dashboards, data infrastructures, and control mechanisms may require substantial initial investment, while the expected return may not be immediately visible. Participants also stressed the shortage of professionals capable of integrating expertise in sustainability, accounting, data management, and digital technologies, creating an important implementation constraint. In contrast, ESG ratings, investor expectations, and the development of analytical regulatory capabilities were viewed as facilitating forces capable of increasing organizational motivation and accelerating adoption. The findings therefore indicate that the extent and speed of digital sustainability reporting depend not only on external pressures and contextual readiness but also on managerial orientation, financial capacity, specialist competencies, market incentives, and the technological sophistication of regulatory institutions.

Table 5. Strategies for Implementing Sustainability Reporting Based on Digital Innovation

Main Strategic Category	Subcategories	Conceptual Evidence
Digital standardization of disclosure	Development of structured reporting formats	Digital standardization of sustainability data
Digital standardization of disclosure	Development of data tagging and sustainability taxonomy	Structured tagging
ESG data governance	Assignment of data ownership and responsibility	Identification of data owners
ESG data governance	Establishment of internal controls over sustainability information	Sustainability data controls
Integration of information systems	Connection of internal enterprise systems with disclosure platforms	Integration with reporting and supervisory systems
Integration of information systems	Elimination of fragmented information silos	Integrated data architecture
Application of advanced digital technologies	Development of ESG dashboards	Digital ESG dashboards
Application of advanced digital technologies	Use of IoT for environmental data capture	Automated environmental data collection
Application of advanced digital technologies	Use of artificial intelligence and advanced analytics	Intelligent analysis and anomaly detection
Phased and pilot-based implementation	Gradual implementation of the reporting framework	Phased adoption
Phased and pilot-based implementation	Initial implementation using priority sustainability indicators	Limited-scope pilot implementation
Strengthening analytical supervision	Transition toward technology-enabled and intelligent regulation	RegTech and analytical supervision

The identified strategies showed that effective implementation requires an integrated transformation of data structures, organizational responsibilities, technological infrastructure, and regulatory processes. Participants regarded digital standardization as a foundational requirement, particularly the development of common reporting formats, structured tags, and a defined sustainability data taxonomy that would make information machine-readable, comparable, and suitable for automated analysis. A second major strategy concerned ESG data governance, including the clear assignment of data ownership, responsibility for data generation and approval, and the establishment of internal control procedures for non-financial information. Experts further emphasized that fragmented organizational systems should be integrated with corporate reporting and regulatory infrastructures to reduce manual processing and increase the consistency of information flows. Advanced technologies such as ESG dashboards, IoT-enabled environmental monitoring, artificial intelligence, and automated anomaly detection were viewed as mechanisms for improving timeliness, accuracy, and analytical capability. Nevertheless, because companies differ in technological maturity and organizational preparedness,

participants consistently favored gradual, pilot-based implementation beginning with a limited number of priority indicators. Strengthening technology-enabled supervision was also viewed as essential for ensuring that the benefits of digital reporting extend beyond corporate disclosure to the broader regulatory architecture of the capital market.

Table 6. Consequences of Implementing Digital Sustainability Reporting

Main Consequence Category	Subcategories	Conceptual Evidence
Improved information quality	Greater disclosure transparency	Increased transparency
Improved information quality	Increased comparability	Standardized and structured sustainability data
Improved information quality	Greater reliability	System-generated data and internal controls
Improved capital-market efficiency	Reduced information asymmetry	Reduction in information asymmetry
Improved capital-market efficiency	Increased investor confidence	Greater market trust
Improved capital-market efficiency	Improved valuation processes	Integration of ESG risks into valuation
Economic consequences	Reduced information risk	Lower perceived information risk
Economic consequences	Potential reduction in the cost of capital	Reduced financing costs
Strengthened supervision and assurance	Facilitation of ESG assurance	Enhanced assurance capability
Strengthened supervision and assurance	Analytical and intelligent regulatory monitoring	Automated monitoring and system-generated alerts

The consequences identified by participants extended across informational, market, economic, assurance, and regulatory dimensions. At the informational level, standardized and digitally structured sustainability data were expected to improve transparency, comparability, reliability, and traceability by reducing dependence on discretionary narrative reporting and increasing the use of system-generated information. At the capital-market level, improved information quality was perceived to reduce information asymmetry between corporate managers and external investors, strengthen investor confidence, and enable sustainability-related risks to be incorporated more systematically into valuation and investment analysis. These informational improvements were also associated with lower perceived information risk and, potentially, a reduction in the cost of capital. Participants further emphasized that digitally generated and controlled sustainability information would make assurance activities more feasible by providing clearer audit trails and more consistent data sources. At the regulatory level, structured digital reporting could support analytical supervision, automated alerts, and risk-based monitoring, thereby improving the ability of capital-market authorities to identify inconsistencies and emerging risks. The identified consequences therefore suggest that digital innovation in sustainability reporting can influence not only the form of corporate disclosure but also the broader informational efficiency, assurance architecture, and supervisory capacity of Iran's capital market.

Selective integration of the categories revealed that the core theoretical category of the study was "the structural transformation of sustainability disclosure from narrative-oriented reporting to digitally data-driven reporting in Iran's capital market." This category integrated the entire set of causal, contextual, intervening, strategic, and consequential relationships identified during axial coding. The model indicates that institutional investor demand, increasing sensitivity to ESG-related risks, the need for higher-quality information, emerging regulatory expectations, and economic incentives create pressure for transformation. This pressure operates within a context characterized by inconsistent disclosure structures, the absence of a unified national reporting standard and taxonomy, fragmented technological infrastructures, unequal digital maturity, and limited assurance capacity. Organizational resistance, implementation costs, shortages of multidisciplinary expertise, market incentives, and regulatory technological capacity modify the strength and direction of this transformation. In response,

organizations and regulatory actors adopt strategies involving digital standardization, ESG data governance, information-system integration, advanced digital technologies, phased implementation, and intelligent supervision. When these strategies are successfully implemented, they contribute to higher information quality, more efficient capital-market information processing, reduced information risk, enhanced investor confidence, stronger assurance, improved regulatory monitoring, and potentially lower capital costs. The resulting model therefore represents digital sustainability reporting as an institutional and structural transformation rather than a discrete technological intervention.

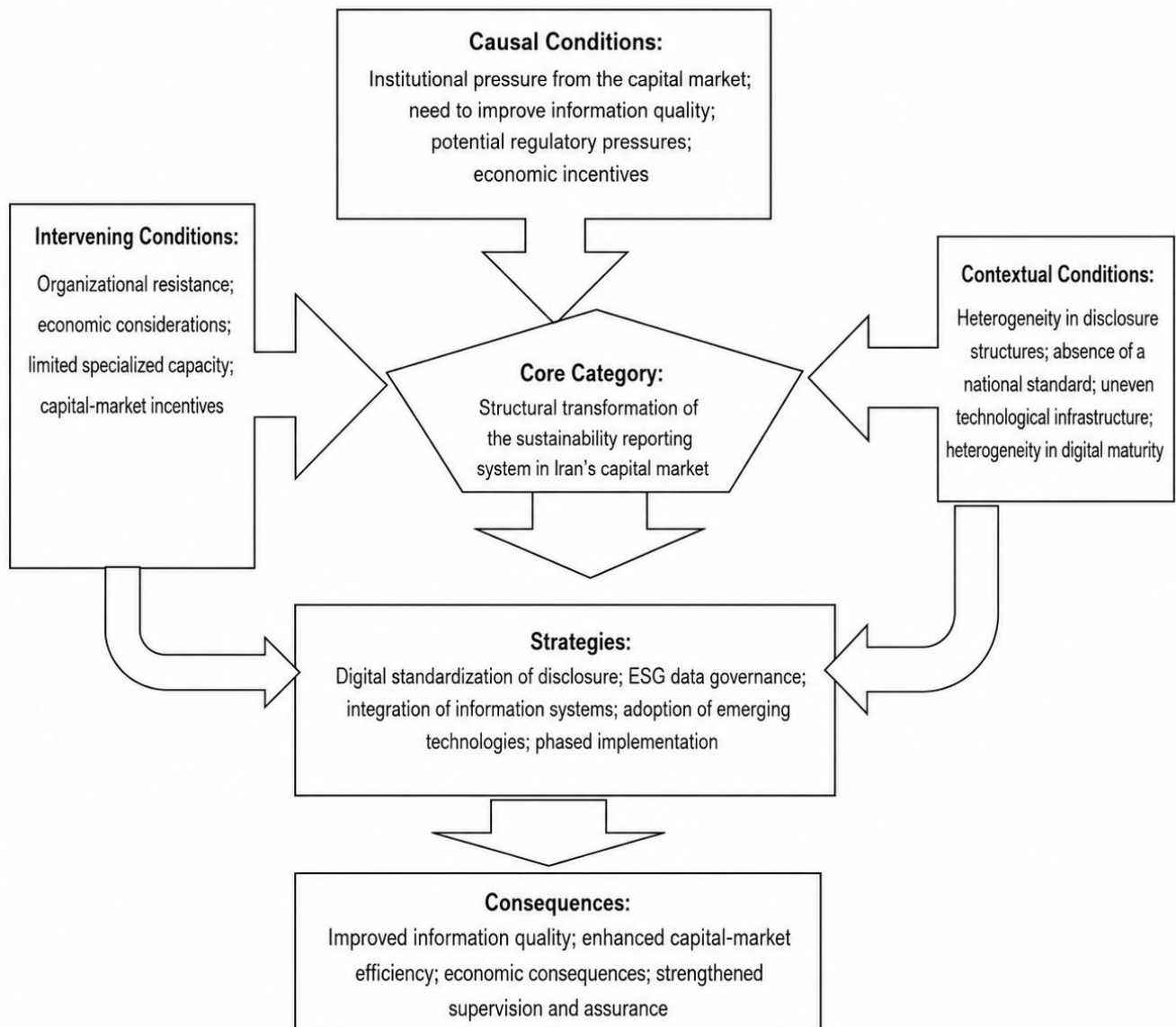


Figure 1. Final Paradigmatic Model of Sustainability Reporting with a Digital Innovation Approach in Iran's Capital Market

4. Discussion and Conclusion

The present qualitative study sought to identify the dimensions and components of sustainability reporting with a digital innovation approach in Iran's capital market. The findings revealed that the phenomenon should not be understood merely as the adoption of new technological tools for preparing sustainability reports; rather, it

represents a broader structural transformation from predominantly narrative, fragmented, and weakly comparable disclosure toward a data-driven, standardized, integrated, and digitally governed reporting system. The grounded-theory analysis organized the findings around a central category described as the structural transformation of the sustainability reporting system in Iran's capital market. This transformation was shaped by four major groups of causal conditions, including institutional pressure from capital-market actors, the need to improve information quality, emerging regulatory pressures, and economic incentives. It occurred within contextual conditions characterized by heterogeneous disclosure structures, the absence of a unified national standard and sustainability data taxonomy, uneven technological infrastructure, differences in firms' digital maturity, and limited assurance capacity. Organizational resistance, implementation costs, limited specialized capabilities, capital-market incentives, and regulatory technological capacity were identified as intervening conditions. The strategies required to operationalize the transformation included digital standardization of disclosure, ESG data governance, integration of information systems, adoption of advanced digital technologies, phased implementation, and analytical regulatory supervision. Finally, the expected consequences included improved transparency, comparability and reliability of sustainability information, reduced information asymmetry, greater investor confidence, better valuation processes, lower information risk, potential reductions in the cost of capital, improved assurance, and stronger regulatory monitoring.

The first major finding concerns the transition from narrative-oriented sustainability disclosure to structured and decision-useful sustainability information. Participants emphasized that current sustainability disclosures frequently lack consistent measurements, comparability, standardized formats, and reliable underlying data, particularly in environmental dimensions. This finding is consistent with the broader sustainability reporting literature, which has repeatedly identified reporting quality, comparability, completeness, and consistency as central challenges in transforming sustainability information into useful corporate disclosure [1, 2]. Alsaid's analysis of sustainability key performance indicators similarly demonstrates that the effectiveness of sustainability reporting depends on the ability to establish measurable indicators and integrate them into performance systems rather than relying solely on descriptive reporting [17]. The present findings also align with evidence that environmental accounting practices can strengthen sustainability-report quality by improving the measurement and disclosure of environmental information [15, 16]. In this respect, the results suggest that digital innovation becomes valuable not merely because it changes the medium of disclosure, but because it can transform the underlying informational architecture by enabling structured, measurable, traceable, and machine-readable sustainability data.

The causal conditions identified in the study further showed that capital-market pressures are becoming an important driver of sustainability reporting transformation. Participants described institutional investors' demand for reliable information, increasing attention to climate and reputational risks, and the growing relevance of sustainability information to firm valuation as pressures encouraging companies to improve disclosure practices. These findings are strongly compatible with evidence indicating that sustainability reporting can influence investor sentiment and investment-related perceptions [4]. The importance of investor responses is also reinforced by findings that investor sentiment can shape the relationship between sustainability reporting and corporate reputation [5]. Similarly, Siregar et al. found that investor sentiment and green innovation play significant roles in linking ESG practices with sustainability reporting [32]. The current results therefore support the interpretation that sustainability disclosure is increasingly embedded within the information-processing mechanisms of capital markets rather than remaining primarily a symbolic corporate responsibility exercise. When sustainability risks

influence investors' perceptions of future cash flows, reputation, resilience, and long-term viability, companies face stronger incentives to provide information that is reliable and capable of being incorporated into investment analysis.

A closely related finding concerned the economic rationale for improving sustainability reporting. Experts associated better digital disclosure with lower information asymmetry, stronger market trust, improved valuation, and potentially a lower cost of capital. Although these consequences emerged from participants' interpretations rather than direct statistical testing, they are consistent with prior empirical evidence connecting sustainability reporting with firm performance and market-related outcomes. Positive relationships between sustainability reporting and financial performance have been reported in emerging-market contexts [7, 8], while similar associations have been observed among non-financial companies [9] and banking institutions [10]. Dashee Dughaim et al. likewise demonstrated that different dimensions of sustainability reporting can influence both financial and non-financial organizational performance [11]. Montoro also highlighted the potential financial-performance implications of sustainability reporting [12]. Moreover, higher sustainability reporting quality has been associated with firm value in ASEAN+3 markets [6]. These studies support the qualitative inference of the present research that improvements in sustainability-information quality can potentially generate economic benefits by reducing uncertainty and strengthening stakeholders' assessments of corporate quality and long-term prospects.

The findings also emphasized that information quality is a central mechanism through which the proposed transformation may affect the capital market. Participants repeatedly referred to comparability, reliability, transparency, standardized data structures, and internal controls as necessary conditions for meaningful reporting. This finding corresponds closely with research demonstrating that sustainability reporting can contribute to accounting information quality [13]. In the Iranian context, sustainability disclosure and accounting-information comparability have also been associated with earnings persistence, indicating that sustainability reporting may interact with conventional financial-information characteristics in shaping the overall corporate information environment [14]. The present findings extend this reasoning by suggesting that digital innovation can strengthen this informational role when sustainability data are generated through structured processes rather than manually assembled narrative reports. In other words, the informational benefits of sustainability reporting appear to depend not only on disclosure quantity but also on the architecture through which sustainability data are generated, controlled, classified, transmitted, and accessed.

Another important result was the identification of institutional and regulatory conditions as critical components of the proposed model. Experts stressed the absence of a unified domestic standard, lack of an established sustainability taxonomy, heterogeneous corporate disclosure formats, and inconsistent levels of reporting readiness. This result is particularly meaningful in the Iranian setting. Zhaleh Azadzanjani et al. identified differences between the requirements of the Tehran Stock Exchange and widely used international sustainability reporting frameworks, highlighting the need for a model adapted to the national capital-market environment [25]. More generally, institutional pressures have been shown to influence the development and adoption of sustainability reporting practices [18]. International developments also demonstrate an accelerating movement from voluntary toward mandatory sustainability reporting [20]. The Corporate Sustainability Reporting Directive and associated European Sustainability Reporting Standards illustrate how regulatory systems increasingly require standardized and systematic sustainability disclosure [21, 22]. Barker similarly emphasizes the growing institutional importance of corporate sustainability reporting within contemporary reporting regimes [23].

Together, these studies support the present finding that technological innovation alone is unlikely to institutionalize digital sustainability reporting without a corresponding regulatory and standard-setting architecture.

The contextual findings regarding uneven digital maturity and fragmented information systems further show why implementation is likely to vary across Iranian listed companies. Participants noted that ESG-related information is frequently produced across separate organizational units and stored in disconnected systems, making integration, validation, and assurance difficult. This observation supports the broader argument that technology and sustainability-reporting frameworks must evolve together [24]. The findings are also consistent with the role of organizational culture and contingency conditions in shaping sustainability reporting practices [19]. Firms with stronger digital capabilities, integrated systems, supportive organizational cultures, and clearer data responsibilities are likely to be better positioned to operationalize structured sustainability disclosure. Conversely, organizations characterized by fragmented databases, limited digital investment, and unclear ownership of ESG information may struggle to meet more sophisticated reporting requirements even if formal standards are introduced.

Digital technologies emerged as a central strategic dimension of the model. Participants specifically identified structured digital tagging, ESG dashboards, IoT-based environmental data capture, intelligent data analysis, automated anomaly detection, and integration with supervisory systems as mechanisms for improving the quality and timeliness of sustainability information. These findings are consistent with the growing literature on artificial intelligence and sustainability reporting. De Villiers et al. argue that AI-based text generation and processing can fundamentally reshape both the preparation and interpretation of sustainability reports while simultaneously generating new challenges concerning reliability, accountability, and governance [26]. More specifically within Iran, Saghafi and Parsapour found that generative AI-based accounting data analysis can contribute to digital sustainability reporting quality, with green sustainability internal control systems playing an important mediating role [27]. The current findings reinforce this perspective but broaden it by suggesting that AI should be embedded in a wider digital ecosystem that also includes standardized data structures, integrated enterprise systems, governance mechanisms, controls, and regulatory interfaces.

The importance assigned to ESG data governance and internal controls represents another significant contribution of the findings. Experts stressed that responsibility for sustainability data must be explicitly assigned, data ownership must be established, and internal controls must cover the generation and validation of non-financial information. Such findings correspond with evidence that corporate integrity and external assurance are positively associated with sustainability reporting quality [30]. They also resonate with concerns regarding the expanding role of auditors in sustainability reporting and the professional complexities surrounding assurance engagements [31]. Digital reporting may facilitate assurance by producing more traceable, structured, and system-generated information, yet it can only do so when technological processes are accompanied by appropriate controls and accountability mechanisms. Thus, the present study indicates that “digital” should not be interpreted as synonymous with “reliable”; reliability emerges when digital technologies operate within a coherent system of data governance, internal control, professional responsibility, and independent assurance.

The intervening conditions identified in the study further demonstrate that implementation is not simply a technical decision. Organizational resistance, perceptions of sustainability reporting as a cost, uncertainty regarding returns on technological investments, and shortages of interdisciplinary expertise may substantially slow adoption. The role of professional capabilities is supported by Al Frijat et al., who emphasized that accountants’ professional

development can enhance the effectiveness of sustainability reporting and contribute to corporate investment efficiency [28]. Knowledge-management capabilities are also increasingly important as organizations attempt to capture, coordinate, and apply sustainability-related knowledge across departments and information systems [29]. In emerging economies, sector-specific evidence similarly points to the importance of institutional and organizational capacity for developing sustainability reporting [33]. These findings suggest that successful digitalization requires not merely investment in software but also the development of employees capable of combining accounting, sustainability, technology, analytics, and governance expertise.

The proposed strategy of phased implementation is particularly important given the heterogeneity identified among firms. Rather than imposing an identical and immediate digital reporting architecture across all listed companies, participants favored implementation through pilot programs, priority indicators, gradual system integration, and progressive development of supervisory capacity. This interpretation is consistent with the broader recognition that sustainability reporting frameworks need to account for differences in organizational scale, resources, technological readiness, and institutional context. Implementation challenges surrounding sustainability requirements for smaller and less-prepared organizations have likewise been discussed in relation to emerging regulatory systems such as the CSRD [21]. A phased approach may therefore reduce organizational resistance, provide opportunities for learning, enable refinement of sustainability taxonomies and controls, and allow regulators to identify unintended implementation difficulties before extending requirements to the broader market.

Finally, the theoretical integration of the findings indicates that digital sustainability reporting should be interpreted as an institutional transformation rather than as a standalone technological innovation. The core transformation identified in this study connects market demand, regulatory development, organizational readiness, data governance, technological infrastructure, professional expertise, assurance, and capital-market consequences within a single explanatory framework. This interpretation is compatible with the broader evolution of sustainability reporting from voluntary corporate communication toward a more formalized component of accountability and corporate responsibility [3]. It also responds to calls in the sustainability-reporting literature for more integrated research capable of linking theoretical, methodological, institutional, and technological dimensions [1, 2]. The proposed model therefore extends existing knowledge by contextualizing these dimensions within Iran's capital market and showing that digitally enabled sustainability reporting is likely to emerge through the interaction of institutional pressures, contextual readiness, facilitating and constraining conditions, coordinated implementation strategies, and anticipated informational and economic consequences.

Several limitations should be considered when interpreting the findings. First, the study was exclusively qualitative and was based on expert interpretations; consequently, the resulting model represents a theoretically grounded explanation of the phenomenon rather than a direct measurement of the prevalence or magnitude of the identified relationships. Second, although theoretical sampling continued until conceptual saturation was achieved, the participant group was limited to experts with relevant academic and professional experience, and other stakeholder groups, including individual investors, technology vendors, corporate employees directly responsible for operational sustainability data, and civil-society actors, may hold different perspectives. Third, the findings are embedded in the institutional and technological characteristics of Iran's capital market and should therefore be transferred to other jurisdictions cautiously. Finally, sustainability reporting and digital technologies are evolving rapidly, meaning that some technological, organizational, or regulatory conditions identified by the participants may change as reporting infrastructures, digital capabilities, and sustainability requirements develop.

Future studies could extend the present model by examining individual components in greater depth across different sectors of the Iranian capital market and by comparing industries with high and low environmental or social exposure. Longitudinal qualitative studies could examine how companies' sustainability reporting practices change as digital infrastructure and regulatory expectations evolve. Comparative research involving other emerging capital markets could also determine which dimensions of the model are specific to Iran and which represent more general characteristics of digitally enabled sustainability reporting. Further research could specifically investigate artificial intelligence governance, ESG data taxonomy design, cybersecurity risks, algorithmic transparency, digital assurance, real-time sustainability reporting, and the competencies required from accountants and auditors. Case studies of companies that have already developed relatively advanced digital reporting systems would also be valuable for examining implementation processes, organizational learning, and practical barriers in greater detail.

For practice, capital-market regulators, listed companies, professional accounting bodies, auditors, and technology providers should treat digital sustainability reporting as an integrated institutional program rather than a software implementation project. A national sustainability reporting framework should be accompanied by a standardized digital taxonomy, clear definitions of ESG data ownership, minimum internal-control requirements, and interoperable reporting protocols. Listed companies should assess their digital maturity before implementation, identify priority sustainability indicators, assign responsibility for data generation and validation, and progressively integrate sustainability information with existing enterprise systems. Pilot implementation among firms with stronger technological readiness could provide evidence for refining reporting requirements before broader adoption. Professional-development programs should simultaneously strengthen expertise in sustainability accounting, data analytics, digital technologies, internal control, and assurance, while regulators should develop analytical supervisory tools capable of using structured sustainability data for risk-based monitoring.

Authors' Contributions

Authors equally contributed to this article.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

Acknowledgments

Authors thank all participants who participate in this study.

Conflict of Interest

The authors report no conflict of interest.

Funding/Financial Support

According to the authors, this article has no financial support.

References

- [1] T. Nasreen, R. Baker, and D. Rezaia, "Sustainability reporting—A systematic review of various dimensions, theoretical and methodological underpinnings," *Journal of Financial Reporting and Accounting*, 2023.
- [2] K. B. Benameur, M. M. Mostafa, A. Hassanein, M. Z. Shariff, and W. Al-Shattarat, "Sustainability reporting scholarly research: A bibliometric review and a future research agenda," *Management Review Quarterly*, vol. 74, no. 2, pp. 823-866, 2024, doi: 10.1007/s11301-023-00319-7.
- [3] G. Trites, *Beyond Sustainability Reporting: The Pathway to Corporate Social Responsibility*. Routledge (in English), 2023.
- [4] Z. Abideen and H. Fulling, "Sustainability reporting and investor sentiment: A sustainable development approach to Chinese-listed firms," *Journal of Cleaner Production*, vol. 466, no. 1, pp. 1-13, 2024, doi: 10.1016/j.jclepro.2024.142880.
- [5] Z. U. Abideen, "The moderating role of investor sentiments between sustainability reporting and firm reputation: Evidence from Chinese listed firms," *Corporate Social Responsibility and Environmental Management*, vol. 32, no. 1, pp. 138-159, 2025, doi: 10.1002/csr.2943.
- [6] H. V. Van, N. M. Nguyen, M. A. Afifa, D. T. T. Vo, and D. V. Bui, "Sustainability reporting quality and firm value in ASEAN+3: A series moderation model," *Corporate Social Responsibility and Environmental Management*, vol. 32, no. 2, pp. 2207-2224, 2025, doi: 10.1002/csr.3059.
- [7] O. S. Shaban and A. Barakat, "The impact of sustainability reporting on a company's financial performance: Evidence from the emerging market," *Journal of Governance & Regulation*, vol. 12, no. 4, pp. 306-315, 2023, doi: 10.22495/jgrv12i4siart10.
- [8] M. Shaaban, "The effect of sustainability reporting on financial performance of industrial companies in emerging markets," *International Journal of Financial Research*, vol. 15, no. 2, pp. 211-229, 2024.
- [9] R. Kushalia, "The relationship between sustainability reporting and financial performance of non-financial companies in Sri Lanka," *Asian Journal of Accounting and Finance*, vol. 6, no. 1, pp. 75-98, 2025.
- [10] F. Jasim, "The effect of sustainability reports on the financial performance of Iraqi banks," *Iraqi Journal of Accounting and Finance*, vol. 9, no. 1, pp. 75-93, 2024.
- [11] A. Dashee Dughaim, A. Aghaei Chadegani, M. S. D. Alrobaaiy, and M. Alimoradi, "The Impact of Sustainability Reporting Dimensions on Financial and Non-Financial Performance of Manufacturing and Non-Manufacturing Companies Listed on the Stock Exchange," *Dynamic Management and Business Analysis*, vol. 4, no. 1, pp. 296-410, 2025.
- [12] L. Montoro, "The influence of sustainability reporting on corporate financial performance," *Sustainability Journal*, vol. 16, no. 2, pp. 1024-1046, 2024.
- [13] D. Ferreira, C. Pereira, M. Queirós, and A. P. Monteiro, "Impact of Sustainability Reporting on Accounting Information Quality," (in English), *Cogent Business & Management*, vol. 12, no. 1, p. 2468875, 2025, doi: 10.1080/23311975.2025.2468875.
- [14] H. Hekmat, A. Rahmani, and S. Movaffagh, "The Effect of Sustainability Reporting Disclosure and Accounting Information Comparability on Earnings Persistence," (in English), *Accounting and Auditing Reviews*, vol. 32, no. 1, pp. 95-116, 2025.
- [15] A. Purwanti, D. S. Nugroho, S. Suratman, R. Simanullang, and T. Handayani, "Green Accounting and Sustainability Reporting: Assessing Corporate Environmental Disclosure Practices," *COSTING: Journal of Economic, Business and Accounting*, vol. 9, no. 2, pp. 1142-1149, 2026, doi: 10.31539/2g9g0n78.
- [16] L. Cheng, I. Sulemana, and A. O. Agyemang, "Environmental Accounting and Corporate Sustainability Reports Quality: Evidence From Ghana," *Corporate Social Responsibility and Environmental Management*, vol. 32, no. 5, pp. 6680-6689, 2025, doi: 10.1002/csr.70057.
- [17] L. A. Z. A. Alsaied and C. A. Ambilichu, "Performance measurement in urban development: unfolding a case of sustainability KPIs reporting," *Journal of Accounting in Emerging Economies*, vol. 14, no. 1, pp. 48-74, 2024, doi: 10.1108/JAEE-09-2021-0299.
- [18] J. Andrades, D. Martinez-Martinez, and M. Larrán, "Sustainability Reporting, Institutional Pressures and Universities: Evidence from the Spanish Setting," *Sustainability Accounting, Management and Policy Journal*, vol. ahead-of-print, no. ahead-of-print, 2024, doi: 10.1108/SAMPJ-07-2023-0455.
- [19] M. Khalili, A. Zabihi, and K. Faghani Makrani, "Explaining a Model of the Effects of Organizational Culture and Contingency Factors on Sustainability Reporting with an Economic Performance Approach (GRI 201)," (in English), *Management Accounting and Auditing Knowledge*, vol. 13, no. 50, pp. 319-338, 2024.
- [20] E. K. Donner, A. Meißner, and S. Bort, "Moving from voluntary to mandatory sustainability reporting-Transparency in sustainable development goals (SDG) reporting: An analysis of Germany's largest MNCs," *Business ethics, the environment & responsibility*, vol. 34, no. 3, pp. 900-911, 2025, doi: 10.1111/beer.12687.
- [21] M. Celli and S. A. U. B. T. Arduini, "Corporate sustainability reporting directive (CSRD) and his future application scenario for italian SMEs," *International Journal of Business and Management*, vol. 19, no. 4, pp. 1-44, 2024, doi: 10.5539/ijbm.v19n4p44.
- [22] Efrag, "ESRS implementation guidance: Corporate Sustainability Reporting Directive (CSRD)," European Financial Reporting Advisory Group, Brussels, 2024. [Online]. Available: <https://www.efrag.org/en/projects/esrs-implementation-guidance-documents>

- [23] R. Barker, "Corporate sustainability reporting," *Journal of Accounting and Public Policy*, vol. 49, p. 107280, 2025.
- [24] E. Du Toit, "Bridging the sustainability reporting gap: Frameworks, technology, and global trends," *Emerald Insight: Sustainability Accounting Review*, vol. 21, no. 2, pp. 134-152, 2024.
- [25] M. Zhaleh Azadzanjani, N. Fazeli, and K. Feghani Makrani, "Presenting a sustainability reporting model: Comparing the requirements of the Tehran Stock Exchange with common sustainability reporting standards in the world," *Accounting and Social Interests*, vol. 14, no. 4, pp. 59-90, 2024, doi: 10.22051/jaasci.2024.45546.1812.
- [26] C. de Villiers, R. Dimes, and M. Molinari, "How will AI text generation and processing impact sustainability reporting? Critical analysis, a conceptual framework and avenues for future research," *Sustainability Accounting, Management and Policy Journal*, vol. 15, pp. 96-118, 2024, doi: 10.1108/SAMPJ-02-2023-0097.
- [27] A. Saghafi and M. R. Parsapour, "Investigating the impact of accounting data analysis using generative artificial intelligence on the quality of digital sustainability reporting considering the mediating role of green sustainability internal control systems," *Financial Accounting Knowledge*, vol. 12, no. 1, pp. 1-31, 2025, doi: 10.30479/jfak.2025.21533.3270.
- [28] Y. S. Al Frijat, A. A. Elamer, M. A. Altawalbeh, and M. W. Moustafa, "Beyond technical skills: The strategic importance of accountants' professional development in enhancing corporate investment efficiency through sustainability reporting," *Corporate Social Responsibility and Environmental Management*, vol. 32, no. 6, pp. 8011-8025, 2025, doi: 10.1002/csr.70110.
- [29] P. Krawczyk, "Knowledge Management in the Context of Sustainability Reporting," in *European Conference on Knowledge Management*, 2025, vol. 1: Academic Conferences International Limited, pp. 544-552.
- [30] M. Elaigwu, S. O. Abdulmalik, and H. R. Talab, "Corporate integrity, external assurance and sustainability reporting quality: evidence from the Malaysian public listed companies," *Asia-Pacific Journal of Business Administration*, vol. 16, no. 2, pp. 410-440, 2024, doi: 10.1108/APJBA-07-2021-0307.
- [31] B. Malsch, "Catch Me If You Match! A Discussion of Auditors' Involvement in Clients' Sustainability Reporting," *Accounting, Organizations and Society*, 2024. [Online]. Available: <https://ideas.repec.org/a/eee/aosoci/v113y2024ics0361368223001071.html>.
- [32] I. F. Siregar, T. Ismail, M. Taqi, and N. Soleha, "Influence of ESG on sustainability reporting: Mediation rule of green innovation and investor sentiment," *International Journal of Energy Economics and Policy*, vol. 14, no. 1, pp. 452-463, 2024, doi: 10.32479/ijeeep.14988.
- [33] M. Gupta, "Sustainability reporting in the banking sector: Evidence from emerging economies," *Meditari Accountancy Research*, vol. 33, no. 1, pp. 53-85, 2025, doi: 10.1108/MEDAR-03-2024-2408.