ESG and AI-Driven Governance Transformation in the Construction Industry: A Case-Based Analysis from Slovenia

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The construction industry is one of the most structurally complex and institutionally regulated sectors, characterized by project-based production, fragmented value chains, and strong exposure to regulatory frameworks. In recent years, this complexity has been intensified by the growing institutionalization of ESG principles and the accelerating diffusion of digital technologies, particularly artificial intelligence. While ESG increasingly functions as an integrated governance architecture shaping strategic decision-making and risk management, the construction sector remains among the least digitalized industries. Although AI-supported tools offer significant potential for performance monitoring, resource optimization, and transparency in reporting, technological adoption alone does not ensure organizational transformation. The presented chapter applies a qualitative case-based research approach focused on a Slovenian construction-sector context. The analysis combines document analysis, ESG governance assessment, and evaluation of AI-supported managerial practices in order to explore the relationship between sustainability transformation and digital governance capabilities. The findings indicate that AI-driven governance mechanisms can significantly support ESG integration, organizational adaptability, and long-term sustainability performance. The study contributes to the growing body of literature on ESG transformation by highlighting the strategic importance of AI-supported governance systems in traditionally conservative industries.

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1 Introduction: Governance Challenges in the Contemporary Construction Industry

The construction industry remains one of the most structurally complex and institutionally regulated sectors in modern economies. It differs from manufacturing and service sectors due to its project-based production, which involves temporary organizations, multiple stakeholders, and diverse contractual arrangements across the value chain. This fragmentation produces significant governance challenges, especially in coordination, transparency, and accountability across organizational boundaries. At the same time, the sector is intensely regulated because of its impact on economic performance, environmental footprint, and social well-being.

Despite its economic importance, construction consistently ranks among the least digitalized industries, with low adoption rates of digital tools and limited integration of advanced analytical systems into governance structures. This discrepancy between technological availability and organizational uptake reflects both the complexity of project coordination and the embeddedness of traditional managerial logics, which remain rooted in hierarchical control and localized decision rights rather than in cross-functional information flows and data-driven governance processes (Bahareh, Hosseini, Martek, Zavadskas, & Antucheviciene, 2021).

In recent years, the sector's governance landscape has been further complicated by the growing institutionalization of Environmental, Social, and Governance (ESG) requirements. ESG is no longer a peripheral reporting framework used mainly by investors; it has become a core governance mechanism that shapes organizational legitimacy, strategic decisions, and risk mitigation practices. Construction's high carbon intensity, resource consumption, and waste generation have put ESG performance at the forefront of both public oversight and stakeholder expectations, linking environmental accountability and social responsibility directly with corporate governance objectives (Cruz, L., Pimenta Dinis, & Baggio, 2023).

The regulatory push toward ESG compliance in the European context including standardized sustainability reporting protocols requires firms to move beyond ad hoc disclosure towards integrated governance architectures that connect environmental performance, labor and safety practices, community engagement, and transparent decision processes. This regulatory complexity amplifies the need for

coherent governance structures capable of embedding long-term sustainability criteria within strategic planning, project execution, and performance monitoring (Novicka & Volkova, 2024).

In parallel, digital transformation and artificial intelligence (AI) are reshaping expectations about organizational intelligence and decision support. AI-enabled tools offer significant capabilities in areas such as real-time monitoring, predictive planning, anomaly detection, and scenario analysis. These functionalities have the potential to improve operational transparency, enhance risk assessment, and support evidence-based strategic decisions. However, the adoption of these tools often remains at the level of functional support rather than structural transformation. AI augments managerial judgment through enhanced analytics but does not replace essential human and organizational authority (Papagianndis, Mikalef, & Conboy, 2025).

A key distinction arises between digitalization the introduction of digital tools to enhance existing processes and digital transformation, which requires fundamental changes to governance models, decision rights, and organizational culture. Construction firms frequently adopt digital technologies within existing hierarchical frameworks, yet fail to modify the deeper governance logic that would enable these technologies to drive strategic change. This divergence highlights the difference between incremental technological upgrades and transformational governance reform. (Bahareh, Hosseini, Martek, Zavadskas, & Antucheviciene, 2021).

Taken together, the combination of high regulatory exposure, low digital maturity, and rising ESG expectations creates a structural tension in contemporary construction governance. Firms operate in environments where external demands evolve rapidly, yet internal capacities for strategic realignment lag behind. This condition can be described as a technological paradox, where technological potential outpaces organizational absorptive capacity, leading to underutilized digital investments and incomplete integration of sustainability criteria into governance routines (Frimpong, et al., 2024).

Although sustainability reporting and digital innovation have each attracted growing scholarly and regulatory attention, their interaction within construction governance structures remains insufficiently conceptualized. Existing analyses typically examine

ESG compliance mechanisms or digital transformation trajectories in isolation, without systematically addressing how regulatory pressure, data infrastructures, and organizational design jointly reshape decision-making authority in project-based environments (Frimpong, et al., 2024). In sectors characterized by fragmented value chains and temporary organizational forms, the combined governance implications of ESG institutionalization and AI-enabled digital practices require closer analytical integration. The persistent divergence between technological capability and organizational adaptation suggests that the core challenge is not technological availability, but structural alignment.

Against this backdrop, the discussion that follows establishes a macro-level problem context for governance development in contemporary construction. High regulatory exposure, increasing sustainability standardization, and limited digital maturity collectively exert pressure on firms to move beyond traditional hierarchical management models toward more structured governance architectures. Artificial intelligence emerges in this setting as a catalyst that strengthens analytical depth, predictive capacity, and transparency; however, its contribution remains contingent upon organizational absorptive capacity and structural readiness (Papagianndis, Mikalef, & Conboy, 2025). The central issue addressed herein is therefore the structural misalignment between rapidly expanding technological potential and comparatively slower institutional and organizational adaptation.

Based on the outlined governance tensions between ESG institutionalization and AI-driven digitalization, the chapter addresses the following research questions:

RQ1: How do ESG regulatory pressures influence governance structures in construction firms operating in post-transition economies?

RQ2: To what extent do AI-enables digital tools contribute to governance transformation rather than merely improving operational efficiency?

RQ3: What organizational and cultural factors shape the alignment between ESG governance requirements and AI-supported digital practices?

The formulation of these research questions reflects recent research emphasizing that digital transformation and sustainability governance increasingly interact within

organizational decision-making systems, requiring integrated analytical approaches rather than separate examination of technological and regulatory dynamics (Vial, 2019).

2 Theoretical Background: ESG, Digital Transformation, and Governance

2.1 ESG Governance in the Construction Industry

ESG has shifted from a primarily disclosure-oriented concept to a governance architecture that influences oversight, decision criteria, risk management routines, and organizational legitimacy–especially in the EU regulatory context where sustainability information is increasingly standardized and assured. This shift is reinforced by the Corporate Sustainability Reporting Directive (CSRD), which was introduced to improve the consistency and comparability of sustainability reporting and to strengthen sustainability-related accountability within corporate governance arrangements (Primec & Belak, 2022)

In construction, ESG governance cannot be treated as an "add-on" because the sector's externalities are structurally embedded in its production logic. The buildings and construction sector remains a major driver of environmental pressure, including energy use and CO_2 emissions, which elevates environmental performance from an operational concern to a board- and strategy-relevant governance issue (UNEP: Global Alliance for Buildings and Construction, 2025)The governance challenge is amplified by construction's project-based organization: temporary coalitions form around each project, responsibilities are distributed across multiple contractual parties, and performance is delivered through fragmented value chains. In such settings, accountability for ESG outcomes is difficult to allocate, monitor, and enforce across organizational boundaries.

These structural characteristics make ESG implementation in construction highly sensitive to coordination mechanisms and control systems. Evidence from construction-focused CSR research indicates that sustainability-related practices often remain reactive, compliance-driven, and insufficiently embedded in strategic governance and performance systems–suggesting the risk of "formal compliance" without deeper governance integration (Loosemore & Lim, 2016)This pattern is

particularly problematic under CSRD-type expectations, where sustainability reporting increasingly requires traceable processes, credible indicators, and governance-level responsibility rather than narrative statements (Primec & Belak, 2022).

At the same time, ESG governance functions as both pressure and opportunity. Regulatory compliance and stakeholder scrutiny impose costs and organizational demands (e.g., data readiness, internal controls, assurance preparation), but structured ESG integration can strengthen risk resilience, improve stakeholder trust, and support long-term strategic positioning–especially when governance systems connect project-level evidence with organizational strategy and oversight (Primec & Belak, 2022). For construction firms, the practical implication is that ESG must be operationalized through governance mechanisms that fit the sector's fragmentation: clear accountability allocation across stakeholders, consistent project-level measurement logic, and decision routines that incorporate environmental and social risk alongside cost–time–quality criteria.

2.2 Digital Transformation and Artificial Intelligence in Governance Systems

Digital transformation reshapes organizational governance when technological adoption extends beyond routine automation and becomes embedded within strategic oversight, decision-making logic, and accountability structures . In this sense, digitalization refers to the use of digital tools to improve existing processes, while digital transformation implies a systemic reconfiguration of organizational models, value creation mechanisms, and governance logic. Digital transformation therefore requires changes to decision rights, performance evaluation frameworks, and managerial routines rather than mere upgrades to software or data collection tools (Vial, 2019).

In governance contexts, this distinction is essential because construction firms often implement digital tools to support documentation, reporting, or project coordination without adjusting the organizational structures that define who makes decisions and how strategic information flows. Digital transformation, by contrast, requires that digital capabilities become part of the formal governance architecture, influencing risk assessment, strategic planning, and cross-functional coordination rather than merely enhancing operational efficiency (Vial, 2019).

Artificial intelligence (AI) plays a central role in digital transformation as a decision-support capability rather than as a substitute for managerial authority. Recent research indicates that AI's primary organizational value lies in augmenting human decision-making by enhancing pattern recognition, risk forecasting, and scenario evaluation. AI systems support governance by processing large volumes of structured and unstructured data, identifying emerging trends, and offering evidence-based insights that inform strategic choices under uncertainty (Aarab, El Marzouki, Boubker, & El Moutaqi, 2025). In this way, AI strengthens analytical capacity and expands information-processing bandwidth, enabling managers to evaluate complex alternatives more effectively.

The effectiveness of AI-supported governance depends fundamentally on robust data infrastructure. High-quality, interoperable, and traceable data systems are prerequisites for reliable analytics and informed decision-making. In fragmented, project-driven industries such as construction, inconsistent data flows and siloed information environments often limit the strategic potential of advanced analytics (Wamba, et al., 2017). Without integrated data governance structures, AI outputs may remain analytically sophisticated but strategically isolated.

Simulation and predictive modeling further enhance governance capabilities by allowing organizations to test strategic options before implementation, thereby reducing uncertainty and strengthening foresight. Technologies such as digital twins and what-if scenario planning enable decision-makers to assess potential impacts on cost, schedule, and sustainability outcomes prior to committing resources (Tao et al., 2019). These simulation tools expand managerial insight but require interoperability between data systems and governance processes to influence strategic choice effectively.

Automation constitutes another dimension of digital integration. Routine compliance procedures, documentation workflows, and monitoring tasks can be partially automated, increasing operational transparency and efficiency. However, automation alone does not constitute digital transformation. Productivity research shows that technological investment yields meaningful governance impact only when accompanied by complementary organizational change, including structural adaptation and updated decision-rights frameworks (Brynjolfsson, Rock, &

Syverson, 2017). Where governance structures remain static, AI and automation function as efficiency enhancers rather than drivers of structural reform.

In sum, digital transformation in governance systems occurs when technological capability, data architecture, and organizational structures evolve in alignment. Artificial intelligence strengthens analytical depth, predictive power, and strategic foresight, but its transformative potential depends on organizational absorptive capacity, data governance, and structural adaptation rather than technological sophistication alone.

2.3 Organizational Adaptation and the Technological Paradox

The technological paradox describes the divergence between rapid technological advancement and comparatively slower organizational adaptation. Although digital systems and artificial intelligence develop at accelerating speed, measurable productivity and governance effects often emerge with delay (Brynjolfsson, Rock, & Syverson, 2017). This lag does not reflect technological inefficiency; rather, it signals that organizational structures, decision routines, and managerial competencies require time to adjust before technological investments generate structural transformation.

Organizational effectiveness depends on internal coherence between long-term strategic orientation, structural configuration, and managerial processes. A systemic perspective on organizational design emphasizes that organizational effectiveness depends on the capacity of structures and processes to facilitate adequate information processing and coordination across organizational units. Galbraith argues that organizational uncertainty arises when the amount of information required for effective decision-making exceeds the information that the organization is able to process, making the design of appropriate structures and communication mechanisms essential for organizational performance (Galbraith, 1977).

Organizational culture further conditions adaptive capacity. Culture defines shared assumptions regarding authority, risk, innovation, and responsibility (Schein & Schein, 2016). In capital-intensive, project-based sectors such as construction, dominant cultural patterns frequently emphasize procedural stability, financial prudence, and risk containment. While these orientations enhance reliability and

control, they may moderate experimentation and cross-functional integration required for AI-enabled governance structures. Resistance to change thus reflects embedded institutional routines rather than individual reluctance alone.

Corporate governance effectiveness also requires consistency between strategic objectives, organizational structure, and managerial capabilities. In her analysis of strategic management and corporate governance, (Duh, 2024) stresses that strategic intentions must be supported by appropriately designed structures and control mechanisms; otherwise, declared objectives remain formally adopted but operationally weak. Governance reform therefore presupposes alignment between formal strategy, structural configuration, and implementation processes. Where such alignment is absent, digital technologies tend to operate alongside established routines rather than reshaping them.

In post-transition economies, the technological paradox becomes structurally embedded. Institutional modernization and regulatory harmonization often advance more rapidly than internal organizational development and managerial capability formation. Organizations in such contexts frequently operate within hybrid governance configurations, where formal regulatory alignment coexists with historically shaped coordination routines. This divergence creates structural asymmetry between external modernization pressures and internal absorptive capacity, limiting the speed and depth of governance transformation and reinforcing incremental rather than systemic adaptation.

Under such conditions, technological integration requires more than capital investment in advanced tools. It demands modernization of routines, redistribution of decision rights, and cultural reorientation toward data-driven coordination. Where strategic coherence, structural flexibility, and cultural readiness evolve simultaneously, technological innovation may support governance renewal. Where these dimensions remain misaligned, digital sophistication expands while governance logic continues to reflect historically embedded patterns.

Based on the preceding theoretical discussion, the following analytical framework illustrates the relationship between ESG institutional pressures, organizational governance structures, and AI-enabled digital capabilities.

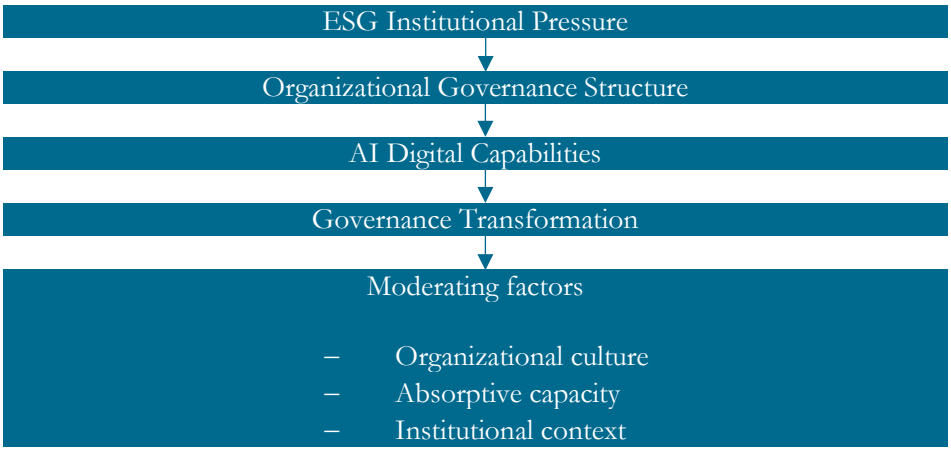

Figure 1: Analytic framework of ESD-AI governance

3 Research Design and Methodological Approach

This study adopts a qualitative case-based research design in order to explore governance transformation as a contextually embedded and structurally mediated process. Governance change in construction firms cannot be adequately captured through isolated quantitative indicators, as it unfolds through interactions between strategic intent, institutional pressure, managerial routines, and technological capability. A case-based approach enables the examination of these interdependencies within their real organizational setting, thereby preserving contextual richness and interpretative depth (Yin, 2017).

Case study methodology is particularly suitable for governance research because governance systems are inherently multi-layered and relational. They involve formal structures, informal practices, strategic narratives, and regulatory environments that cannot be meaningfully reduced to measurable variables alone. Case study research is particularly suitable for analyzing complex organizational phenomena in which the objective is to understand how and why processes evolve over time (Eisenhardt & Graebner, 2007). Governance transformation–particularly in post-transition economies–represents precisely such a phenomenon.

The selection of a single in-depth case allows for analytical rather than statistical generalization. The objective is not to produce universal causal claims but to generate a theoretically informed explanation of how ESG pressures and AI-enabled digitalization interact with organizational structures. As Flyvbjerg (2006) emphasizes, strategically chosen cases provide powerful insight into structural dynamics and can illuminate broader theoretical propositions when analyzed rigorously (Flyvbjerg, 2006). The chosen company, VG5 d.o.o., represents a relevant case due to its position within a regulated construction environment, its exposure to ESG requirements, and its gradual adoption of digital governance tools.

Data collection relies on three primary categories of sources. First, strategic documents provide insight into formal governance intent and declared organizational priorities. These include corporate strategy documents, sustainability-related statements, governance frameworks, and publicly available company information. Document analysis enables examination of how ESG principles and digital initiatives are articulated at the strategic level and how they are embedded within formal governance language (Bowen, 2009).

Second, financial indicators serve as contextual signals of organizational capacity and strategic orientation. Publicly available annual financial statements, including revenue development, capital structure, and investment patterns, provide a backdrop for interpreting the firm's ability to support governance transformation and technological integration. Financial data are not treated as dependent variables but as interpretive anchors that illuminate risk tolerance, resource allocation logic, and strategic stability (Kaplan & Nortan, 2008).

Third, organizational practices constitute a central analytical dimension. These include observable coordination routines, decision-making structures, reporting mechanisms, and digital tool usage patterns. Governance transformation becomes visible not merely in formal declarations but in how processes are enacted in practice. Qualitative organizational research achieves stronger explanatory depth when formal structural arrangements are analyzed in connection with managerial routines and processes of sensemaking (Gioa, Corley, & Hamilton, 2013)

The analytical logic of this study is interpretative rather than technical. Instead of focusing on procedural methodological complexity, the research emphasizes coherence analysis–examining alignment or misalignment between strategic rhetoric, structural configuration, digital capability, and organizational culture. Governance transformation is therefore interpreted as a process of structural adaptation shaped by institutional pressure, technological opportunity, and managerial agency.

The research design thus prioritizes explanatory depth over methodological abstraction. By integrating strategic documents, financial indicators, and organizational practices within a coherent interpretative framework, the study seeks to illuminate how ESG institutionalization and AI-supported digital tools reshape governance structures in a post-transition construction context.

The objective of the empirical part of this study is to examine how ESG governance requirements and AI-supported digital tools interact within the governance practices of a construction company operating in a post-transition economic context. The research aims to provide an interpretative understanding of how sustainability pressures and digital technologies influence organizational coordination, decision-making processes, and governance mechanisms.

The empirical research was conducted in the period between October 2025 and February 2026. The study follows a qualitative research approach commonly applied in management and organizational research when the objective is to examine complex organizational processes and governance practices within their real organizational context.

The research design is based on an in-depth analysis of a single organizational context. The selected construction company was analyzed through a structured qualitative research procedure in order to understand how ESG governance requirements and AI-supported digital tools are reflected in the organizational governance structures, decision-making processes, and coordination practices of the company.

The primary data collection method used in this research was document analysis. The analyzed materials included publicly available strategic documents, sustainability disclosures, annual reports, governance-related information, and financial statements of the company.

To analyze the collected material, the study applied thematic analysis, with the analytical procedure focused on identifying themes related to governance structures, digital governance tools, and organizational coordination mechanisms (Braun & Clarke, 2008).

The analysis was structured around three analytical dimensions:

- formal ESG governance structures
- digital governance tools and data infrastructure
- organizational coordination mechanisms and decision-making routines

To improve the reliability of the research, the study applied methodological triangulation, combining multiple sources of evidence including corporate strategic documents, financial indicators, and observable governance practices.

The analytical framework applied in this study is based on the assumption that ESG transformation in the construction industry is increasingly dependent on the integration of digital governance mechanisms and AI-supported decision-making processes. In order to systematically assess this relationship, the case analysis focuses on four analytical dimensions: (1) strategic integration of ESG principles into corporate governance structures, (2) implementation of AI-supported governance and monitoring mechanisms, (3) organizational adaptability and digital transformation capabilities, and (4) perceived long-term sustainability and competitiveness outcomes.

The selected Slovenian case was chosen based on the following criteria: relevance within the national construction sector, observable ESG transition activities, evidence of digital transformation processes, and availability of publicly accessible strategic and sustainability-related data. The analysis combines qualitative document analysis with comparative interpretation of governance practices, ESG disclosures, and technology adoption patterns.

This methodological approach enables a more comprehensive understanding of how AI-supported governance mechanisms contribute to ESG implementation and organizational transformation within construction companies operating in transitional and highly regulated market environments.

4 Case Context: Construction Governance in a Post-Transition Economy

4.1 Institutional and Market Characteristics

The construction sector in post-transition economies operates within an institutional framework shaped by regulatory harmonization with European Union standards, strong dependence on public investment cycles, and evolving governance structures. In Slovenia, construction activity is closely connected to national infrastructure strategies, cohesion policy funding, and public procurement procedures, which increases firms' exposure to fiscal adjustments and regulatory changes (Commission, 2021) As a result, governance systems in construction companies must continuously balance compliance obligations with long-term strategic positioning.

Market dynamics in the Slovenian construction industry are characterized by pronounced cyclical volatility and competitive intensity. Demand for construction services is closely linked to macroeconomic performance and the timing of publicly financed infrastructure projects. The Construction Sector Observatory of the European Commission identifies the sector as highly sensitive to public procurement frameworks and regulatory monitoring mechanisms (Commission, 2021). Such conditions require firms to develop governance structures capable of integrating regulatory surveillance with financial risk management and strategic foresight.

The European construction sector operates within a structurally fragmented and highly regulated environment characterized by project-based production, cyclical demand fluctuations, and persistent productivity constraints. Regulatory complexity and administrative requirements significantly influence market dynamics, particularly in smaller EU economies where public procurement and infrastructure investments represent a substantial share of total construction output. In addition, the sector continues to face structural inefficiencies related to fragmentation of supply chains,

limited technological diffusion, and skill shortages, all of which increase governance complexity and reduce strategic flexibility (Leontie, 2022). In the Slovenian context, companies increasingly face difficulties in securing adequately trained personnel, which directly influences project delivery capacity and limits the speed of technological modernization (Pavićević, 2025). The shortage is not merely quantitative but also qualitative, affecting competencies required for digital integration and ESG-related reporting.

Consequently, the integration of foreign workers has become an operational necessity. However, cross-border labor mobility introduces managerial complexity related to language barriers, cultural adaptation, training requirements, and safety compliance. Effective onboarding, mentoring systems, and structured human resource policies are therefore essential to maintain productivity and organizational cohesion in a project-based environment (Pavićević, 2025).

Financial governance constitutes an additional structural challenge. Construction firms frequently operate under extended payment terms and are required to pre-finance substantial project phases, creating liquidity pressures and heightened exposure to financial risk. Publicly available financial data of Slovenian construction firms confirm the importance of conservative capital management and controlled indebtedness in ensuring operational stability within cyclical market conditions.

Beyond labor and financial constraints, the sector is characterized by stringent technical standards, regulatory oversight, and safety requirements. Compliance with environmental regulations, building codes, and occupational safety frameworks increases procedural complexity and strengthens the need for formal governance mechanisms (Commission, 2021).

Taken together, regulatory dependence, labor shortages, financial volatility, and competitive pressure shape a governance environment in which ESG alignment and digital transformation cannot be implemented incrementally. Instead, they require deliberate strategic coordination and strengthened organizational absorptive capacity within structurally constrained post-transition contexts.

4.2 Organizational Profile and Strategic Orientation of the Case Company

VG5 d.o.o. is a Slovenian construction company headquartered in Ljubljana, operating primarily in the field of execution engineering and technically demanding construction projects. The company is classified among medium-sized construction enterprises in Slovenia, both in terms of revenue volume and organizational scale (VG5 d.o.o., 2025). Its core activity encompasses the execution of high-complexity construction works, supported by coordination, engineering management, and investment-related services.

From a strategic perspective, the company follows a growth-oriented development model grounded in concentric expansion and selective horizontal diversification. In addition to strengthening its position in the domestic market, VG5 d.o.o. has gradually expanded its operational presence to the Croatian market, thereby extending its geographical scope while maintaining its core engineering focus (AJPES, 2025). Such expansion reflects a controlled growth strategy aimed at reinforcing market stability and reducing exposure to purely domestic cyclical fluctuations.

Regarding corporate-level strategy, the company pursues a differentiation approach. Instead of competing primarily on price, VG5 d.o.o. positions itself in segments characterized by higher technical complexity, reliability requirements, and coordinated project execution. This strategic orientation enables the company to operate in higher value-added market niches and reduces vulnerability to aggressive price competition typical of fragmented construction markets. The emphasis on technical expertise, engineering precision, and structured coordination represents a central competitive mechanism.

Financial policy reflects a conservative and stability-oriented governance logic. According to publicly available annual financial statements, the company maintains controlled indebtedness and stable capital structure ratios, ensuring operational resilience within a cyclical industry environment (VG5 d.o.o., 2024). CompanyWall financial indicators confirm moderate leverage levels and steady revenue development in recent years (CompanyWall, n.d.)Such financial positioning

supports incremental modernization and controlled strategic expansion without excessive exposure to liquidity risk.

The governance structure of VG5 d.o.o. is organized through a formally defined hierarchical framework with clearly allocated managerial responsibilities across technical, financial, and administrative domains . Strategic authority is concentrated at the executive level, while operational coordination is distributed among specialized functional units. This configuration enables internal accountability, financial oversight, and structured project supervision, reflecting characteristics typical of professionally managed firms operating in post-transition institutional contexts (VG5 d.o.o., 2024).

In terms of organizational orientation, the company demonstrates alignment between strategic objectives and structural configuration. Growth ambitions are supported by financial discipline, differentiated market positioning, and clearly defined managerial roles. Digital tools, including BIM-based coordination and structured documentation systems, function primarily as supportive mechanisms embedded within existing governance structures rather than as drivers of radical structural transformation.

Overall, VG5 d.o.o. represents a medium-sized, growth-oriented construction enterprise characterized by strategic differentiation, controlled financial management, and formalized governance architecture. Its strategic development path and structural configuration provide a relevant empirical setting for examining the interaction between ESG requirements, digital governance mechanisms, and organizational adaptation in a post-transition economy.

5 ESG and AI-Driven Governance Transformation: Case Analysis

5.1 ESG Integration into Governance Structures

The integration of Environmental, Social and Governance (ESG) principles into corporate governance structures represents a substantive shift from sustainability as a peripheral reporting obligation toward sustainability as a core decision-making architecture. The adoption of the Corporate Sustainability Reporting Directive (CSRD) at the European level has institutionalized sustainability disclosure

requirements and significantly expanded the scope of managerial accountability for non-financial information (European Commission, 2022). As a result, ESG considerations increasingly influence strategic planning, risk management, and performance monitoring systems rather than remaining confined to external communication practices.

Under the CSRD framework, organizations are required to implement standardized sustainability reporting aligned with European Sustainability Reporting Standards (ESRS), which implies formalization of data collection systems, internal control mechanisms, and oversight responsibilities. This regulatory development strengthens the role of governance bodies in supervising sustainability-related risks and opportunities, effectively embedding ESG within strategic decision cycles (European Commission, 2022). New EU sustainability reporting logic introduces legal and managerial demands that directly reshape corporate governance practices by requiring comparability, reliability, and assurance of ESG disclosures. In this context, ESG does not merely expand reporting content but restructures the informational foundation upon which strategic decisions are made (Primec & Belak, 2022).

From a decision-making perspective, ESG integration broadens the evaluative criteria applied to investment selection, procurement processes, subcontractor relationships, and long-term project portfolio management. Instead of focusing exclusively on financial returns and operational efficiency, governance systems increasingly incorporate environmental exposure, stakeholder impact, supply-chain transparency, and reputational risk considerations. This shift corresponds with the argument that sustainable corporate governance requires systematic alignment between stakeholder interests, strategic objectives, and reporting mechanisms (Čufar, Primec, & Belak, 2025). Consequently, ESG influences not only what is disclosed but also what is prioritized in managerial deliberations.

At the formal level, ESG integration materializes through documented sustainability strategies, defined performance indicators, structured risk registers, compliance procedures, and traceable reporting systems. The CSRD framework reinforces these mechanisms by requiring auditable sustainability information and clearer allocation of responsibility within governance bodies (European Commission, 2022). Such

formalization increases transparency and strengthens oversight but simultaneously raises administrative and data-management demands.

However, governance transformation extends beyond formal structures into informal organizational practices. The depth of ESG implementation depends significantly on leadership interpretation, internal communication patterns, and the extent to which sustainability is embedded in everyday managerial routines. Research in the construction sector suggests that corporate responsibility initiatives often remain operational and compliance-oriented rather than strategically integrated, particularly in project-based environments characterized by fragmentation and short-term contractual logic (Loosemore & Lim, 2016). In such contexts, ESG may be implemented procedurally–through documentation and selective initiatives–without fundamentally reshaping authority structures or incentive systems.

Implementation constraints are especially pronounced in construction, where project temporality, multi-tier subcontracting networks, and cost-pressure dynamics complicate the systematic integration of sustainability metrics. The need to coordinate across independent actors reduces data consistency and weakens centralized control over environmental and social performance indicators. Furthermore, capital intensity and liquidity sensitivity may lead firms to prioritize short-term financial stability over long-term sustainability investments. The regulatory escalation alone does not guarantee substantive governance change unless organizations develop internal capabilities to translate disclosure requirements into managerial practice (Primec & Belak, 2022).

In this case context, ESG integration can therefore be interpreted as a governance recalibration process rather than a linear compliance adjustment. While regulatory pressure establishes formal obligations, effective transformation depends on the organization's ability to embed ESG within strategic deliberation, align incentive structures with sustainability objectives, and maintain coherence between formal policies and operational realities. Where such alignment remains partial, ESG functions primarily as an accountability extension rather than as a transformative governance mechanism.

5.2 AI-Supported Tools and Digital Governance Practices

Artificial intelligence has increasingly evolved into a governance-enabling infrastructure capable of enhancing analytical depth, predictive accuracy, and real-time monitoring across complex organizational systems. Recent research emphasizes that contemporary AI systems function primarily as decision-support mechanisms that augment managerial cognition rather than replace executive authority (OECD, 2023). In governance contexts, AI contributes to improved information processing, risk detection, and scenario evaluation, thereby strengthening strategic planning capabilities.

Within the planning domain, AI applications enhance forecasting reliability by integrating historical performance data, cost trajectories, supply chain variability, and environmental indicators. The highlights that advanced analytics and machine learning models improve anticipatory governance by enabling forward-looking assessments and dynamic resource allocation (OECD, 2023). In project-based industries such as construction, where uncertainty is structurally embedded, predictive modeling supports more resilient planning decisions and reduces exposure to cascading project risks.

Monitoring and control functions have similarly expanded through AI-driven data aggregation and anomaly detection systems. Real-time dashboards integrate financial metrics, operational indicators, and ESG-related data streams, allowing management to detect deviations and compliance risks at earlier stages. The principle that reinforces high-impact AI systems must ensure traceability, human oversight, and accountability within governance structures (European Commission, 2024). Consequently, AI-supported monitoring does not eliminate managerial responsibility but increases transparency and supervisory precision.

Simulation technologies represent a further strategic dimension of AI integration. Recent studies on digital twin applications in industrial environments demonstrate how AI-powered simulation models enable organizations to test operational and environmental scenarios prior to implementation (Fuller, Fan, Day, & Barlow, 2020). In construction governance, such tools facilitate impact assessment related to cost optimization, time scheduling, carbon performance, and safety risk evaluation.

Simulation-based governance thus strengthens anticipatory capacity and supports informed strategic trade-offs.

Despite these advantages, contemporary literature consistently underscores structural limitations. AI systems are critically dependent on data governance quality, interoperability, and cross-functional integration (OECD, 2023). Fragmented project structures, heterogeneous IT systems, and limited digital maturity reduce algorithmic reliability and weaken predictive accuracy. Furthermore, empirical analyses of digital transformation indicate that technological adoption without complementary organizational redesign rarely produces transformative governance outcomes (Vial, 2019).

While AI adoption has accelerated considerably in recent years, many organizations continue to face internal capability gaps that limit its strategic impact. Deficiencies in data literacy, fragmented information systems, cybersecurity vulnerabilities, and weak strategic alignment often prevent firms from translating technological investment into sustained governance improvement. In capital-intensive sectors such as construction, where stability and risk control are dominant priorities, these limitations moderate the transformative potential of AI. Rather than reshaping authority structures, AI frequently remains embedded within established hierarchical governance configurations.

In the present case context, AI-supported tools enhance planning precision, reporting transparency, and monitoring efficiency. However, structural authority distribution and strategic orientation remain largely stable. AI therefore functions as a governance amplifier rather than a structural disruptor, reinforcing analytical capacity while leaving core organizational architecture predominantly intact. This observation corresponds with the technological productivity paradox described by Brynjolfsson, Rock, and Syverson, who argue that technological capabilities frequently expand faster than organizational redesign, leading to a lag between digital investment and measurable structural transformation (Brynjolfsson, Rock, & Syverson, 2017).

Digital transformation research similarly emphasizes that technological adoption produces meaningful organizational change only when accompanied by complementary adjustments in decision-making processes, managerial routines, and organizational structures (Vial, 2019).

Without such complementary organizational adaptation, digital technologies tend to enhance monitoring precision and analytical capacity while leaving underlying governance structures largely unchanged.

5.3 Organizational and Cultural Constraints

Governance transformation in construction firms is strongly conditioned by organizational culture, structural configuration, and embedded coordination routines. Organizational culture shapes how strategic priorities are interpreted and how change initiatives are enacted in practice. (Schein & Schein, 2016) Schein define culture as a pattern of shared basic assumptions that guide perception and behavior within organizations. In project-based and risk-sensitive industries such as construction, these assumptions often emphasize stability, procedural control, and risk minimization. Such cultural orientations strengthen operational reliability but may simultaneously reduce structural adaptability and openness to governance redesign.

Alignment between strategy, structure, and processes represents a prerequisite for sustainable organizational transformation. Digital transformation research demonstrates that technological implementation without structural adaptation rarely produces systemic change. When AI-based governance tools are introduced into established hierarchical systems without reconfiguring decision rights or coordination mechanisms, they tend to enhance monitoring precision without fundamentally redistributing authority.

Resistance to change emerges as a predictable response when established roles, power relations, and accountability systems are challenged. Mullins (2010) explains that resistance frequently stems from uncertainty, fear of loss of status, perceived threats to job security, and ambiguity regarding new responsibilities (Mullins, 2010). In hierarchical organizations, where authority lines are clearly defined, transformation initiatives may be perceived as destabilizing established control

mechanisms. In capital-intensive sectors such as construction, where decision errors carry significant financial consequences, cautious managerial behavior becomes rational. Under such conditions, ESG-related governance adjustments and AI-supported transparency mechanisms may be formally accepted yet cautiously implemented.

The structural dimension of constraint becomes particularly visible when technological capability advances faster than organizational redesign. Empirical research on artificial intelligence and productivity demonstrates that performance improvements depend on complementary organizational investments, process innovation, and managerial adaptation (Brynjolfsson, Rock, & Syverson, 2017). Without parallel adjustment of decision-making structures and coordination logic, advanced analytics expand informational capacity but do not transform governance architecture. Analytical sophistication therefore increases while structural authority patterns remain concentrated.

Organizational misalignment between technology and structure has been widely documented in digital transformation studies. (Westerman, Bonnet, & McAfee, 2014) show that companies achieving significant digital performance gains combine technological capability with leadership alignment and structural integration. In contrast, firms that treat digital tools as technical add-ons rather than strategic redesign mechanisms experience incremental rather than systemic outcomes. In governance contexts, AI depends on horizontal data flows and cross-functional transparency, while traditional hierarchical systems rely on vertical reporting chains and centralized oversight.

In post-transition economic environments, these tensions may be intensified by historically embedded managerial traditions and evolving institutional frameworks. Enterprises often integrate formal regulatory compliance with established coordination practices, producing hybrid governance configurations. (OECD, 2023) notes that effective AI governance requires organizational capacity, internal accountability mechanisms, and managerial competence, not only technological infrastructure. Where structural alignment remains partial, technological advancement outpaces institutional adaptation.

The technological paradox therefore materializes at the organizational level: digital and ESG mechanisms expand monitoring precision and analytical reach, yet structural authority distribution and cultural patterns evolve gradually. Sustainable governance transformation depends on coherent integration of strategy, structure, processes, and organizational culture rather than technological sophistication alone (Brynjolfsson, Rock, & Syverson, 2017).

6 Discussion: Implications for Sustainable Construction Governance

The findings indicate that ESG transformation within the construction industry cannot be understood solely as a regulatory compliance process. Instead, the case demonstrates that successful ESG implementation increasingly depends on the organization's ability to integrate digital governance mechanisms and AI-supported managerial practices into strategic decision-making processes.

The analysis further suggests that AI-driven governance tools contribute to improved monitoring capabilities, more transparent reporting processes, enhanced operational coordination, and more effective sustainability performance tracking. However, the study also identifies several organizational limitations, including resistance to change, limited digital competencies, and difficulties in aligning traditional management structures with emerging ESG and AI governance requirements.

These findings support the argument that the transformation toward sustainable governance in the construction industry represents not only a technological challenge but also a broader organizational and strategic transformation process.

The findings of this study indicate that sustainable governance transformation in the construction industry does not emerge as a linear consequence of regulatory expansion or technological adoption. Instead, governance development unfolds through a complex interaction between ESG institutionalization, AI-enabled digital capabilities, and organizational adaptation capacity. While ESG frameworks increasingly redefine accountability structures and strategic priorities, and artificial intelligence expands analytical and predictive capabilities, their transformative impact remains conditional upon structural alignment within firms.

Recent research confirms that AI is increasingly embedded into ESG-related strategic processes, particularly in areas such as performance monitoring, risk modelling, and sustainability reporting (Mansour, Al Zobi, & Alomair, 2025). However, empirical analyses also demonstrate that the presence of advanced digital tools does not automatically generate structural transformation. AI improves information-processing speed and reporting precision, yet governance redesign requires complementary organizational investment, leadership commitment, and process reconfiguration (Cui, 2025). The present findings support this distinction: technological capability enhances oversight functions, but deeper authority redistribution and decision logic adaptation evolve more gradually.

This dynamic can be interpreted through the lens of the technological paradox. Studies examining digital innovation and productivity consistently show that performance gains from AI and digital systems depend on complementary changes in organizational processes and management practices (Brynjolfsson, Rock, & Syverson, 2017). When such complementary adjustments are incomplete, organizations experience improved analytics without proportional structural transformation. The construction sector, characterized by hierarchical coordination, project-based fragmentation, and capital discipline, is particularly exposed to this imbalance. Digital governance tools expand monitoring and simulation capacity, yet traditional reporting hierarchies and centralized authority often remain intact.

Contemporary AI governance scholarship further emphasizes that responsible and effective AI deployment requires integration within formal accountability systems (Batool, Zowghi, & Bano, 2023). Regulatory approaches, including European AI governance frameworks, increasingly stress transparency, human oversight, and risk classification. However, regulatory compliance does not equate to institutional transformation. Without structural recalibration of coordination mechanisms and decision rights, AI remains embedded within pre-existing governance architectures rather than reshaping them.

The interaction between ESG and AI adds an additional layer of complexity. ESG integration expands stakeholder-oriented accountability and requires systematic measurement of environmental and social performance. Recent systematic reviews on AI for ESG integration demonstrate that organizations increasingly rely on machine learning and predictive analytics to evaluate sustainability indicators and

investment risk exposure (Charan, Samanta, & Vincent, 2025). Nevertheless, the literature also identifies a persistent gap between technological availability and strategic embedding. This study's findings reinforce that observation: ESG metrics may be formally incorporated into reporting systems, while operational decision logic remains primarily financial and risk-oriented.

For managers in construction firms, these results suggest that ESG and AI should not be managed as parallel compliance initiatives but as interconnected governance mechanisms. Strategic embedding requires integration of sustainability indicators into capital allocation, risk modelling, and performance evaluation frameworks. AI investments should be accompanied by redesign of reporting flows, cross-functional data integration, and leadership training to strengthen absorptive capacity. Without structural adaptation, digitalization risks remaining operational rather than strategic.

For policymakers, the implications concern the balance between regulatory escalation and organizational capability development. Recent scholarship on AI governance underscores the importance of institutional readiness, managerial literacy, and supervisory clarity (Batool, Zowghi, & Bano, 2023). In capital-intensive sectors such as construction, mandatory ESG disclosure and AI regulation may increase formal transparency without necessarily accelerating governance modernization. Policy design should therefore incorporate support mechanisms, practical guidance, and digital infrastructure development that enhance firms' adaptive capacity rather than relying solely on compliance mandates.

For researchers, the findings highlight the need to examine governance transformation as a structural process rather than as a technological outcome. Much of the emerging literature focuses on AI performance potential or ESG reporting quality in isolation (Cui, 2025). Fewer studies analyze the co-evolution of technological capability, organizational culture, and institutional environment within project-based industries. Longitudinal studies observing authority redistribution, process redesign, and stakeholder integration over time would provide deeper insight into how governance architectures adapt under combined ESG and AI pressures. Comparative research between post-transition and mature institutional environments would further illuminate contextual variation in absorptive capacity.

The technological paradox thus becomes central to understanding sustainable construction governance. AI enhances predictive planning, simulation modelling, and compliance monitoring, while ESG expands normative accountability and stakeholder expectations. Yet structural transformation remains contingent upon managerial willingness to recalibrate authority, redesign coordination systems, and invest in organizational learning. In post-transition economies, where institutional modernization continues to evolve alongside market pressures, this alignment process may unfold incrementally rather than disruptively.

Sustainable construction governance therefore emerges not as a function of technological sophistication alone, but as an outcome of coherent integration between regulatory frameworks, digital capability, and organizational architecture. ESG and AI function as catalysts that intensify transparency and analytical reach. Their systemic impact depends on whether organizations translate enhanced information into restructured decision-making processes. Where such translation remains partial, governance evolves gradually, reinforcing oversight precision while preserving foundational structural logics.

The study contributes to the existing literature by extending current discussions on ESG governance beyond regulatory and reporting perspectives toward a more integrated governance-transformation framework. While previous studies have predominantly focused on ESG disclosure quality and sustainability reporting compliance, the present analysis highlights the importance of AI-supported governance capabilities as a strategic enabler of ESG transformation.

In particular, the findings emphasize that companies operating in traditional industries such as construction face a dual transformation challenge: simultaneously adapting to sustainability requirements and accelerating digital governance transformation. This interaction between ESG implementation and AI-supported governance mechanisms remains relatively underexplored in existing literature, especially in the context of transitional European economies.

7 Conclusion and Future Research Directions

This study examined the interaction between ESG institutionalization and AI-enabled digital transformation within the governance structures of a construction firm operating in a post-transition economy. The findings demonstrate that sustainable governance transformation does not emerge automatically from regulatory compliance or technological implementation. Rather, it depends on structural coherence between corporate strategy, organizational design, digital capabilities, and managerial culture.

One of the central findings is that ESG increasingly functions as an integrated governance framework rather than merely a disclosure requirement. In the analyzed case, sustainability considerations were formally embedded within decision-making structures; however, the depth of their strategic influence remained conditioned by established organizational routines and risk-oriented managerial logic. Similarly, AI-supported analytical tools enhanced planning precision, transparency, and monitoring capabilities, yet without parallel structural and cultural recalibration they did not fundamentally redefine underlying governance structures. This misalignment reflects the technological paradox: analytical sophistication advances more rapidly than institutional and organizational adaptation.

The study contributes to the literature in three principal ways. First, it develops an integrated analytical perspective that positions ESG governance and AI-driven digital transformation as interdependent dimensions of contemporary corporate governance evolution. By linking sustainability governance with digital transformation processes, the study contributes to the growing body of research examining how regulatory pressures and technological capabilities jointly influence organizational governance structures. Second, the research provides empirical insight into governance transformation in the construction sector, a project-based and capital-intensive industry characterized by fragmentation, regulatory exposure, and coordination complexity. By examining a construction firm operating in a post-transition economy, the study illustrates how ESG requirements and digital tools interact within real organizational settings. Finally, the findings offer managerial insights by highlighting conditions under which ESG governance requirements and digital technologies can be effectively aligned within organizational practices. The results suggest that successful governance transformation depends not only on

technological adoption but also on organizational coordination mechanisms, decision-making routines, and institutional context. By bridging theoretical concepts with case-based empirical analysis, the study improves understanding of how sustainability pressures and digital innovation jointly shape governance structures in practice.

Despite these contributions, the research is subject to several limitations. The study relies on a single case study design, which enables detailed exploration of governance dynamics but limits statistical generalization of findings to the broader construction industry. However, case study research aims to achieve analytical generalization by providing theoretically relevant insights rather than statistically representative conclusions (Yin, 2017; Flyvbjerg, 2006).

The analysis relied primarily on strategic documentation, publicly available financial data, and observable organizational practices. Internal managerial cognition, informal power structures, and employee-level perceptions were not systematically examined. Moreover, the rapidly evolving regulatory and technological landscape suggests that governance structures remain dynamic, and longitudinal developments may alter current configurations.

Future research should extend beyond single-case inquiry and incorporate comparative analyses across multiple firms and institutional settings. Longitudinal research designs would be particularly valuable in assessing whether ESG and AI integration ultimately reconfigure authority distribution and decision-making logic or primarily enhance monitoring within existing hierarchical systems. Further investigation into micro-level organizational processes–including leadership cognition, resistance dynamics, and cross-functional coordination–would provide deeper insight into absorptive capacity and structural adaptation. Quantitative studies linking digital maturity, ESG performance indicators, and financial resilience could complement qualitative findings and strengthen empirical robustness.

A central question for future scholarship remains whether the convergence of ESG governance and AI-driven digitalization leads to structural transformation or primarily operational optimization. Identifying the conditions under which technological and sustainability integration translates into systemic governance redesign represents an important research frontier.

In conclusion, sustainable construction governance cannot be reduced to technological sophistication or regulatory conformity. It is the outcome of strategic alignment across organizational structure, managerial culture, process architecture, and digital capability. The transformative potential of ESG and artificial intelligence depends on managerial willingness to recalibrate decision-making logic and redesign governance mechanisms. Where such alignment is proactively pursued, systemic transformation becomes attainable; where it remains partial, governance evolution proceeds incrementally rather than structurally.

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