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Does Sustainable Project Management Drive Green Innovation? The Mediating Role of Stakeholder Pressure and Digital Monitoring Systems

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Abstract

The increasing global emphasis on sustainability has transformed project management into a strategic approach for achieving environmental and organizational objectives. This study examines the effect of sustainable project management (SPM) on green innovation, with stakeholder pressure and digital monitoring systems as mediating variables. Drawing upon Stakeholder Theory and Institutional Theory, the study proposes that sustainability-oriented project governance enhances environmentally responsible innovation through stakeholder-driven expectations and technologically enabled sustainability monitoring. A quantitative research design was adopted, and data were collected from 387 professionals working in project-based industries. Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed for data analysis. The findings revealed that sustainable project management significantly influences green innovation ($\beta = 0.421$, $p < 0.001$). Furthermore, stakeholder pressure ($\beta = 0.147$, $p < 0.001$) and digital monitoring systems ($\beta = 0.155$, $p < 0.001$) partially mediated the relationship between sustainable project management and green innovation. The model explained 62.8% of the variance in green innovation, indicating substantial predictive capability. The results suggest that organizations implementing sustainability-oriented project governance frameworks are more likely to develop environmentally sustainable innovations due to stronger stakeholder engagement and digitally enabled environmental monitoring. The study contributes to the sustainability and project management literature by integrating stakeholder governance and digital transformation into a unified framework explaining green innovation outcomes.

Keywords: Sustainable project management, green innovation, stakeholder pressure, digital monitoring systems, sustainability, digital transformation.

Introduction

Sustainability has become a dominant strategic priority for organizations due to increasing environmental degradation, climate change concerns, stakeholder activism, and stricter regulatory frameworks. Traditional project management practices primarily emphasized cost, quality, scope, and schedule performance while largely ignoring long-term environmental and social consequences. However, organizations are now expected to integrate sustainability principles into

project governance and operational decision-making processes to achieve long-term competitiveness and legitimacy (Haleem et al., 2022).

Sustainable project management (SPM) has therefore emerged as a critical managerial approach integrating environmental, social, and economic sustainability dimensions into project planning, execution, monitoring, and closure. Sustainable project management emphasizes responsible resource utilization, stakeholder engagement, environmental accountability, and long-term value creation rather than short-term project efficiency alone. Recent literature demonstrates that sustainability integration significantly improves organizational resilience, stakeholder trust, and strategic adaptability in project-based environments (Orieno et al., 2024).

At the same time, organizations are increasingly investing in green innovation to improve environmental performance and maintain competitive advantage. Green innovation refers to the development and implementation of environmentally sustainable products, technologies, services, and operational processes that reduce ecological harm while improving organizational efficiency and stakeholder value. Green innovation has become essential because governments, investors, customers, and communities increasingly demand environmentally responsible business operations (Xie et al., 2024).

Existing research suggests that organizations implementing sustainability-oriented management practices are more likely to engage in green innovation initiatives because sustainability creates pressures and opportunities for cleaner technologies, resource efficiency, and environmentally responsible operational systems (Kulsum et al., 2025). Nevertheless, many organizations still struggle to transform sustainability intentions into measurable innovation outcomes. One major reason is that sustainability-driven innovation depends not only on internal project management practices but also on external stakeholder demands and technological monitoring capabilities.

Stakeholder pressure has become one of the strongest drivers of environmental innovation in contemporary organizations. Stakeholders including governments, investors, customers, suppliers, environmental advocacy groups, and local communities increasingly expect firms to adopt sustainable operational practices and transparent environmental reporting mechanisms. According to Stakeholder Theory, organizations must respond to stakeholder expectations to maintain legitimacy and long-term survival. Prior studies confirm that stakeholder pressure positively influences environmental performance and green innovation adoption (Haleem et al., 2022; Xie et al., 2024).

In addition to stakeholder pressure, digital transformation has significantly altered sustainability management practices within project environments. Technologies such as Artificial Intelligence (AI), Internet of Things (IoT), Building Information Modeling (BIM), blockchain, and cloud-based sustainability monitoring systems enable organizations to collect real-time environmental data, optimize resource allocation, improve transparency, and support environmentally responsible decision-making. Digital monitoring systems therefore play a critical role in strengthening sustainability governance and facilitating green innovation implementation (Qing & Jin, 2023).

Despite increasing scholarly attention toward sustainability and innovation, several important gaps remain in the literature. First, prior research often examines sustainability practices and green innovation separately rather than investigating their integrated relationships within project management environments. Second, limited studies explore the mediating mechanisms explaining how sustainable project management drives green innovation. Third, the combined roles of stakeholder pressure and digital monitoring systems remain underexplored despite their growing strategic importance in sustainability governance.

This study therefore investigates whether sustainable project management drives green innovation through the mediating roles of stakeholder pressure and digital monitoring systems.

Drawing upon Stakeholder Theory and Institutional Theory, the study proposes that sustainable project management enhances green innovation both directly and indirectly through stakeholder-driven sustainability expectations and digitally enabled environmental monitoring mechanisms.
The study contributes to the project management and sustainability literature in several ways. First, it integrates sustainability management, stakeholder theory, and digital transformation into a unified conceptual framework explaining green innovation outcomes. Second, it highlights the importance of digital monitoring systems as strategic enablers of environmental innovation. Third, the study provides practical implications for organizations seeking to improve sustainability performance, environmental accountability, and innovation capability within project-based operations.

Literature Review

Sustainable Project Management

Sustainable project management refers to the incorporation of environmental, economic, and social sustainability considerations into project planning, execution, monitoring, and evaluation processes. Unlike traditional project management approaches that focus primarily on cost efficiency and project delivery performance, sustainable project management emphasizes long-term value creation, environmental responsibility, stakeholder welfare, and sustainable resource utilization (Orieno et al., 2024).
The growing importance of sustainability in project management is closely associated with increasing environmental challenges, climate change concerns, and global sustainable development initiatives. Organizations are now expected to ensure that project outcomes contribute positively to environmental protection and social welfare while maintaining economic performance. Sustainable project management therefore requires balancing profitability with environmental and social responsibilities through sustainability-oriented governance mechanisms.
Research demonstrates that sustainable project management enhances organizational adaptability, stakeholder trust, and long-term operational resilience. Sustainable project practices such as energy-efficient resource allocation, waste minimization, sustainable procurement, carbon reduction strategies, and stakeholder engagement significantly improve organizational sustainability performance (Haleem et al., 2022).
The Triple Bottom Line framework provides an important theoretical foundation for sustainable project management because it emphasizes the simultaneous achievement of economic prosperity, environmental protection, and social equity. Sustainable project management therefore extends beyond operational efficiency and focuses on broader societal and environmental impacts.

Green Innovation

Green innovation refers to the development and implementation of environmentally sustainable products, technologies, services, and organizational processes that minimize environmental harm while improving economic performance and competitive advantage. Green innovation includes green product innovation, green process innovation, renewable energy technologies, waste reduction systems, and environmentally responsible operational practices (Xie et al., 2024).
Green innovation has become increasingly important because organizations face growing pressures to reduce environmental impacts and comply with sustainability regulations. Firms investing in green innovation often experience benefits such as improved operational efficiency, stronger stakeholder relationships, enhanced corporate reputation, regulatory compliance, and long-term competitiveness (Liu et al., 2024).

The Resource-Based View suggests that green innovation can become a strategic capability enabling organizations to achieve sustainable competitive advantage. Environmentally innovative firms are more capable of adapting to changing market conditions, regulatory demands, and stakeholder expectations.

Moreover, digital transformation significantly enhances green innovation capability. Technologies such as AI, IoT, cloud computing, and predictive analytics improve sustainability monitoring, energy efficiency, environmental reporting, and data-driven innovation processes. Organizations integrating digital technologies into sustainability management are therefore more likely to achieve superior environmental innovation outcomes (Qing & Jin, 2023).

Sustainable Project Management and Green Innovation

The relationship between sustainable project management and green innovation has received increasing scholarly attention due to growing sustainability expectations within organizational environments. Sustainable project management creates favorable conditions for green innovation by encouraging environmentally responsible operations, cleaner technologies, resource efficiency, and sustainability-oriented organizational cultures.

Organizations implementing sustainability-oriented project governance frameworks are more likely to invest in environmentally sustainable technologies and innovation systems because sustainability initiatives often require operational transformation and technological adaptation. Sustainable project management also improves organizational learning and knowledge sharing, which facilitate innovation capability development.

Previous studies confirm that sustainability-oriented management practices positively influence organizational innovation performance. Organizations emphasizing environmental accountability and sustainability governance demonstrate higher levels of green process innovation and green product innovation (Xie et al., 2024).

Furthermore, sustainable project management enhances collaboration among internal and external stakeholders, thereby improving access to environmental knowledge, sustainability expertise, and innovation-related resources. This collaborative environment supports environmentally responsible experimentation and sustainable innovation development.

Hypothesis 1: Sustainable project management positively influences green innovation.

Mediating Role of Stakeholder Pressure

Stakeholder pressure refers to demands and expectations imposed by stakeholders regarding organizational environmental and social performance. Stakeholders including governments, customers, investors, suppliers, environmental groups, and communities increasingly expect organizations to adopt sustainable operational practices and environmentally responsible innovation strategies.

Stakeholder Theory explains that organizations must respond to stakeholder expectations to maintain legitimacy, access critical resources, and sustain long-term competitiveness. Stakeholder pressure therefore acts as an important external mechanism influencing organizational sustainability behavior (Haleem et al., 2022).

Research demonstrates that stakeholder pressure significantly encourages green innovation adoption. Regulatory pressure compels firms to comply with environmental standards, customer pressure motivates organizations to produce environmentally friendly products, and investor pressure promotes sustainability transparency and ESG performance (Kulsum et al., 2025).

Sustainable project management improves stakeholder engagement and environmental accountability by integrating sustainability considerations into project governance frameworks. As organizations strengthen sustainability practices, stakeholders exert greater pressure for

environmental innovation and sustainability reporting. Consequently, stakeholder pressure serves as an important mechanism linking sustainable project management with green innovation outcomes.

Hypothesis 2: Stakeholder pressure mediates the relationship between sustainable project management and green innovation.

Mediating Role of Digital Monitoring Systems

Digital monitoring systems refer to technological platforms used to collect, analyze, and manage sustainability-related data during project execution. These systems include Artificial Intelligence (AI), Internet of Things (IoT), blockchain, cloud computing, Building Information Modeling (BIM), and environmental analytics platforms.

Digital technologies significantly improve environmental monitoring, sustainability reporting, predictive analytics, and operational transparency. Organizations using digital monitoring systems can identify sustainability risks, optimize resource utilization, reduce environmental waste, and improve decision-making efficiency (Qing & Jin, 2023).

Digital monitoring systems also strengthen accountability and stakeholder communication because organizations can provide transparent sustainability performance information in real time. Real-time environmental monitoring improves compliance with sustainability standards and facilitates evidence-based environmental management practices.

Sustainable project management encourages organizations to invest in digital technologies supporting sustainability governance and environmental performance optimization. As organizations implement digital monitoring systems, they become more capable of adopting environmentally sustainable innovation strategies and achieving green innovation objectives.

Hypothesis 3: Digital monitoring systems mediate the relationship between sustainable project management and green innovation.

Research Methodology

Research Philosophy and Approach

This study adopts a positivist research philosophy because the investigation focuses on examining causal relationships among measurable constructs, including sustainable project management, stakeholder pressure, digital monitoring systems, and green innovation. A quantitative research approach was selected because it allows statistical testing of hypotheses and enhances the generalizability of findings across project-based organizations.

The study utilized a cross-sectional survey design to collect empirical data from project managers, sustainability officers, construction engineers, digital transformation specialists, and senior executives working in project-intensive industries. The quantitative approach is particularly suitable for sustainability and innovation research because it enables systematic analysis of multidimensional organizational phenomena through statistical modeling techniques (Hair et al., 2022).

Population and Sampling

The target population consisted of project-based organizations operating in construction, manufacturing, infrastructure, renewable energy, and technology sectors. These industries were selected because sustainability practices and green innovation initiatives are highly relevant within environmentally sensitive operational environments.

A purposive sampling technique was employed to select respondents possessing direct knowledge regarding sustainability management and project governance practices. The study distributed 500 structured questionnaires, of which 387 valid responses were received, resulting in a response rate

of 77.4%. The sample size exceeded the minimum threshold recommended for Structural Equation Modeling (SEM) analysis (Hair et al., 2022).

The demographic profile indicated that 61% of respondents were male and 39% were female. Approximately 47% of respondents possessed more than five years of project management experience, while 36% held senior managerial positions. The majority of respondents belonged to construction and infrastructure industries due to their extensive involvement in sustainability-focused projects.

Measurement Instruments

All constructs were measured using previously validated scales adapted from prior studies to ensure content validity and reliability.

Sustainable Project Management (SPM)

Sustainable project management was measured using seven items adapted from Martens and Carvalho (2017), focusing on environmental integration, sustainable resource allocation, stakeholder engagement, and sustainability-oriented project governance.

Stakeholder Pressure (SP)

Stakeholder pressure was measured using five items adapted from Xie et al. (2024), capturing regulatory expectations, customer sustainability demands, investor pressure, and community environmental concerns.

Digital Monitoring Systems (DMS)

Digital monitoring systems were assessed using six items derived from Qing and Jin (2023), focusing on the implementation of AI-driven monitoring tools, IoT systems, cloud-based sustainability analytics, and real-time environmental tracking technologies.

Green Innovation (GI)

Green innovation was measured using six items adapted from Chen et al. (2006), including green product innovation, eco-friendly process innovation, renewable energy integration, and environmentally sustainable operational practices.

All items were measured using a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

Data Analysis Technique

The study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4.0 software. PLS-SEM was selected because it is appropriate for predictive research models involving multiple mediating relationships and latent constructs (Hair et al., 2022).

The analysis followed a two-stage approach:

1. Measurement model assessment
2. Structural model assessment

The measurement model evaluated reliability, convergent validity, and discriminant validity using Cronbach's alpha, composite reliability (CR), average variance extracted (AVE), and heterotrait-monotrait ratio (HTMT). The structural model assessed path coefficients, coefficient of determination (R^2), predictive relevance (Q^2), and mediation effects through bootstrapping procedures with 5,000 resamples.

Results

Respondents' Demographic Profile

The demographic characteristics of respondents were analyzed to evaluate the suitability and representativeness of the sample. The findings revealed that the majority of respondents possessed

significant professional experience in project management and sustainability-related operations, thereby strengthening the credibility of the collected data.

Among the 387 valid responses, 61.2% of respondents were male, while 38.8% were female. Regarding age distribution, most respondents belonged to the 31–40 years age category (42.4%), followed by 41–50 years (31.5%). In terms of educational qualification, 57.6% possessed a master's degree, while 18.9% held doctoral qualifications. Furthermore, 47.3% of respondents had more than five years of professional experience in project-based industries.

Table 1: Demographic Characteristics of Respondents

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	237	61.2
	Female	150	38.8
Age	21–30 Years	68	17.6
	31–40 Years	164	42.4
	41–50 Years	122	31.5
	Above 50 Years	33	8.5
Education	Bachelor's Degree	91	23.5
	Master's Degree	223	57.6
	PhD Degree	73	18.9
Experience	Less than 5 Years	104	26.9
	5–10 Years	183	47.3
	Above 10 Years	100	25.8
Industry	Construction	136	35.1
	Manufacturing	92	23.8
	Infrastructure	74	19.1
	Renewable Energy	48	12.4
	Technology Sector	37	9.6

The demographic findings indicate that the respondents were sufficiently experienced and professionally qualified to evaluate sustainability-oriented project management practices and green innovation initiatives.

Measurement Model Assessment

The measurement model was evaluated to examine internal consistency reliability, convergent validity, and discriminant validity. Cronbach's alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE) were used to assess construct reliability and validity.

The results demonstrated that all constructs exceeded the recommended threshold values. Cronbach's alpha values ranged from 0.841 to 0.921, indicating strong internal consistency. Composite reliability values ranged between 0.876 and 0.934, confirming satisfactory construct reliability. Similarly, AVE values exceeded the minimum threshold of 0.50, demonstrating adequate convergent validity.

Table 2: Reliability and Convergent Validity Analysis

Construct	Items	Cronbach's Alpha	Composite Reliability	AVE
Sustainable Project Management (SPM)	7	0.921	0.934	0.701
Stakeholder Pressure (SP)	5	0.873	0.902	0.649
Digital Monitoring Systems (DMS)	6	0.891	0.917	0.688
Green Innovation (GI)	6	0.841	0.876	0.612

All factor loadings exceeded the recommended threshold of 0.70, confirming satisfactory indicator reliability.

Table 3: Factor Loadings

Construct	Item Code	Factor Loading
Sustainable Project Management	SPM1	0.823
	SPM2	0.851
	SPM3	0.847
	SPM4	0.861
	SPM5	0.834
	SPM6	0.809
	SPM7	0.842
Stakeholder Pressure	SP1	0.791
	SP2	0.826
	SP3	0.844
	SP4	0.803
	SP5	0.815
Digital Monitoring Systems	DMS1	0.842
	DMS2	0.861
	DMS3	0.814
	DMS4	0.836
	DMS5	0.848
	DMS6	0.819
Green Innovation	GI1	0.781
	GI2	0.803
	GI3	0.814
	GI4	0.799
	GI5	0.772
	GI6	0.788

The findings confirm that the measurement scales demonstrated strong psychometric properties suitable for structural model evaluation.

Discriminant Validity

Discriminant validity was assessed using the Heterotrait-Monotrait Ratio (HTMT). All HTMT values remained below the recommended threshold value of 0.85, indicating adequate discriminant validity among the constructs.

Table 4: HTMT Analysis

Constructs	SPM	SP	DMS	GI
Sustainable Project Management (SPM)	—	—	—	—
Stakeholder Pressure (SP)	0.712	—	—	—
Digital Monitoring Systems (DMS)	0.684	0.641	—	—
Green Innovation (GI)	0.792	0.756	0.773	—

The HTMT results confirm that each construct was empirically distinct from the others.

Structural Model Assessment

The structural model was evaluated using path coefficients, t-values, p-values, coefficient of determination (R^2), and predictive relevance (Q^2). Bootstrapping with 5,000 resamples was conducted to examine hypothesis significance.

The results indicated that sustainable project management significantly influenced green innovation ($\beta = 0.421$, $t = 8.764$, $p < 0.001$). This finding supports the argument that sustainability-oriented project governance frameworks encourage environmentally responsible innovation initiatives.

Similarly, sustainable project management significantly influenced stakeholder pressure ($\beta = 0.513$, $t = 10.217$, $p < 0.001$) and digital monitoring systems ($\beta = 0.468$, $t = 9.432$, $p < 0.001$).

Stakeholder pressure positively affected green innovation ($\beta = 0.287$, $t = 5.986$, $p < 0.001$), while digital monitoring systems also demonstrated a significant positive relationship with green innovation ($\beta = 0.331$, $t = 6.542$, $p < 0.001$).

Table 5: Direct Hypotheses Testing

Hypothesis	Relationship	Beta (β)	t-value	p-value	Decision
H1	SPM → GI	0.421	8.764	0.000	Supported
H2a	SPM → SP	0.513	10.217	0.000	Supported
H2b	SP → GI	0.287	5.986	0.000	Supported
H3a	SPM → DMS	0.468	9.432	0.000	Supported
H3b	DMS → GI	0.331	6.542	0.000	Supported

The findings suggest that organizations emphasizing sustainability integration within project management practices are significantly more capable of developing environmentally sustainable innovations.

Coefficient of Determination (R^2)

The coefficient of determination (R^2) was used to evaluate the explanatory power of the structural model.

Table 6: Coefficient of Determination (R^2)

Endogenous Variable	R^2 Value	Interpretation
Stakeholder Pressure	0.263	Moderate
Digital Monitoring Systems	0.219	Moderate
Green Innovation	0.628	Substantial

The R^2 value for green innovation indicates that 62.8% of the variance in green innovation was explained by sustainable project management, stakeholder pressure, and digital monitoring systems. This demonstrates substantial predictive capability of the proposed research model.

Predictive Relevance (Q^2)

The blindfolding procedure was employed to assess predictive relevance (Q^2). According to Hair et al. (2022), Q^2 values greater than zero indicate predictive relevance.

Table 7: Predictive Relevance (Q^2)

Construct	Q^2 Value
Stakeholder Pressure	0.184
Digital Monitoring Systems	0.171
Green Innovation	0.391

The results confirm that the structural model demonstrated strong predictive relevance for all endogenous constructs.

Mediation Analysis

The mediation effects of stakeholder pressure and digital monitoring systems were evaluated using bootstrapping procedures.

The findings revealed that stakeholder pressure partially mediated the relationship between sustainable project management and green innovation ($\beta = 0.147$, $t = 4.921$, $p < 0.001$). Similarly, digital monitoring systems partially mediated the relationship between sustainable project management and green innovation ($\beta = 0.155$, $t = 5.114$, $p < 0.001$).

Table 8: Mediation Analysis

Hypothesis	Indirect Relationship	Beta (β)	t-value	p-value	Decision
H2	SPM → SP → GI	0.147	4.921	0.000	Supported
H3	SPM → DMS → GI	0.155	5.114	0.000	Supported

The mediation findings indicate that stakeholder pressure and digital monitoring systems significantly strengthen the relationship between sustainable project management and green innovation.

Effect Size (f^2)

Effect size analysis was conducted to examine the relative contribution of exogenous constructs.

Table 9: Effect Size (f^2)

Relationship	f^2 Value	Effect Size
SPM → GI	0.284	Medium
SPM → SP	0.356	Large

Relationship	f^2 Value	Effect Size
SPM → DMS	0.318	Large
SP → GI	0.173	Medium
DMS → GI	0.201	Medium

The results demonstrate that sustainable project management exerted a substantial influence on stakeholder pressure and digital monitoring systems, while moderate effects were observed on green innovation.

Summary of Findings

Overall, the empirical findings strongly support the proposed conceptual framework. Sustainable project management significantly enhanced green innovation both directly and indirectly through stakeholder pressure and digital monitoring systems.

The results demonstrate that organizations integrating sustainability principles into project governance are more likely to develop environmentally responsible innovations due to increased stakeholder expectations and technologically enabled sustainability monitoring capabilities.

The findings further highlight that digital transformation and sustainability management are increasingly interconnected strategic priorities rather than independent organizational initiatives.

Discussion

The findings of this study provide strong empirical evidence supporting the positive relationship between sustainable project management and green innovation. Organizations implementing sustainability-oriented project governance frameworks demonstrated greater capability to adopt environmentally sustainable products, technologies, and operational processes. These findings are consistent with prior studies emphasizing that sustainability integration creates favorable conditions for innovation development through resource efficiency, environmental accountability, and strategic adaptability (Martens & Carvalho, 2017).

The results further indicate that stakeholder pressure significantly mediates the relationship between sustainable project management and green innovation. This finding supports Stakeholder Theory, which argues that organizations respond strategically to external stakeholder expectations to maintain legitimacy and competitiveness. Governments, customers, investors, and environmental advocacy groups increasingly demand environmentally responsible business practices, thereby encouraging firms to pursue sustainability-oriented innovation initiatives.

One important implication is that stakeholder pressure should not be viewed solely as an external compliance burden. Instead, stakeholder expectations can function as strategic drivers motivating organizations to improve environmental performance and innovation capability. Firms ignoring stakeholder sustainability demands risk reputational damage, reduced investor confidence, and declining market competitiveness.

The findings also demonstrate that digital monitoring systems play a significant mediating role between sustainable project management and green innovation. Organizations utilizing AI-driven sustainability analytics, IoT-enabled monitoring systems, cloud-based reporting platforms, and BIM technologies were more capable of implementing environmentally sustainable innovation strategies.

This result confirms that digital transformation is no longer optional within sustainability-oriented project environments. Many organizations continue treating sustainability and digitalization as separate strategic domains, which is a major managerial mistake. The findings clearly indicate

that environmental sustainability increasingly depends on digital intelligence, predictive monitoring, and data-driven operational governance.

Digital monitoring systems improve transparency, accountability, resource optimization, and sustainability reporting accuracy. Organizations capable of collecting real-time environmental data are better positioned to identify operational inefficiencies, reduce environmental waste, and develop innovative sustainability solutions.

Another important contribution of this study is the integration of sustainability management, stakeholder governance, and digital transformation into a unified framework explaining green innovation outcomes. Prior literature often examined these variables independently, limiting theoretical understanding of how sustainability-oriented project governance translates into measurable environmental innovation capability.

The study therefore contributes to both project management and sustainability literature by demonstrating that green innovation is not simply a technological outcome but rather a multidimensional organizational capability shaped by sustainability governance, stakeholder expectations, and digital transformation processes.

Theoretical Implications

This study contributes to the literature in several important ways. First, it extends Stakeholder Theory by demonstrating how stakeholder pressure functions as a mediating mechanism linking sustainable project management with green innovation outcomes. The findings confirm that stakeholder expectations significantly influence organizational environmental innovation behavior.

Second, the study contributes to Institutional Theory by illustrating how sustainability regulations, social expectations, and technological monitoring systems shape organizational sustainability practices and innovation strategies.

Third, the integration of digital monitoring systems into the sustainability-innovation framework expands existing literature on digital transformation and sustainable project governance. The findings highlight that digital technologies are not merely operational tools but strategic enablers of sustainability-oriented innovation capability.

Practical Implications

The study provides several practical implications for managers, policymakers, and project practitioners.

Organizations should integrate sustainability principles into every stage of project management rather than treating sustainability as a peripheral compliance activity. Sustainability-oriented governance frameworks improve environmental performance while simultaneously strengthening innovation capability.

Project managers should also prioritize stakeholder engagement because stakeholder expectations significantly influence sustainability performance and green innovation adoption. Transparent sustainability communication and collaborative stakeholder relationships enhance organizational legitimacy and innovation opportunities.

Furthermore, organizations must invest in digital monitoring systems such as AI-based analytics, IoT platforms, BIM technologies, and cloud-based sustainability dashboards. These technologies improve environmental monitoring, predictive decision-making, and operational efficiency while supporting environmentally sustainable innovation initiatives.

Policymakers should encourage digital sustainability transformation through supportive regulations, financial incentives, and environmental innovation policies promoting sustainable project governance practices.

Conclusion

This study examined whether sustainable project management drives green innovation through the mediating roles of stakeholder pressure and digital monitoring systems. The findings confirmed that sustainable project management positively influences green innovation both directly and indirectly through stakeholder-driven sustainability expectations and technologically enabled environmental monitoring mechanisms.

The study highlights that sustainability-oriented project governance significantly enhances environmental innovation capability by encouraging resource efficiency, environmental accountability, stakeholder engagement, and digital transformation. Stakeholder pressure emerged as a major external driver motivating organizations to adopt environmentally sustainable operational practices and innovation strategies.

Similarly, digital monitoring systems significantly strengthened sustainability performance and green innovation outcomes by improving environmental transparency, predictive analytics, and resource optimization. Organizations implementing advanced digital sustainability monitoring systems demonstrated greater capability to achieve environmentally responsible innovation objectives.

The findings emphasize that sustainability, stakeholder governance, and digital transformation should not be managed independently. Organizations seeking long-term competitiveness and environmental legitimacy must integrate these dimensions into a unified strategic framework supporting sustainable innovation and responsible project governance.

Limitations and Future Research Directions

Despite its contributions, this study has several limitations. First, the cross-sectional research design limits causal inference because data were collected at a single point in time. Future studies should adopt longitudinal research designs to examine sustainability and innovation relationships over time.

Second, the study focused primarily on project-based organizations within construction, manufacturing, and infrastructure industries. Future research should investigate sustainability-driven innovation in other sectors such as healthcare, information technology, education, and public administration.

Third, the study examined stakeholder pressure and digital monitoring systems as mediating mechanisms. Future studies may explore additional mediators such as organizational culture, leadership capability, environmental knowledge sharing, and sustainability-oriented organizational learning.

Fourth, future researchers should examine potential moderating variables including environmental uncertainty, organizational size, technological readiness, and regulatory intensity.

Finally, comparative cross-country studies would provide deeper understanding regarding how institutional environments and sustainability regulations influence sustainable project management and green innovation relationships across different economic and cultural contexts.

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