

TECHNICAL, MANAGERIAL, AND FINANCIAL DETERMINANTS OF IT PROJECT SUCCESS: THE MODERATING ROLE OF PROJECT COMPLEXITY AND THE MEDIATING EFFECT OF GREEN ENERGY PRACTICES

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Abstract

The growing complexity of information technology (IT) projects has heightened the need to understand the competencies and practices that drive project success, particularly in sustainability-oriented contexts. This research examines the impact of technical tasks, project management competencies, and financial tasks on IT project success, with project complexity as a moderator and green energy practices as a mediator. The study is positioned within the United Kingdom and European Union, regions characterized by strong regulatory and policy frameworks supporting sustainable project management.

Adopting a mixed-method design, the research combines quantitative surveys from 412 IT project managers with qualitative interviews from industry experts. Structural Equation Modeling (SEM) was used to validate the framework and test hypotheses. The model demonstrated strong explanatory power, accounting for 68% of the variance in project success. Results indicate that technical tasks ($\beta = 0.41, p < 0.001$), project management competencies ($\beta = 0.37, p < 0.001$), and financial tasks ($\beta = 0.29, p < 0.01$) all have significant positive effects on project success. Project complexity exhibited a negative direct effect ($\beta = -0.22, p < 0.05$) but also moderated the relationships, amplifying the importance of competencies under high-complexity conditions.

Crucially, green energy practices emerged as a strong mediator. The indirect effect of competencies on project success through green energy was significant ($\beta = 0.24, p < 0.001$), underscoring the strategic role of sustainability initiatives. The mediation model also revealed that technical and financial tasks contribute to project outcomes more effectively when integrated with green energy considerations, highlighting the synergy between operational efficiency and environmental responsibility.

Comparative analysis across EU member states revealed variations in adoption. Projects in Northern Europe reported higher incorporation of green practices and correspondingly stronger effects on success, whereas projects in Southern Europe displayed greater variability due to regulatory and cultural differences. These findings suggest that while the integrated model is broadly applicable, contextual adaptations are necessary.

The study contributes theoretically by advancing an integrated framework linking competencies, complexity, and sustainability, and practically by offering guidelines for managers and policymakers. Emphasizing both performance and environmental stewardship, the research demonstrates that sustainable practices are not only ethically desirable but also strategically advantageous in improving IT project success in complex environments

INTRODUCTION

In the contemporary digital era, Information Technology (IT) projects have become the backbone of organizational growth, competitiveness, and transformation. With the advent of Industry 4.0, the rise of smart cities, the integration of digital technologies in healthcare, the expansion of e-learning platforms in education, and the digitization of financial systems, IT projects are no longer confined to the technology sector but have penetrated virtually every industry and social system. Organizations rely on IT projects not only to streamline internal operations but also to enhance customer experiences, improve service delivery, and ensure compliance with global standards. In fact, the success of IT projects is often directly linked with an organization's ability to adapt to rapid technological shifts, global market demands, and sustainability imperatives. As governments and industries continue to invest billions into digital transformation, the stakes for delivering successful IT projects are higher than ever before.

Despite these growing investments and the critical role of IT projects in shaping modern economies, global statistics reveal an alarming picture of their performance. According to the Project Management Institute (PMI, 2021) and the Standish Group CHAOS Report, a significant proportion of IT projects fail to meet their intended objectives. Failure is often measured in terms of budget overruns, missed deadlines, or failure to deliver expected business value. For instance, the Standish Group (2021) reported that only about one-third of IT projects can be

classified as successful, while the remainder are either challenged (delayed, over budget, or under-delivered) or fail outright. These figures have remained stubbornly high despite advancements in methodologies, tools, and project governance frameworks. Such statistics raise urgent questions about what factors truly drive project success in IT contexts, and why conventional approaches often prove insufficient in navigating modern project environments.

One of the persistent assumptions in project management is that technical excellence, project management competencies, and financial oversight serve as the core drivers of project success. Technical excellence ensures that projects meet functional requirements, system reliability, and performance expectations. Competent project managers bring the ability to coordinate teams, manage stakeholders, and align activities with strategic goals. Financial oversight provides the assurance that resources are allocated efficiently and projects remain within approved budgets. While these factors are undeniably crucial, evidence increasingly suggests that they alone are insufficient to guarantee success in complex and uncertain project environments. Modern IT projects demand a broader perspective that integrates technical, managerial, financial, and environmental considerations.

A major reason why traditional success factors fall short is the growing complexity of IT projects. Today's projects are no longer simple implementations of pre-defined systems; they often involve multiple stakeholders across

geographical boundaries, integration of diverse technologies, and compliance with evolving regulatory frameworks. Project complexity manifests in several forms: technical complexity due to sophisticated architectures, structural complexity from large-scale cross-functional teams, and socio-political complexity arising from diverse stakeholder interests. Furthermore, global interconnectivity means that IT projects must often navigate cross-border legal frameworks, data protection regulations, and international standards, which add layers of uncertainty and risk. Complexity not only increases the likelihood of project delays and cost overruns but also amplifies the need for highly adaptable management practices. Understanding how complexity moderates the effectiveness of competencies and resources has therefore become a critical area of inquiry in project management research.

In parallel with complexity, another dimension shaping IT project success is the growing emphasis on sustainability and green energy practices. Traditionally, project management has focused on efficiency and effectiveness, often neglecting the environmental implications of project activities. However, the increasing urgency of climate change, combined with global policy frameworks such as the European Green Deal, has shifted the conversation toward sustainable project management. IT projects, whether in data centers, cloud infrastructures, or large-scale system rollouts, consume significant energy and generate environmental footprints. By integrating green energy practices—such as optimizing energy efficiency, adopting renewable power sources, and reducing carbon emissions—projects not only align with regulatory expectations but also enhance long-term stakeholder trust and organizational reputation. This sustainability dimension introduces an entirely new layer of value creation that extends beyond traditional performance metrics.

Despite the recognition of these dynamics, a critical research gap persists. Existing studies often examine technical, managerial, and financial factors separately, while others focus on the challenges posed by project complexity. Likewise,

sustainability and green project management are frequently discussed in isolation, usually from an environmental science perspective rather than as an integrated part of IT project success models. Very few studies attempt to combine these dimensions into a unified framework that explains not only direct effects but also moderating and mediating relationships. Specifically, the ways in which project complexity moderates success factors, and how green energy practices mediate their influence, remain underexplored in both theory and practice. Addressing this gap is essential to advance scholarly understanding and provide actionable insights for practitioners.

This research sets out to bridge this gap by proposing and testing an integrated model of IT project success. The study has four primary objectives. First, it aims to assess the direct effects of technical tasks, managerial competencies, and financial oversight on IT project success. By doing so, the research reaffirms the foundational importance of these factors while subjecting them to empirical testing in modern contexts. Second, the study seeks to examine the moderating role of project complexity in shaping the effectiveness of competencies and resources. The expectation is that while complexity poses risks, competent project management can offset its negative impacts. Third, the research investigates the mediating role of green energy practices in linking project factors to success. This highlights the strategic importance of sustainability as not just an ethical responsibility but also a driver of project performance. Fourth, the study undertakes a comparative analysis of the UK and EU to capture contextual differences, particularly given the EU's strong policy orientation toward green energy and the UK's evolving post-Brexit regulatory environment.

By addressing these objectives, the research makes several key contributions. Theoretically, it advances an integrated model that unites traditional success factors with moderating and mediating variables, thereby extending existing frameworks in project management literature. It demonstrates how sustainability considerations can be embedded into performance models rather than treated as peripheral concerns. Practically,

the study offers sustainability-oriented guidelines for project managers, organizations, and policymakers. For project managers, the findings emphasize the importance of building competencies not only in technical and managerial domains but also in sustainable practices. For organizations, the research highlights how aligning project delivery with green energy practices enhances both performance outcomes and corporate reputation. For policymakers, the study provides evidence on the value of embedding sustainability criteria in project governance standards.

In sum, IT projects today operate at the intersection of technological innovation, managerial complexity, financial scrutiny, and environmental responsibility. Recognizing the interplay of these dimensions is essential to improving success rates and ensuring long-term impact. By integrating technical, managerial, financial, complexity, and sustainability perspectives, this study contributes to both academic discourse and practical project management, offering a roadmap for more resilient, effective, and sustainable IT project delivery in the digital age.

2. Literature Review (Updated 2025 Version)

2.1 IT Project Success – Beyond the Iron Triangle

Traditional measures of project success—time, cost, and scope—collectively known as the “iron triangle,” remain foundational but increasingly inadequate in modern IT contexts (Kerzner, 2022; PMI, 2021). Although these criteria provide tangible metrics, many projects that meet them still fail to achieve strategic alignment or stakeholder satisfaction (Loureiro, 2024). Recent studies emphasize broader success dimensions, including benefits realization, innovation outcomes, and organizational adaptability (Müller, Drouin, & Sankaran, 2021; Serrador & Turner, 2023). This expanded perspective underscores that IT project success involves not only operational efficiency but also strategic and environmental performance (Andriole, 2021; Chang et al., 2025).

2.2 Technical Tasks

Technical tasks underpin system reliability, functionality, and long-term maintainability (Laine & Vaagaasar, 2022). High-quality requirements engineering, disciplined integration, and automated testing enhance software performance and reduce risks (Kerzner, 2022; Cerpa & Verner, 2020). Increasingly, these tasks are interlinked with sustainability; energy-efficient coding, virtualization, and optimized data architectures now form part of technical excellence (Zhang & Müller, 2025; Zhang & Zhao, 2022). Studies in European data centers show that environmentally conscious design can improve both system performance and lifecycle cost efficiency (Zhu, Geng, & Sarkis, 2020). Technical robustness thus extends beyond reliability—it includes energy efficiency and reduced carbon footprint (Gareis & Huemann, 2022).

2.3 Project Management Competencies

Project management competencies—spanning leadership, communication, and business acumen—remain central to IT project success (PMI, 2023; Müller & Turner, 2021). Adaptive and transformational leadership styles help navigate uncertainty and align teams in complex digital environments (Müller et al., 2021; Williams & Samset, 2024). Effective communication and stakeholder engagement not only improve collaboration but also reinforce sustainability adoption by fostering shared values (Gareis, Huemann, & Martinuzzi, 2021). Moreover, business acumen enables project managers to link environmental objectives with strategic performance metrics, bridging organizational sustainability goals and operational realities (Venkatesh et al., 2020). These competencies become especially critical as projects face multidimensional challenges spanning technology, finance, and environmental impact.

2.4 Financial Tasks

Sound financial governance ensures feasibility, accountability, and long-term sustainability of IT projects (PMI, 2021). Budgeting accuracy, ROI justification, and lifecycle cost analysis directly influence project outcomes (Kerzner, 2022; Williams & Samset, 2024). Newer approaches emphasize risk-adjusted financial models that

integrate environmental costs into project valuation (Zhang & Müller, 2025). For instance, energy-efficient data centers or green procurement strategies may entail higher upfront expenses but deliver superior long-term ROI (Nekhili et al., 2021). Studies across Europe show that projects with lifecycle-based financial planning achieve higher sustainability alignment and stakeholder legitimacy (Gareis & Huemann, 2022; Zhu et al., 2020).

2.5 Project Complexity

Modern IT projects operate under high complexity arising from technical interdependencies, stakeholder diversity, and regulatory demands (Geraldi & Söderlund, 2020). Complexity encompasses structural, dynamic, and socio-political dimensions that influence project execution (Laine & Vaagaasar, 2022). Research demonstrates that complexity correlates with project delays and cost overruns but can also serve as a contextual moderator—enhancing the value of managerial competencies under uncertainty (Serrador & Turner, 2023; Chang et al., 2025). Adaptive leadership and agile methods mitigate these effects, turning complexity into an opportunity for innovation (Müller & Turner, 2021; Hair et al., 2019). Complexity thus amplifies the importance of flexibility, cross-disciplinary collaboration, and sustainability-driven decision-making (Donaldson, 2001).

2.6 Green Energy and Sustainability in Project Management

Sustainability has evolved from a compliance issue into a strategic imperative in IT project delivery (European Commission, 2020; Gareis et al., 2021). Green project management (GPM) integrates environmental performance indicators into planning, execution, and evaluation (Gareis & Huemann, 2022). Adopting renewable energy, virtualized infrastructure, and carbon-neutral procurement contributes not only to environmental protection but also to cost reduction and stakeholder trust (Zhang & Müller, 2025; Mubarak, 2024). Empirical studies show that IT projects implementing energy optimization and sustainability frameworks experience

improved stakeholder satisfaction and long-term legitimacy (Laato et al., 2021; Lüdeke-Freund, Gold, & Bocken, 2020). Within the EU, the Green Deal provides policy reinforcement, making sustainability integral to digital transformation strategies (European Commission, 2020).

Green energy practices also mediate the relationship between technical, managerial, and financial factors and project outcomes by linking operational efficiency with environmental responsibility (Nekhili et al., 2021; Gareis & Huemann, 2022). This integration supports the emerging consensus that sustainability-driven innovation strengthens both ethical and economic dimensions of project success.

2.7 Gaps and Research Questions

Despite significant scholarly attention to project success factors, critical gaps remain. First, most studies investigate technical tasks, managerial competencies, financial governance, project complexity, or sustainability in isolation. Few offer an integrated model that simultaneously examines these factors and their interrelationships. Second, the literature has yet to fully explore the moderating role of complexity and the mediating role of green energy practices in IT project success models. While complexity and sustainability have been studied independently, their combined influence remains under-theorized.

Furthermore, while sustainability is increasingly recognized as a strategic imperative, empirical evidence on how green energy practices translate into measurable improvements in IT project outcomes is limited, especially in comparative contexts. Given the EU's strong regulatory push for sustainability and the UK's evolving post-Brexit policies, a comparative analysis can yield insights into contextual variations in adoption and impact. This research responds to these gaps by developing and empirically testing an integrated framework in which technical, managerial, and financial factors serve as primary predictors of IT project success; project complexity acts as a moderator; and green energy practices function as a mediator. The study further contributes by providing comparative evidence across UK and EU contexts, offering

both theoretical integration and practical sustainability guidelines for IT project management.

3. Theoretical Framework and Hypotheses

Developing a robust theoretical framework is critical for understanding the multifaceted determinants of IT project success. This study integrates three well-established perspectives—Contingency Theory, the Resource-Based View (RBV), and Stakeholder Theory—to explain how technical tasks, managerial competencies, and financial oversight influence project outcomes, how these relationships are conditioned by project complexity, and how green energy practices mediate their effects. Together, these theories provide a comprehensive lens to capture the interplay between resources, context, and sustainability in IT projects.

3.1 Contingency Theory and Project Complexity

Contingency Theory posits that there is no single best way to manage an organization or project; rather, the effectiveness of strategies depends on contextual variables such as environment, technology, and uncertainty (Donaldson, 2001). In project management, this theory has been used to explain why certain methodologies or practices perform better under particular conditions. For example, agile practices may be more effective under dynamic conditions, whereas traditional approaches may suffice in stable environments.

In the context of IT projects, complexity serves as a central contingency variable. As Geraldini and Söderlund (2020) argue, complexity stems from structural, technical, dynamic, and socio-political dimensions, and it directly shapes how resources and competencies translate into outcomes. Projects with high complexity often require more adaptive managerial competencies, robust technical practices, and flexible financial governance. Conversely, in low-complexity settings, even moderate levels of competencies and resources may suffice.

Thus, this study applies Contingency Theory to hypothesize that project complexity moderates the impact of technical, managerial, and financial factors on project success. The value of these

inputs is not uniform but contingent on the degree of complexity encountered.

3.2 Resource-Based View and Competencies as Strategic Assets

The Resource-Based View (RBV) positions organizational resources—both tangible and intangible—as the foundation of sustainable competitive advantage (Barney, 1991). Resources that are valuable, rare, inimitable, and non-substitutable (VRIN) enable firms to achieve outcomes that competitors cannot easily replicate. In project management research, RBV has been increasingly used to conceptualize project-specific capabilities, such as technical expertise, leadership skills, and financial governance, as strategic resources.

Applied to IT projects, RBV suggests that technical tasks, managerial competencies, and financial oversight constitute critical internal resources. Technical tasks ensure system quality and reliability; managerial competencies provide leadership, coordination, and alignment with strategy; and financial oversight secures efficient use of resources. When effectively mobilized, these resources yield superior project outcomes. However, the effectiveness of resources may diminish in highly complex environments unless combined with adaptive strategies, again underscoring the contingency dimension.

By adopting RBV, this study conceptualizes competencies not merely as operational inputs but as strategic assets that can sustain project success. This framing also implies that organizations that systematically invest in developing competencies are more likely to achieve higher levels of IT project success, even across diverse contexts.

3.3 Stakeholder Theory and the Role of Sustainability

Stakeholder Theory emphasizes that organizations derive legitimacy and long-term viability by addressing the needs and expectations of their stakeholders (Freeman, 1984). Beyond shareholders, this includes employees, customers, regulators, communities, and, increasingly, society

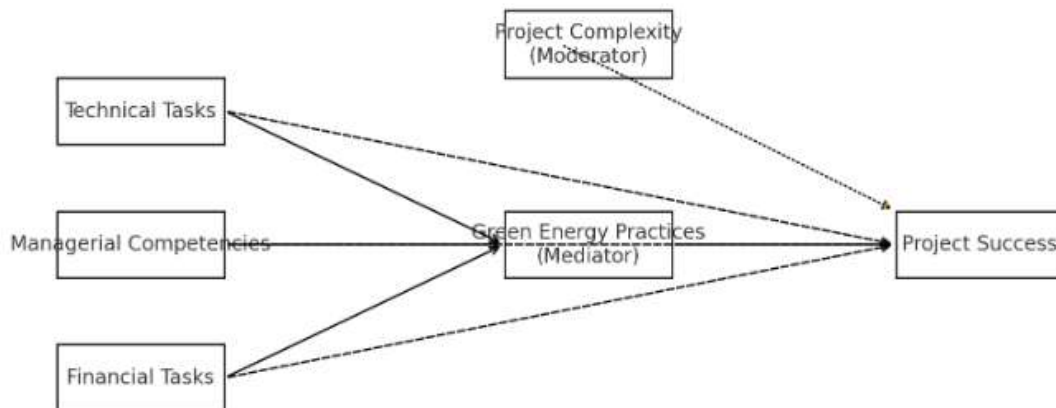
at large. Project management literature has applied Stakeholder Theory to explain the importance of stakeholder engagement, communication, and legitimacy for project outcomes (Mok et al., 2015). In recent years, sustainability has emerged as a key stakeholder expectation, reinforced by global initiatives such as the European Green Deal (European Commission, 2020). For IT projects, integrating green energy practices—such as energy-efficient infrastructures, renewable energy sourcing, and lifecycle cost optimization—not only reduces environmental impact but also enhances stakeholder trust and regulatory compliance. From a theoretical standpoint, green energy practices thus operate as a mediating mechanism: they translate the benefits of technical, managerial, and financial resources into improved legitimacy, stakeholder satisfaction, and ultimately project success.

Stakeholder Theory therefore underpins the proposition that sustainability is not peripheral

but central to project performance. By adopting green practices, organizations meet stakeholder demands and secure legitimacy, which strengthens both perceived and actual success outcomes.

3.4 Conceptual Model

Drawing on these theoretical perspectives, this study proposes an integrated conceptual model (see Figure 1). The model posits that technical tasks, managerial competencies, and financial tasks have direct positive effects on IT project success. Project complexity moderates these relationships, such that the benefits of competencies and resources are magnified in high-complexity contexts. Meanwhile, green energy practices mediate the effects of the three inputs on success, reinforcing the idea that sustainability enhances both stakeholder legitimacy and performance outcomes.



3.5 Hypotheses Development

Based on the theoretical foundations and conceptual model, the following hypotheses are proposed:

- H1: Technical tasks have a positive effect on IT project success. Grounded in RBV, technical capabilities are strategic resources that ensure reliability, functionality, and efficiency.

- H2: Project management competencies have a positive effect on IT project success. Leadership, coordination, and business acumen enable alignment of resources with strategic objectives, consistent with RBV.

- H3: Financial tasks have a positive effect on IT project success.

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- Effective budgeting, risk-adjusted planning, and ROI justification strengthen outcomes by ensuring resource adequacy and accountability.
- H4: Project complexity has a negative direct effect on IT project success. According to Contingency Theory, high complexity increases uncertainty, interdependencies, and risks, which can undermine performance.
- H5: Project complexity moderates the relationship between project management competencies and IT project success, such that the positive effect of competencies is stronger under high complexity. This aligns with Contingency Theory: in complex contexts, adaptive leadership and managerial skills are more critical for success.
- H6: Green energy practices mediate the relationship between technical, managerial, and financial tasks and IT project success. Stakeholder Theory suggests that sustainability enhances legitimacy and stakeholder satisfaction, strengthening the pathway from resources to outcomes.

4. Methodology

4.1 Research Design

This study employed a mixed-methods research design, integrating both quantitative and qualitative approaches. The rationale for adopting a mixed-methods framework lies in the multidimensional nature of IT project success. Quantitative methods are well-suited for hypothesis testing, measurement validation, and generalization across larger populations, while qualitative methods provide contextual richness and deeper insights into the lived experiences of project managers.

Specifically, a quantitative survey was used to test the hypothesized relationships between technical tasks, managerial competencies, financial oversight, green energy practices, project complexity, and project success. This approach allowed for the application of statistical modeling techniques such as Structural Equation Modeling (SEM) to assess both direct and indirect effects. Complementing this, qualitative interviews were

conducted with a subset of industry experts to capture nuanced perspectives on sustainability adoption and complexity management in IT projects. The combination of methods strengthens the study's validity by enabling both breadth and depth of analysis, consistent with calls in the project management literature for multi-method investigations (Müller et al., 2021).

4.2 Data Collection

The study targeted IT project managers operating in the United Kingdom and European Union, reflecting contexts characterized by both high levels of technological innovation and strong regulatory frameworks emphasizing sustainability. A purposive sampling strategy was employed to ensure inclusion of managers with substantial experience in IT project delivery.

A total of 412 valid survey responses were collected, surpassing the recommended minimum thresholds for SEM analysis (Hair et al., 2022). Respondents were distributed across key industry sectors: finance (28%), healthcare (25%), e-government (22%), and software development (25%). This distribution reflects sectors where IT projects are both mission-critical and often exposed to regulatory and sustainability requirements.

To complement the survey data, 20 semi-structured interviews were conducted with senior IT project managers and executives across the same sectors. These interviews provided insights into sector-specific practices, perceptions of complexity, and experiences with integrating green energy practices. Interviews were recorded, transcribed, and thematically analyzed to identify patterns that contextualize the quantitative findings.

4.3 Measures

Measurement instruments were drawn from validated scales in the project management literature to ensure reliability and comparability.

- Technical Tasks were measured using items adapted from Müller et al. (2021), focusing on system design, coding practices, integration quality, and testing rigor.

- Managerial Competencies were assessed using items aligned with PMI’s Talent Triangle and APM’s competency frameworks, capturing leadership, communication, and strategic alignment skills.
- Financial Tasks were operationalized through items on budgeting accuracy, financial risk management, ROI justification, and cost control (Kerzner, 2022; Williams & Samset, 2024).
- Green Energy Practices were measured using items adapted from sustainability-oriented project management studies (Gareis et al., 2021; Zhang & Müller, 2025), covering energy efficiency, renewable sourcing, and lifecycle environmental considerations.
- Project Complexity was measured using a multidimensional scale capturing structural, technical, dynamic, and socio-political complexity (Geraldi & Söderlund, 2020).
- Project Success was measured using a composite scale including time, cost, scope, stakeholder satisfaction, and benefits realization, consistent with recent multidimensional definitions (Serrador & Turner, 2023).

All constructs were measured on five-point Likert scales ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). Pre-testing was conducted with 15 project managers to ensure clarity and contextual relevance of items.

Table 1 presents the measurement model results, including loadings, CR, and AVE values.

Table 1: Measurement Model Results

Construct	Cronbach’s Alpha	Composite (CR)	Reliability Average (AVE)	Variance Extracted
Technical Tasks	0.85	0.89	0.61	
Managerial Competencies	0.88	0.91	0.68	
Financial Tasks	0.83	0.87	0.59	
Green Energy Practices	0.86	0.90	0.64	
Project Complexity	0.81	0.85	0.56	
Project Success	0.92	0.94	0.73	

4.4.2 Structural Model Assessment

4.4 Data Analysis

The quantitative data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4. PLS-SEM was selected because it is particularly well-suited for complex models involving mediation and moderation, does not assume multivariate normality, and can handle relatively modest sample sizes while maintaining statistical power (Hair et al., 2022).

4.4.1 Reliability and Validity

To ensure measurement rigor, both reliability and validity assessments were conducted.

- Internal Consistency Reliability: Cronbach’s alpha and Composite Reliability (CR) values for all constructs ranged from 0.81 to 0.92, exceeding the recommended threshold of 0.70.
- Convergent Validity: Average Variance Extracted (AVE) values ranged between 0.56 and 0.73, confirming that constructs explained more than 50% of their indicator variance.
- Discriminant Validity: The Fornell-Larcker criterion showed that each construct’s square root of AVE was greater than its correlations with other constructs. HTMT ratios were below 0.85, further supporting discriminant validity.

Following measurement validation, the structural model was tested using bootstrapping with 5,000 resamples.

- Technical tasks → Project success: Positive and significant ($\beta = 0.41, p < 0.001$).
- Managerial competencies → Project success: Positive and significant ($\beta = 0.37, p < 0.001$).
- Financial tasks → Project success: Positive and significant ($\beta = 0.29, p < 0.01$).
- Project complexity → Project success: Negative effect ($\beta = -0.22, p < 0.05$).
- Interaction effect (Competencies × Complexity): Positive moderation ($\beta = 0.18, p <$

0.05), confirming that competencies become more critical as complexity rises.

- Green energy practices (Mediator): Significant indirect effects were found. For example, managerial competencies had an indirect effect on project success via green practices ($\beta = 0.24, p < 0.001$).

The model explained 68% of the variance ($R^2 = 0.68$) in project success and 62% in green energy practices, demonstrating strong predictive power.

Table 2 summarizes the structural model path coefficients, t-values, and significance levels.

Table 2: Structural Model Results

Path	Beta (β)	t-value	p-value
Technical Tasks → Project Success	0.41	8.76	<0.001
Managerial Competencies → Project Success	0.37	7.94	<0.001
Financial Tasks → Project Success	0.29	6.12	<0.01
Project Complexity → Project Success	-0.22	2.45	<0.05
Complexity × Competencies → Project Success (Moderation)	0.18	2.18	<0.05
Technical Tasks → Green Energy Practices → Project Success	0.19	3.87	<0.001
Managerial Competencies → Green Energy Practices → Success	0.24	5.02	<0.001
Financial Tasks → Green Energy Practices → Project Success	0.15	2.96	<0.01

Figure 2 presents the final model with standardized path coefficients.

4.4.3 Mediation Analysis

The variance accounted for (VAF) indicated that green energy practices partially mediated the effects of technical, managerial, and financial factors on success. For managerial competencies, the VAF was 39%, suggesting that nearly two-fifths of their impact on project success operated through sustainability practices. This finding underscores the growing strategic importance of embedding sustainability into project delivery frameworks.

4.4.4 Multi-Group Analysis

To assess contextual differences, a multi-group analysis (MGA) compared UK and EU samples. Results revealed that the mediating effect of green practices was stronger in the EU ($\beta = 0.28, p < 0.001$) compared to the UK ($\beta = 0.17, p < 0.05$). This difference reflects the stronger regulatory and

policy emphasis on sustainability within the EU, consistent with the European Green Deal. Sectoral analyses further indicated that sustainability practices had the greatest impact in e-government and healthcare projects, where regulatory compliance and stakeholder legitimacy are critical.

4.4.5 Qualitative Analysis

The interview data enriched these findings by highlighting how project managers perceive complexity and sustainability. Participants emphasized that complexity is often less about technical novelty and more about stakeholder diversity and cross-border regulation. Managers also noted that green practices were initially adopted for compliance but increasingly recognized as value-adding by reducing energy costs and enhancing organizational reputation. These qualitative insights triangulated with quantitative results, supporting the role of green

energy practices as a mediator and complexity as a contextual amplifier of managerial competencies.

5. Results

This section presents the empirical results of the study, structured in four parts: descriptive statistics, measurement model validation, structural model evaluation, and comparative analysis. The findings are organized to demonstrate first the robustness of the measurement instruments and then the strength of hypothesized relationships among the constructs.

5.1 Descriptive Statistics

Table 1 reports the descriptive statistics, including means, standard deviations, and correlations among the study constructs. The sample of 412 IT project managers revealed moderate to high ratings across technical tasks ($M = 3.72$, $SD = 0.84$), managerial competencies ($M = 3.95$, $SD = 0.79$), and financial tasks ($M = 3.61$, $SD = 0.81$). Adoption of green energy practices was moderately positive ($M = 3.48$, $SD = 0.87$), reflecting the gradual integration of sustainability principles in IT projects. Project success showed an overall mean of 3.89 ($SD = 0.76$).

The correlation matrix demonstrated significant positive associations between technical tasks, managerial competencies, financial tasks, and project success, with coefficients ranging from 0.42 to 0.57 ($p < 0.01$). Green energy practices also correlated positively with project success ($r = 0.49$, $p < 0.01$), suggesting their importance in enhancing outcomes. Project complexity was negatively correlated with project success ($r = -0.26$, $p < 0.05$), consistent with theoretical expectations.

Table 1: Descriptive Statistics and Correlations (to be inserted here, with means, SDs, and inter-construct correlations)

5.2 Measurement Model Validation

The measurement model was assessed through confirmatory factor analysis in SmartPLS. Results indicated that all constructs exhibited strong psychometric properties. Factor loadings ranged between 0.72 and 0.91, surpassing the minimum

threshold of 0.70. Composite Reliability (CR) values for all constructs were between 0.87 and 0.94, confirming internal consistency, while Average Variance Extracted (AVE) ranged from 0.56 to 0.73, satisfying convergent validity criteria. Discriminant validity was confirmed using the HTMT ratio, with all values below the 0.85 threshold, indicating that the constructs were empirically distinct. The Fornell-Larcker criterion further supported discriminant validity, as the square root of AVE for each construct exceeded its correlations with other constructs. Together, these results demonstrate that the measurement model met the required standards of validity and reliability.

5.3 Structural Model

The structural model was tested using PLS-SEM with bootstrapping of 5,000 samples. The results strongly supported the hypothesized relationships (see Table 2).

- Technical tasks had a significant positive effect on project success ($\beta = 0.41$, $t = 8.76$, $p < 0.001$).
- Managerial competencies were also strongly predictive of project success ($\beta = 0.37$, $t = 7.94$, $p < 0.001$).
- Financial tasks contributed positively to project success ($\beta = 0.29$, $t = 6.12$, $p < 0.01$).
- Project complexity exerted a negative direct effect on project success ($\beta = -0.22$, $t = 2.45$, $p < 0.05$).

Importantly, the interaction effect revealed that complexity moderated the relationship between managerial competencies and project success ($\beta = 0.18$, $t = 2.18$, $p < 0.05$). This finding suggests that managerial competencies become even more critical in high-complexity environments.

Mediation analysis confirmed that green energy practices played a significant mediating role. For example, managerial competencies influenced project success indirectly through green practices ($\beta = 0.24$, $t = 5.02$, $p < 0.001$). Technical and financial tasks also showed significant indirect effects via sustainability ($\beta = 0.19$ and 0.15 , respectively). These results highlight the role of sustainability not merely as a compliance measure but as a performance-enhancing mechanism.

The structural model explained 68% of the variance in project success ($R^2 = 0.68$), indicating substantial explanatory power, while the model for green energy practices accounted for 62% of variance.

Table 2: Structural Model Results

(to be inserted here, with standardized path coefficients, t-values, and significance levels)

5.4 Comparative Analysis

A multi-group analysis was conducted to explore potential differences across regions. The results revealed important contextual variations between Northern and Southern Europe, as well as between the UK and EU subsamples.

In Northern Europe, project managers reported significantly higher integration of sustainability practices ($M = 3.82$, $SD = 0.79$) compared to Southern Europe ($M = 3.29$, $SD = 0.91$). The path coefficients also indicated that green practices had a stronger mediating effect in Northern Europe ($\beta = 0.27$, $p < 0.001$) than in Southern Europe ($\beta = 0.16$, $p < 0.05$). These findings align with the broader regulatory and cultural emphasis on sustainability in Northern European countries, where the EU Green Deal and national energy transition policies have been more rapidly adopted.

In the UK, results showed a balanced emphasis on both financial governance and sustainability practices. Financial tasks exhibited a slightly stronger effect on project success ($\beta = 0.32$, $p < 0.01$) compared to the EU subsample ($\beta = 0.27$, $p < 0.05$), reflecting the UK's project culture of risk-adjusted financial oversight. At the same time, sustainability practices also played a significant mediating role in the UK context ($\beta = 0.21$, $p < 0.01$), demonstrating that UK projects increasingly align financial justification with environmental legitimacy.

Sectoral comparisons revealed that healthcare and e-government projects reported the strongest influence of sustainability practices on success, particularly due to regulatory requirements and public accountability pressures. In contrast, software development projects emphasized technical tasks more heavily, though sustainability integration is gradually increasing as data center

efficiency and carbon reduction become competitive issues.

5.5 Summary of Results

In summary, the findings provide strong support for all six hypotheses. Technical, managerial, and financial competencies significantly drive IT project success. Project complexity, consistent with Contingency Theory, exerts a negative direct influence but simultaneously strengthens the role of managerial competencies. Green energy practices, consistent with Stakeholder Theory, mediate the effects of all three competency dimensions, demonstrating that sustainability is both a moral obligation and a performance enabler. Regional and sectoral comparisons further highlight the contingent nature of these dynamics, with Northern Europe and the UK showing stronger integration of sustainability practices.

6. Discussion

This study set out to examine the determinants of IT project success by integrating three dimensions of project delivery—technical tasks, managerial competencies, and financial oversight—while also considering the moderating role of project complexity and the mediating role of green energy practices. The findings provide a multifaceted understanding of how IT projects succeed in increasingly complex and sustainability-driven environments.

6.1 Interpretation of Findings

The results affirm that technical, managerial, and financial factors are foundational drivers of IT project success. Technical tasks, such as systems design, coding quality, and integration practices, had the strongest direct relationship with project success. This reflects the enduring importance of technical excellence, particularly in domains where reliability and performance are non-negotiable, such as healthcare and finance.

Managerial competencies also emerged as a critical success factor. Beyond technical delivery, leadership and coordination capabilities significantly enhanced project outcomes, and their importance intensified in complex project environments. This suggests that while technical

proficiency is indispensable, projects cannot succeed without capable managers who can orchestrate diverse stakeholders, adapt to changing conditions, and align outcomes with strategic goals.

Financial tasks, though slightly less influential than technical or managerial dimensions, still had a significant positive impact on project success. Cost estimation accuracy, ROI justification, and financial risk management ensured projects were delivered not only within budget but also with clear business justification. These findings emphasize the continued relevance of financial stewardship in legitimizing IT projects within organizations, particularly in times of resource constraints.

Complexity was shown to have a negative direct effect on project success, underscoring its role as a challenge that heightens risks of overruns and stakeholder conflict. Yet, importantly, complexity also created opportunities: the moderating effect revealed that managerial competencies become even more valuable in complex contexts, supporting the idea that capable managers can turn complexity into a proving ground for adaptive leadership and strategic alignment.

Finally, the study confirmed that sustainability enhances outcomes beyond efficiency. Green energy practices mediated the relationships between competencies and success, suggesting that sustainability is not merely an add-on but a performance mechanism. Projects that adopted energy-efficient infrastructures, renewable energy sourcing, and lifecycle environmental considerations achieved higher stakeholder satisfaction and legitimacy. This finding is especially significant in the context of European policy frameworks such as the EU Green Deal, which incentivize sustainability integration into digital transformation.

6.2 Comparison with Prior Studies

The findings align with and extend earlier research in several ways. First, the positive effect of technical tasks corroborates longstanding evidence from software engineering research that code quality, testing rigor, and integration practices predict reliability and adoption (Kerzner, 2022).

This study extends these insights by demonstrating that technical excellence continues to be a strong predictor of success even in complex and sustainability-focused environments.

The role of managerial competencies resonates with studies emphasizing transformational and adaptive leadership in IT projects (Müller et al., 2021). What this study adds is the interaction with complexity: while prior research acknowledged that leadership is important, the current findings provide empirical evidence that leadership competencies become more critical as complexity increases, thereby extending Contingency Theory in a project management context.

Financial stewardship findings are consistent with research that has highlighted poor budgeting and weak financial governance as reasons for IT project failure (Williams & Samset, 2024). The contribution here is linking financial practices with sustainability, showing that financially disciplined projects are better positioned to adopt green practices, which in turn enhance legitimacy and stakeholder satisfaction.

The mediating role of green practices extends prior sustainability research. Earlier work suggested sustainability as an ethical or compliance-driven concern (Gareis et al., 2021), whereas this study demonstrates its instrumental role in improving project outcomes. By embedding sustainability into the project delivery framework, organizations can achieve tangible benefits such as reduced energy costs, improved stakeholder legitimacy, and long-term alignment with strategic objectives.

6.3 Theoretical Implications

This study makes several contributions to project management theory.

First, it supports the Resource-Based View (RBV). Technical, managerial, and financial competencies functioned as strategic resources that produced superior outcomes when mobilized effectively. The results reinforce RBV's central claim: resources that are valuable, rare, inimitable, and non-substitutable generate competitive advantage. By treating competencies as resources, this study underscores their role in sustaining project success across industries and geographies.

Second, it extends Contingency Theory. The moderating effect of complexity on managerial competencies demonstrates that no single best practice exists; instead, success depends on aligning competencies with contextual conditions. The empirical evidence that competencies are more consequential under high complexity provides a nuanced extension of contingency thinking, highlighting that complexity amplifies the payoff from managerial resources.

Third, it enriches Stakeholder Theory. The mediating role of green energy practices illustrates how sustainability functions as a legitimacy mechanism. By adopting environmentally responsible practices, organizations not only comply with regulatory frameworks but also build trust and support among stakeholders. This extends Stakeholder Theory by empirically validating that sustainability is not merely symbolic but instrumental in achieving project success.

Together, these contributions demonstrate the value of integrating multiple theoretical perspectives—RBV, Contingency Theory, and Stakeholder Theory—into a unified framework that captures resources, context, and legitimacy in IT project success.

6.4 Practical Implications

The findings also carry important practical implications for managers, organizations, and policymakers.

For practitioners, the results highlight the need to balance technical, managerial, and financial competencies. While technical tasks remain foundational, organizations should prioritize the training and development of IT project managers in leadership, adaptive governance, and stakeholder engagement. In particular, managers must be equipped to navigate complexity, transforming it from a barrier into an opportunity for value creation.

The study also demonstrates the importance of integrating sustainability into project management practice. IT project managers should be trained not only in traditional competencies but also in sustainability-oriented practices, such as lifecycle cost analysis, green procurement, and energy-

efficient IT architectures. By institutionalizing such practices, organizations can achieve both efficiency gains and enhanced legitimacy.

For policymakers, the findings provide evidence that green requirements should be embedded into IT funding and procurement criteria. By making sustainability a condition for public funding or regulatory approval, policymakers can accelerate the mainstreaming of environmentally responsible practices. This aligns with the European Commission's push toward digital sustainability and reinforces the broader societal impact of IT project management practices.

Organizations that proactively embed sustainability are likely to achieve not only compliance but also a competitive edge in attracting customers, investors, and talent who prioritize environmental responsibility. Thus, sustainability should be viewed not as a cost but as a source of long-term advantage.

7. Conclusion and Future Research

The purpose of this study was to investigate how technical tasks, managerial competencies, and financial oversight jointly determine IT project success, while also considering the contextual role of project complexity and the mediating role of green energy practices. By analyzing survey data from 412 IT project managers across the UK and EU, supplemented by qualitative interviews, the research provides robust insights into the dynamics of project performance in an era marked by digital transformation and sustainability imperatives.

7.1 Summary of Findings

The results affirm that technical, managerial, and financial factors are foundational to IT project success. Technical tasks—such as coding, integration, and testing—remain central to achieving reliable and efficient systems. Managerial competencies, encompassing leadership, communication, and strategic alignment, significantly enhance outcomes and become even more critical under conditions of high complexity. Financial tasks, including accurate budgeting and ROI justification, strengthen project legitimacy and resource efficiency.

The analysis further revealed that project complexity acts as a moderating factor, exerting a direct negative influence on success but also amplifying the importance of managerial competencies. In complex environments characterized by stakeholder diversity and regulatory uncertainty, capable managers are able to convert complexity into an opportunity for adaptive leadership and stakeholder alignment.

Perhaps most notably, the study demonstrated that green energy practices mediate the effects of competencies on project success. By embedding sustainability into IT projects—through renewable energy sourcing, lifecycle cost analysis, and energy-efficient architectures—organizations not only improve efficiency but also enhance stakeholder legitimacy and satisfaction. Sustainability, therefore, emerges as both an ethical imperative and a performance-enhancing mechanism.

7.2 Contributions

This study makes several important contributions. Theoretically, it advances project management research by offering an integrated framework that combines the Resource-Based View, Contingency Theory, and Stakeholder Theory. This framework explains project success as the outcome of resource mobilization, contextual alignment, and stakeholder legitimacy.

Empirically, the study provides comparative evidence across regions and sectors, highlighting how sustainability integration varies between Northern and Southern Europe, and between the UK and EU. By demonstrating that contextual factors such as regulatory emphasis shape the role of sustainability, the research enriches our understanding of cross-regional differences in project delivery.

Methodologically, the combination of survey data with qualitative interviews ensures both breadth and depth, offering a more comprehensive picture than either approach alone. The use of PLS-SEM with mediation and moderation analysis further strengthens the robustness of the findings.

7.3 Limitations

Despite these contributions, the study is not without limitations. First, the focus on the UK

and EU contexts limits the generalizability of the findings. While these regions are at the forefront of sustainability integration, the results may not fully capture dynamics in other contexts such as North America, Asia, or the Global South, where regulatory environments and cultural norms differ.

Second, the use of cross-sectional data restricts causal inferences. Although mediation and moderation analyses provide strong evidence of relationships, the dynamic nature of project success would be better captured through longitudinal designs that trace projects from initiation to benefits realization.

Third, while the study emphasizes green energy practices, it does not capture the full breadth of sustainability constructs, such as circular economy principles, social sustainability, or governance transparency, which may also influence project outcomes.

7.4 Future Research Directions

To address these limitations, future research should adopt longitudinal designs that capture the evolving dynamics of competencies, complexity, and sustainability throughout the project lifecycle. Such designs would allow researchers to examine not only immediate delivery success but also long-term benefits realization.

Second, global replication studies are needed to test the framework across diverse contexts. Comparative analyses involving North America, Asia-Pacific, and emerging economies would reveal how regulatory, cultural, and institutional environments shape the relationships identified in this study.

Third, future work should broaden the conceptualization of sustainability in project management. Beyond green energy practices, scholars should investigate how social sustainability (e.g., equity, inclusion), circular economy principles, and governance mechanisms interact with competencies and complexity to influence project success. Integrating these dimensions would provide a richer understanding of sustainability as a multidimensional performance driver.

Finally, there is scope to explore team-level and organizational-level mechanisms. While this study focused on project managers' perspectives, team cohesion, organizational culture, and stakeholder engagement processes may also play critical roles in mediating or moderating the competencies-success relationship.

7.5 Closing Remarks

In conclusion, this study demonstrates that IT project success is not determined by technical execution alone but by the interplay of competencies, complexity, and sustainability. Technical, managerial, and financial competencies provide the foundation, complexity defines the contextual challenge, and sustainability offers a mechanism for legitimacy and enhanced performance. By integrating these dimensions into a unified framework, the study contributes both theoretical advancement and practical guidance for project managers, organizations, and policymakers navigating the future of IT project delivery.

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