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Innovation Capability, Green Innovation, and Property Business Performance: The Mediating Role of Competitive Advantage

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ABSTRACT

The property industry is increasingly pressured to convert innovation and sustainability practices into measurable business outcomes, yet evidence on how this conversion occurs in regional markets remains scarce. This study examines the effects of innovation capability and green innovation on business performance through competitive advantage in the property industry of the Special Region of Yogyakarta (DIY). A quantitative explanatory design was applied using 141 project-level responses from active landed housing projects, analyzed with Partial Least Squares Structural Equation Modeling (PLS-SEM). The results show that innovation capability has a strong positive effect on competitive advantage ($\beta = 0.835$, $p < 0.001$), and competitive advantage positively affects business performance ($\beta = 0.591$, $p < 0.001$). Competitive advantage demonstrates indirect-only mediation between innovation capability and business performance ($\beta = 0.493$, $p < 0.001$). In contrast, green innovation does not significantly affect competitive advantage or business performance. These findings confirm the Resource-Based View (RBV) by showing that internal resources must be converted into a competitive advantage to improve performance, and they also expose how green innovation underperforms in a cost-sensitive regional market.

Keywords: Business Performance; Competitive Advantage; Green Innovation; Innovation Capability; Property Industry

JEL Classification: M10; O31; Q56

INTRODUCTION

The property industry plays a strategic role in national economic development through its contributions to investment and employment creation. Business performance in this sector is no longer measured solely by short-term profitability. It is also evaluated by a firm's ability to sustain stable growth, adapt to market dynamics, and respond to rising sustainability demands (Coelho et al., 2023; Sanchaniya & Geipele, 2024).

Organizational capacity for innovation operates as a vital dynamic asset, empowering market players to capture emerging prospects, conceptualize novel solutions, and restructure internal processes to escalate overall achievements (Alghamdi & Agag, 2024; Otache, 2024). The sustainability agenda has further directed attention to green innovation, which refers to efforts to reduce ecological impact while improving resource efficiency through environmentally oriented products and processes (Coelho et al., 2023; Nuryakin & Maryati, 2022). In the property industry, this shift is reflected in the adoption of energy-efficient housing designs, environmentally friendly building materials, and sustainable estate management.

Despite this strategic shift, the adoption of green innovation in Indonesia remains limited. Pauziah and Rufaidah (2026) found that only 12.4% of property developers consistently apply green building practices with measurable financial outcomes. Greenship certification data from the Green Building Council Indonesia (GBC Indonesia, 2024) reinforce this pattern. As of early 2024, no landed housing project in Special Region of Yogyakarta (DIY) had obtained certification. This condition raises the question of why green innovation, which is expected to drive competitive advantage, has not translated into sustainable business performance in regional markets.

Theoretical underpinnings of the Resource-Based View (RBV) establish market superiority as the fundamental mechanism required to transform internal organizational assets into measurable financial outcomes (Barney et al., 2021; Porter, 1985). The advancement of this paradigm through the Natural Resource-Based View (NRBV) conceptualizes the strategic governance of ecological constraints as a persistent driver for securing long-term market dominance (Hart, 1995; Hayat & Qingyu, 2024). Three research gaps remain. First, few studies have tested competitive advantage as a mediating mechanism that links innovation to performance (Otache, 2024). Second, findings on green innovation remain inconsistent (Novitasari & Agustia, 2023; Pauziah & Rufaidah, 2026). Third, most property research in Indonesia has concentrated on metropolitan areas such as Jabodetabek (Indarto & Widoatmodjo, 2025), while DIY presents a fundamentally different structure dominated by mid-scale developers, price-sensitive buyer segments, and landed housing projects.

This study, therefore, tests how competitive advantage transmits the influence of innovation capability and green innovation onto the business performance of DIY property firms. The study enriches the RBV and NRBV literature through empirical testing in an underexplored regional market. It also offers practical contributions for developers and policymakers in designing strategies that connect innovation with sustainable performance. While RBV and NRBV jointly provide the theoretical foundation of this study, the empirical testing also evaluates the contextual applicability of both perspectives within the regional property industry rather than assuming that each theoretical proposition will necessarily receive equal empirical support.

The novelty of this study lies in its project-level examination of innovation capability, green innovation, competitive advantage, and business performance in a non-metropolitan Indonesian property market. Unlike prior studies that mainly emphasize

direct effects or metropolitan contexts, this study positions competitive advantage as the mediating mechanism that converts innovation-related resources into business performance. This approach provides a more contextual understanding of how innovation creates value in regional landed housing projects.

LITERATURE REVIEW

Theoretical and Variables Review

Natural Resource-Based View (NRBV)

Pollution prevention, product stewardship, and sustainable development form the strategic core of Hart's (1995) NRBV, extending traditional resource perspectives to achieve environmentally driven competitive advantage (Lestari & Sunyoto, 2023). Several studies confirm the NRBV proposition across industries (Coelho et al., 2023; Nuryakin & Maryati, 2022). In the property industry, however, findings remain mixed. Some studies show that sustainability integration directly drives financial performance (Sanchaniya & Geipele, 2024; Tripopsakul, 2025), while others report insignificant effects due to high upfront investment and limited consumer willingness to pay a premium (Novitasari & Agustia, 2023; Pauziah & Rufaidah, 2026). NRBV is therefore theoretically strong but depends on enabling industry conditions such as regulation, consumer awareness, and material cost structures, which are examined in this study.

Innovation Capability

Innovation capability refers to the organizational capacity to develop, implement, and commercialize new ideas that create strategic value. From the RBV perspective, innovation capability functions as an intangible resource that strengthens differentiation and competitive positioning when it is translated into market-recognized value (Barney et al., 2021; Otache, 2024; Purwanto et al., 2025). In the property industry, innovation capability extends beyond construction technology to include adaptive housing concepts, simple smart home features, efficient spatial design, and marketing innovation aligned with the preferences of young families and buy-to-rent investors.

Green Innovation

Green innovation refers to environmentally oriented product and process improvements aimed at reducing ecological impact while supporting efficiency and market value creation (Coelho et al., 2023; Nuryakin & Maryati, 2022). Consistent with NRBV, green innovation is positioned not only as regulatory compliance but also as a potential source of competitive advantage through resource efficiency, green differentiation, and improved sustainability performance (Novitasari & Agustia, 2023; Tripopsakul, 2025; Widyantoro et al., 2025). In the Indonesian construction and real estate sector, green innovation has been linked to higher property value, although realizing this value depends on supporting managerial systems (Farida & Setiawan, 2024). However, its empirical effectiveness depends on market readiness, consumer awareness, and the ability of firms to translate environmental practices into buyer-perceived value, with outcomes in the Indonesian context remaining limited (Pauziah & Rufaidah, 2026).

Competitive Advantage

Following Barney et al. (2021) and Porter (1985), competitive advantage is the capacity to deliver customer value that rivals cannot easily copy, whether by lower cost or by differentiation. Contemporary literature extends this concept beyond market positioning to dynamic capabilities that enable continuous adaptation to changing business environments (Alghamdi & Agag, 2024; Otache, 2024). In the property industry, the basis of competitive advantage has shifted from traditional reliance on location and price to value creation through innovative housing concepts, technology integration, and sustainability-based differentiation.

Business Performance

Business performance reflects the extent to which an organization achieves its strategic objectives, measured through both financial and non-financial dimensions (Iskandar & Colline, 2025; Novitasari & Agustia, 2023). In the property industry, business performance has distinctive characteristics because it is tied to long project cycles. Beyond profitability, the absorption rate is a key metric that captures the speed at which units are taken up by the market and typically spans several months to years. This characteristic implies that the impact of innovation on performance should be interpreted with attention to the time lag inherent in the property sector.

Hypotheses Development

Innovation Capability and Green Innovation on Competitive Advantage

RBV views innovation capability as an intangible resource that drives differentiation, process efficiency, and market responsiveness, which competitors cannot easily replicate (Alghamdi & Agag, 2024; Barney et al., 2021). In the DIY property market, dominated by mid-scale developers with limited innovation capacity, developers that offer modern minimalist housing concepts with land optimization, flexible layouts, and simple smart home features gain greater scope for differentiation (Otache, 2024). NRBV extends this logic by positioning green innovation as a strategic capability that can create competitive advantage through resource efficiency, waste management, and environmentally based differentiation (Lestari & Sunyoto, 2023). While Novitasari & Agustia (2023) and Tripopsakul (2025) report a positive relationship in mature ecosystems, evidence from the Indonesian property industry remains limited, with only 12.4% of developers consistently applying green practices (Pauziah & Rufaidah, 2026). Nevertheless, NRBV argues that the competitive benefits of green innovation are highly contingent upon institutional support, consumer environmental awareness, and the maturity of sustainability-oriented markets. Therefore, empirical verification remains necessary, particularly within regional property markets where these enabling conditions may differ substantially from metropolitan settings.

H1: Innovation capability raises the competitive advantage of DIY landed-housing developers.
H2: Green innovation strengthens competitive advantage among these developers.

Innovation Capability and Green Innovation on Business Performance

Innovation capability is expected to translate directly into business performance through enhanced product value, which can be converted into sales growth and profitability (Otache, 2024). For green innovation, NRBV asserts that the effect on business performance operates through operational savings, reputation gains, and access to market segments that value sustainable practices (Tripopsakul, 2025). Findings, however, remain inconsistent. The long property project cycle may slow the manifestation of innovation effects, while high upfront investment in green technology may delay the financial impact of sustainability initiatives (Novitasari & Agustia, 2023; Pauziah & Rufaidah, 2026). This inconsistency provides a relevant research space for testing in the DIY property context, where mid-scale developers, price-sensitive buyers, and landed housing projects shape the conversion of innovation into performance. Consequently, although NRBV theoretically predicts a positive relationship between green innovation and business performance, the extent to which this relationship materializes is expected to depend on contextual market conditions, thereby justifying empirical testing in the DIY property industry.

H3: Innovation capability improves the business performance of DIY landed-housing developers.

H4: Green innovation contributes to stronger business performance in this sector.

Competitive Advantage on Business Performance

RBV holds that firms with a strong competitive advantage achieve above-industry-average performance through premium pricing or expanded profit margins (Barney et al., 2021; Núñez et al., 2026). Otache (2024) and Pauziah & Rufaidah (2026) consistently support this relationship across industries, including the property sector in Indonesia.

H5: Competitive advantage drives higher business performance among DIY property developers.

Innovation Capability and Green Innovation on Business Performance Through Competitive Advantage

Internal resources do not automatically translate into business performance without conversion into a market-recognized position. Drawing on RBV, competitive advantage acts as the mechanism that bridges this conversion through product differentiation, cost efficiency, and service quality (Musonnafa et al., 2022; Otache, 2024; Pauziah & Rufaidah, 2026; Seow et al., 2025). The same logic applies to green innovation, which requires a transmission mechanism before environmental practices can become economic value through reputation gains, sustainability-based differentiation, and long-term efficiency benefits (Li et al., 2025; Novitasari & Agustia, 2023; Núñez et al., 2026; Tripopsakul, 2025).

H6: Competitive advantage mediates the link between innovation capability and business performance.
H7: Competitive advantage mediates the link between green innovation and business performance.

Previous Relevant Studies

Table 1 summarizes previous studies relevant to this research.

Table 1. Summary of Previous Relevant Studies

Author(s) (Year)	Main Topic	Context & Method	Key Findings
Pauziah & Rufaidah (2026)	Effect of innovation capability and green innovation on business performance, with competitive advantage as moderator	Property developers, West Java, Indonesia; PLS-SEM	IC supports BP; GI is not significant on BP; CA as moderator is not significant; GI adoption only 12.4%
Sanchaniya & Geipele (2024)	Strategic sustainability and sustainability performance	Real estate industry; linear regression	GI, IC, and strategic sustainability support BP; CA as mediator is significant
Nuryakin & Maryati (2022)	Green marketing orientation, GI, and green competitive advantage	SMEs in Yogyakarta; SEM AMOS	GI and green CA mediate the effect of green marketing orientation on performance
Novitasari & Agustia (2023)	Green innovation, competitive advantage, and firm performance	Manufacturing firms, Indonesia; PLS-SEM	Competitive advantage mediates the effect of green innovation on firm performance

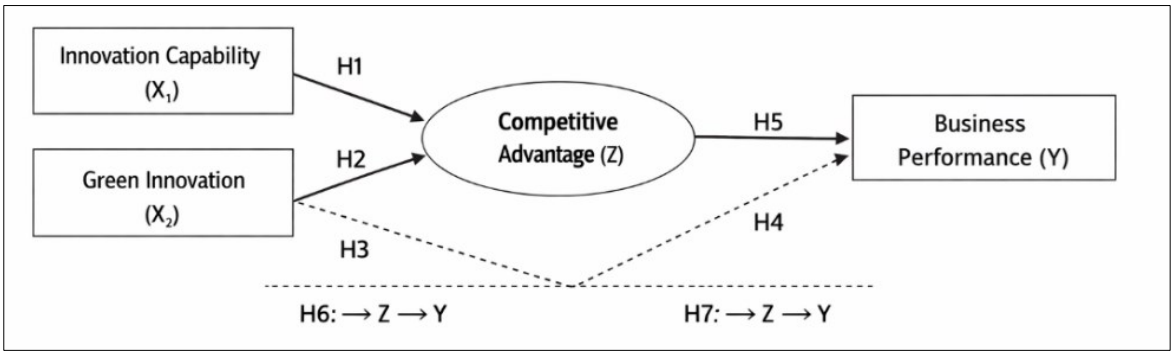
Tripopsakul (2025)	ESG practices, green innovation, and financial performance	ASEAN listed firms; panel regression	Green innovation partially mediates the relationship between ESG practices and long-term market valuation
Farida & Setiawan (2024)	Green innovation and property value	Construction and real estate firms, Indonesia; SEM	Green innovation is related to property value, but management control systems are needed to realize the value

This study examines the mediating role of competitive advantage in the underexplored regional property industry of DIY, with RBV and NRBV serving as complementary theoretical frameworks.

Conceptual Framework

The conceptual framework of this study is presented in Figure 1. The model positions innovation capability and green innovation as independent variables, competitive advantage as the mediating variable, and business performance as the dependent variable.

Figure 1. Research Framework



RESEARCH METHOD

Research Design and Unit of Analysis

A quantitative explanatory design was applied to test the relationships among innovation capability, green innovation, competitive advantage, and business performance. The unit of analysis was active landed housing projects developed by property firms in DIY. Data were collected from informed project-level respondents who were directly involved in or had access to information on product development, marketing strategy, and operational implementation. The project was selected as the unit of analysis for two reasons. Methodologically, innovation strategies and sustainability implementation are project-specific, since a single developer can have several projects with distinct strategic characteristics. Empirically, firm-level population data are limited, so analysis at the project level provides a more representative database for testing the relationships among variables.

Respondents were individuals directly involved in project-level decision-making or with access to project information related to product development, marketing strategy, and operational implementation. Each questionnaire referred to one specific landed housing project, so the project rather than the respondent served as the unit of observation. In some cases, a single individual provided separate responses for more than one project within their area of knowledge and responsibility, which is common in the practice of

developers with multiple projects. To minimize repeated-response bias, respondents were explicitly asked to evaluate each project independently based on its specific characteristics, and each project was recorded as a distinct case. It is acknowledged that this procedure cannot fully eliminate the potential within-respondent dependency arising from the informed-respondent design; this dependency is therefore treated as a limitation and interpreted with caution in the Limitations section, while the procedural remedies described below were applied to reduce the risk of common method bias (CMB).

Population and Sampling

The population of this study comprised all landed housing projects developed by active property firms in DIY as of 15 May 2026, totaling 207 projects based on comprehensive mapping that combined REI DPD DIY and APERSI DPD DIY data with property marketplace platforms. The cut-off date was set to maintain internal validity, given the dynamic nature of the property industry in which new projects continuously emerge. Apartment projects, commercial properties, and projects still in the pre-construction or land-clearing phase were excluded since they did not meet the operational criteria of the study. This population definition is consistent with previous research practice on REI property developers in Indonesia (Pauziah & Rufaidah, 2026).

Sampling was conducted through non-probability purposive sampling, with the inclusion criteria requiring respondents to be directly involved in project operations and to have an in-depth understanding of the project's business strategy. Sample size determination was based on statistical power analysis using G*Power, with a 5% significance level, 80% statistical power, a medium effect size ($f^2 = 0.15$), and a maximum of three predictors, which produced a minimum requirement of 77 respondents. G*Power is appropriate for hypothesis testing with PLS-SEM, which emphasizes the predictive power of the model (Hair et al., 2021). Data were collected using a mixed-mode approach that combined online and in-person questionnaire distribution to maximize respondent participation, given that the property industry still relies on face-to-face interaction in project marketing activities. The study obtained 141 valid project-level responses covering 141 active landed housing projects, satisfying the methodological requirements for PLS-SEM analysis.

Measurement

Each variable was measured using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The operational definitions and indicators of each variable are presented in Table 2.

Table 2. Operational Definitions of Variables

Variable	Indicator		Source
Innovation Capability (7 indicators)	IC1	Capacity of the project team to generate innovative ideas related to housing concepts, design, and product features	Otache (2024)
	IC2	Product differentiation compared with competitors	
	IC3	Speed in adopting new methods in project development	
	IC4	Application of modern technology in the development process	
	IC5	Innovation in project marketing strategies	
	IC6	Development of innovative after-sales services	

	IC7	Capability to learn from previous project experience	
Green Innovation (5 indicators)	GI1	Use of environmentally friendly building materials	Coelho et al. (2023); Nuryakin & Maryati (2022)
	GI2	Energy-efficient housing design	
	GI3	Construction waste management	
	GI4	Water management and vegetation in the estate	
	GI5	Resident education on sustainable lifestyles	
Competitive Advantage (6 indicators)	CA1	Uniqueness of the project concept compared with competitors	Barney et al. (2021); Pauziah & Rufaidah (2026); Porter (1985)
	CA2	Price competitiveness in the target market segment	
	CA3	Developer reputation in the DIY property market	
	CA4	Construction and finishing quality of the project	
	CA5	Strategic location and estate accessibility	
	CA6	Added value that competitors find difficult to imitate	
Business Performance (6 indicators)	BP1	Achievement of project sales targets	Iskandar & Colline (2025); Venkatraman (1989)
	BP2	Unit absorption rate (sales absorption rate)	
	BP3	Project profitability against target	
	BP4a	Project market share growth	
	BP4b	Consumer satisfaction with the project	
	BP5	Referral and repeat purchase rates	

Common Method Bias (CMB)

Data collection from a single source using the same instrument may introduce CMB, which can affect estimation accuracy (Podsakoff et al., 2003). To minimize this risk, the study applied procedural remedies. Respondent anonymity was guaranteed, the questionnaire used clear and unambiguous wording, and the order of questions was arranged to prevent respondents from anticipating the relationships among variables. The inner-model VIF was subsequently examined as a post-estimation diagnostic to assess potential structural collinearity rather than as a direct statistical test of common method bias. The combined use of procedural remedies and post-estimation diagnostics provides additional confidence regarding the robustness of the structural model.

Data Analysis

Statistical analysis relied on the SmartPLS 4.0 software to perform Partial Least Squares Structural Equation Modeling (PLS-SEM). This analytical approach perfectly suits complex mediation frameworks and handles non-normal data distributions. The evaluation process consisted of two main stages. The measurement model assessment confirmed indicator validity and reliability by fulfilling standard criteria for outer loadings, Average Variance Extracted (AVE), Composite Reliability, Cronbach's Alpha, and the Dijkstra-Henseler indicator. Analysts established discriminant validity using the Fornell-Larcker method and the HTMT ratio. The subsequent structural model evaluation analyzed path coefficients, R-squared metrics, Q-squared predicted values (Hair et al., 2021), and effect sizes. A bootstrapping technique involving 5000 subsamples tested the hypotheses to determine the significance levels of direct and indirect effects.

RESULTS

This section presents the findings from the analysis of 141 project-level responses covering 141 active landed housing projects in DIY as of 15 May 2026. The presentation begins with the respondent profile, followed by the outer model evaluation, inner model evaluation, structural collinearity assessment, and concludes with the hypothesis testing through bootstrapping with 5,000 subsamples.

Profile of Respondents

Table 3. Profile of Project-Level Responses (N = 141)

Characteristic		Frequency	Percentage (%)
Gender	Male	77	54.61
	Female	64	45.39
Age	≤ 30 years	43	30.5
	31-40 years	46	32.62
	41-50 years	48	34.04
	> 50 years	4	2.84
Position	Marketing	71	50.35
	Manager	22	15.6
	Owner/Director	15	10.64
	Project Staff	3	2.13
	Other	30	21.28
Work Experience	< 1 year	26	18.44
	1-3 years	50	35.46
	> 5 years	65	46.1
Project Location	Sleman Regency	88	62.41
	Bantul Regency	32	22.7
	Gunungkidul Regency	11	7.8
	Yogyakarta City	9	6.38
	Kulon Progo Regency	1	0.71
Company Age	< 5 years	27	19.15
	5-10 years	40	28.37
	> 10 years	74	52.48

Three observations from Table 3 are notable. First, most project-level responses were provided by informants working in marketing functions (50.35%), which supports the project-based unit of analysis because marketing teams have direct familiarity with differentiation strategy and consumer responses to innovation. Second, projects are concentrated in Sleman Regency (62.41%) and Bantul Regency (22.7%) as buffer areas around the provincial capital. Third, 46.1% of informants have more than five years of experience, while 52.48% of projects come from firms operating for more than ten years, supporting the credibility of the data.

Convergent Validity and Reliability

Table 4. Results of Convergent Validity and Construct Reliability

Construct	Indicator	Outer Loading	Cronbach's α	rho_a	rho_c (CR)	AVE
Innovation Capability (IC)	IC1	0.837	0.903	0.919	0.924	0.637
	IC2	0.860				
	IC3	0.579				
	IC4	0.829				
	IC5	0.829				
	IC6	0.845				
	IC7	0.772				
Green Innovation (GI)	GI1	0.591	0.891	0.937	0.918	0.696
	GI2	0.820				
	GI3	0.902				
	GI4	0.906				
	GI5	0.908				
Competitive Advantage (CA)	CA1	0.868	0.922	0.925	0.939	0.721
	CA2	0.821				
	CA3	0.895				
	CA4	0.877				
	CA5	0.813				
	CA6	0.820				
Business Performance (BP)	BP1	0.831	0.935	0.942	0.948	0.754
	BP2	0.902				
	BP3	0.892				
	BP4a	0.832				
	BP4b	0.854				
	BP5	0.896				

Source: SmartPLS 4.0 output (2026)
Note: Cronbach's α = Cronbach's Alpha; rho_a = Dijkstra-Henseler's rho_A; rho_c = Composite Reliability; AVE = Average Variance Extracted.

Table 4 shows that outer loadings range from 0.579 to 0.908. IC3 and GI1 fall below 0.70 but remain above the 0.40 minimum (Hair et al., 2021) and were retained because their AVE values still exceed 0.50, so overall convergent validity was not compromised. Cronbach's α (0.891-0.935), rho_a (0.919-0.942), and rho_c (0.918-0.948) all surpass 0.70, indicating high internal reliability. AVE values (0.637-0.754) confirm adequate convergent validity in line with the PLS-SEM criteria recommended by Hair et al. (2021).

Discriminant Validity

Table 5. Results of Discriminant Validity (Fornell-Larcker Criterion and HTMT Ratio)

Construct		1	2	3	4
Fornell-Larcker Criterion					
1	BP	0.868			
2	CA	0.831	0.849		
3	GI	0.710	0.725	0.834	
4	IC	0.781	0.839	0.863	0.798
HTMT Ratio					
1	BP	-			
2	CA	0.884	-		
3	GI	0.709	0.745	-	
4	IC	0.826	0.904	0.935	-

Source: SmartPLS 4.0 output (2026)

Note: Fornell-Larcker diagonal = √AVE; HTMT = Heterotrait-Monotrait Ratio. Threshold: √AVE > inter-construct correlation (Fornell & Larcker, 1981); HTMT < 0.90 conservative or < 0.95 for conceptually close constructs (Henseler et al., 2015); Business Performance (BP), Competitive Advantage (CA), Green Innovation (GI), Innovation Capability (IC)

Table 5 presents the discriminant validity results. The Fornell-Larcker criterion is met for business performance, competitive advantage, and green innovation. However, the √AVE for innovation capability (0.798) is lower than its correlations with competitive advantage (0.839) and green innovation (0.863), suggesting conceptual overlap. The HTMT values between innovation capability and competitive advantage (0.904) and between innovation capability and green innovation (0.935) exceed the conservative 0.90 threshold (Henseler et al., 2015), although they remain below the lenient 0.95 cutoff for conceptually close constructs.

The high HTMT values are more likely to reflect substantive conceptual overlap in DIY property developer practice, although the potential discriminant validity issue is acknowledged as a study limitation. The constructs were retained for three reasons. First, innovation capability and green innovation are theoretically distinct under RBV and NRBV, as the former reflects general innovation capacity while the latter refers specifically to environmentally oriented innovation. Second, both constructs were measured using validated multi-item indicators and achieved acceptable reliability and AVE values. Third, although the HTMT values exceeded the conservative 0.90 threshold, they remained below the 0.95 cutoff for conceptually close constructs. Therefore, the constructs were retained despite the observed conceptual proximity. Accordingly, the subsequent structural relationships and mediation effects are interpreted with appropriate caution while maintaining the theoretical distinction among the constructs supported by RBV and NRBV.

Developers who actively innovate in design, technology, and construction methods commonly adopt environmental elements at the same time, so the two innovation dimensions tend to operate as integrated capabilities. This pattern is consistent with the PLS-SEM literature, which permits the HTMT threshold to be relaxed to 0.95 for conceptually close constructs (Henseler et al., 2015). Given this overlap, the structural relationships and mediation results involving these constructs, and the green innovation effect in particular, are interpreted with caution rather than treated as fully independent, as elaborated in the Discussion section.

Structural Model Evaluation

Table 6. Results of Structural Model Evaluation (R^2, Q^2predict, and f^2)

Construct / Relationship		R^2	Q^2predict (mean)	f^2
Business Performance		0.719	0.438	-
Competitive Advantage		0.704	0.495	-
H1	IC → CA	-	-	0.600
H2	GI → CA	-	-	0.000
H3	IC → BP	-	-	0.016
H4	GI → BP	-	-	0.017
H5	CA → BP	-	-	0.368

Source: SmartPLS 4.0 output (2026)
Note: R^2 = coefficient of determination; Q^2predict = predictive relevance (Hair et al., 2021), mean of endogenous indicators; f^2 = effect size; Business Performance (BP), Competitive Advantage (CA), Green Innovation (GI), Innovation Capability (IC)

Table 6 shows R^2 values for business performance (0.719) and competitive advantage (0.704), both in the substantial category (Hair et al., 2021). Q^2predict values are positive, confirming predictive relevance (Hair et al., 2021). The effect sizes show large impacts

of innovation capability on competitive advantage ($f^2 = 0.600$) and competitive advantage on business performance ($f^2 = 0.368$), while the direct effects of innovation capability on business performance, green innovation on business performance, and green innovation on competitive advantage are negligible. This pattern indicates that innovation capability's effect on business performance likely operates through competitive advantage, while green innovation's contribution is limited in the present context.

Structural Collinearity Assessment

The inner model VIF was examined to assess potential multicollinearity in the structural paths. Table 7 presents the VIF results for the five paths in the model.

Table 7. Results of Structural Collinearity Assessment

Structural Path		VIF	Status
H1	IC → CA	3.924	Acceptable (< 5.0)
H2	GI → CA	3.924	Acceptable (< 5.0)
H3	IC → BP	6.277	Elevated (> 5.0)
H4	GI → BP	3.924	Acceptable (< 5.0)
H5	CA → BP	3.376	Acceptable (< 5.0)

Source: SmartPLS 4.0 output (2026)
Note: Threshold of 5.0 (Hair et al., 2021) is used as the standard reference for structural collinearity in PLS-SEM; Business Performance (BP), Competitive Advantage (CA), Green Innovation (GI), Innovation Capability (IC)

Most structural paths show VIF values between 3.38 and 3.92, within the acceptable threshold of 5.0 (Hair et al., 2021). The IC → BP path shows the highest VIF (6.28), which exceeds this threshold. This elevated value indicates potential collinearity on the IC → BP path and is acknowledged as a limitation of the study. The pattern is also consistent with the high conceptual proximity among strategic capability constructs reported by the HTMT values in Table 5, indicating that in DIY property developer practice, innovation capability, green innovation, and competitive advantage tend to operate as integrative capabilities rather than fully distinct constructs (Alghamdi & Agag, 2024). The interpretation of the direct effects involving these constructs should therefore be made with care, while the procedural remedies described in the Method section serve to minimize the risk of CMB.

Hypothesis Testing

Hypothesis testing was conducted using a bootstrapping procedure with 5,000 subsamples. Table 8 summarizes the testing results for the seven research hypotheses.

Table 8. Results of Hypothesis Testing (Bootstrapping 5,000 Subsamples)

Hypothesis		β	STDEV	t-stat	p-value	Decision
H1	IC → CA	0.835	0.085	9.784	<0.001	Supported
H2	GI → CA	0.005	0.096	0.053	0.958	Not Supported
H3	IC → BP	0.167	0.134	1.242	0.214	Not Supported
H4	GI → BP	0.138	0.085	1.615	0.106	Not Supported
H5	CA → BP	0.591	0.097	6.084	<0.001	Supported
H6	IC → CA → BP	0.493	0.105	4.685	<0.001	Supported
H7	GI → CA → BP	0.003	0.057	0.052	0.958	Not Supported

Source: SmartPLS 4.0 output (2026)
Note: β = path coefficient; STDEV = standard deviation; significance at α = 0.05 ($t > 1.96$, $p < 0.05$); Business Performance (BP), Competitive Advantage (CA), Green Innovation (GI), Innovation Capability (IC)

As shown in Table 8, H1, H5, and H6 are supported, while H2, H3, H4, and H7 are not supported. The combination of a non-significant direct effect (H3) and a significant

indirect effect (H6) indicates indirect-only mediation, also referred to as full mediation, meaning that the contribution of innovation capability to business performance is realized only through the formation of competitive advantage. In contrast, the absence of both direct and indirect effects for green innovation (H4 and H7) reflects no-effect non-mediation, indicating no transmission of green innovation through competitive advantage in the DIY property context.

DISCUSSION

Key Findings Analysis

The empirical testing produced three supported hypotheses (H1, H5, H6) and four unsupported hypotheses (H2, H3, H4, H7). This pattern strengthens the resource transmission mechanism in RBV while revealing the implementation limitations of NRBV in the regional property industry context. The following sub-sections interpret the findings per hypothesis with reference to the DIY property industry, while taking into account the implications of the conceptual overlap among constructs reported in Tables 5 and 7.

H1: The Influence of Innovation Capability on Competitive Advantage

Innovation capability functions as the strongest determinant of competitive advantage. This empirical outcome completely supports the RBV theory regarding the transformation of unique internal assets into a solid market position (Barney, 1991; Barney et al., 2021). The magnitude of this effect reflects the DIY market context, which is competitive but still operates through conventional approaches. Developers that successfully offer modern minimalist concepts with land optimization, flexible layouts suited to young families and buy-to-rent investors, simple smart home features, and efficient spatial design for compact housing gain greater scope for differentiation (Otache, 2024).

H2: The Influence of Green Innovation on Competitive Advantage

Green innovation has no significant effect on competitive advantage, consistent with Pauziah and Rufaidah (2026), who reported that green innovation adoption in the Indonesian property industry remains very limited (12.4%). Given the potential conceptual overlap indicated by the high HTMT values, this interpretation is made with care. The central reason is that, in DIY developer practice, green innovation does not yet stand as an independent strategic lever but is embedded within broader innovation capability, so it does not generate a distinct competitive position of its own. Green building certification also requires material investment that is often uneconomical in the middle-class segment, where no landed housing project in DIY had obtained Greenship certification as of 2024 (GBC Indonesia, 2024), and sustainability regulations such as AMDAL and green open space remain largely procedural rather than a source of differentiation. The market-level mechanisms that prevent green innovation from translating into performance are examined in detail under H4.

H3: The Influence of Innovation Capability on Business Performance

The direct effect of innovation capability on business performance is not significant. This result is best interpreted through the long property project cycle. Unlike the manufacturing industry, where the impact of innovation is measured in months, the housing industry has a sales absorption rate that spans several months to years, so the impact is less visible in short- to medium-term performance indicators. The non-significant direct effect is consistent with the indirect-only mediation pattern, in line with the RBV proposition that internal resources must pass through a conversion mechanism before producing superior performance (Barney, 1991; Otache, 2024).

H4: The Influence of Green Innovation on Business Performance

The non-significant effect of green innovation on business performance is consistent with Novitasari & Agustia (2023) and Pauziah & Rufaidah (2026). Four contextual mechanisms in the DIY property market help explain this result. First, DIY consumers remain predominantly price-sensitive, with student, young family, and buy-to-rent segments treating selling price as the main decision variable, echoing emerging-economy evidence that willingness to pay a premium for green buildings is constrained by incentives and environmental literacy rather than being automatic (Al Mamun et al., 2023). Second, green features are not yet a purchase priority, since location, price, and developer reputation outweigh energy efficiency or environmentally friendly materials in consumer decisions, as reflected by the absence of Greenship-certified landed housing in DIY (GBC Indonesia, 2024). This pattern is consistent with evidence from the Jabodetabek market, where willingness to pay for green housing depends on consumer attitudes, subjective knowledge, and environmental concern rather than being an automatic purchase driver (Pangaribuan et al., 2023). Evidence from DIY consumers indicates that green perceived value and green trust must first be established before they translate into green purchase intention, which remains an emerging condition in this market (Nurhalisa et al., 2023). Third, green materials such as certified timber, low-carbon concrete, and solar panels are generally more expensive than conventional alternatives, raising project costs, especially in the middle-class segment with thin margins, which is consistent with regional evidence identifying cost, limited awareness, and insufficient incentives as primary barriers to green building development (Roslee et al., 2022). Fourth, green innovation typically requires a longer payback period since operational savings are realized only after occupancy, while the short- to medium-term performance metrics in this study capture early-stage indicators such as unit sales, absorption rate, and project profitability. This time horizon mismatch explains why green investment has not yet driven the performance metrics measured here, consistent with ASEAN evidence that green innovation translates into financial performance only partially and over longer horizons (Tripopsakul, 2025), with Indonesian evidence that green innovation can constrain short-term financial performance due to high initial costs (Siagian & Siagian, 2025), and with Indonesian real estate evidence that the value of green innovation materializes only when supported by adequate managerial systems (Farida & Setiawan, 2025). The findings align with the NRBV proposition (Hart, 1995) that transforming environmental resources into financial advantage requires enabling conditions that are not yet fully formed in the DIY property industry in 2026.

H5: The Influence of Competitive Advantage on Business Performance

Competitive advantage shows a positive and significant effect on business performance, confirming the central role of competitive advantage as a driver of performance (Porter, 1985). This result is highly convergent with Pauziah and Rufaidah (2026) in the West Java property industry, with a nearly identical magnitude of effect. The consistency across different geographic contexts indicates that the role of competitive advantage in driving performance is a robust pattern in the Indonesian property industry, supporting the view that developers building conceptual uniqueness, reputation, and added product value achieve superior performance.

H6: Mediation of Competitive Advantage on Innovation Capability and Business Performance

Competitive advantage demonstrates indirect-only mediation, also referred to as full mediation, in the relationship between innovation capability and business performance. The combination of an insignificant direct relationship and a significant indirect path completely validates this specific mediation model (Hair et al., 2021), indicating that the contribution of innovation capability to business performance is realized only through the formation of competitive advantage as the transmission mechanism. However, the high VIF value on the IC → BP path indicates that the interpretation of the direct path should be made with care due to the conceptual proximity between innovation capability and competitive advantage. The finding strengthens the central RBV proposition that superior internal resources do not automatically generate superior performance, but must pass through a conversion process into a market-recognized position (Barney et al., 2021). The result also complements Pauziah and Rufaidah (2026), who tested competitive advantage as a moderator without finding support, by providing empirical evidence that competitive advantage is more appropriately positioned as a mediator.

H7: Mediation of Competitive Advantage on Green Innovation and Business Performance

Competitive advantage does not mediate the relationship between green innovation and business performance. Combined with the non-significant direct effect in H4, this pattern reflects no-effect non-mediation, in which both direct and indirect effects are not significant. The contrast with H6 highlights that the mediating mechanism of competitive advantage works effectively only when internal resources have sufficient market visibility. Green innovation that remains hidden, implemented at the operational level but not communicated strategically or valued by consumers as a differentiator, cannot benefit from this mediation pathway. The strategic implication is that as long as the industry ecosystem does not support systematic green innovation adoption and the market does not show willingness to pay for sustainability attributes, the transmission of green innovation into business performance through competitive advantage cannot occur.

Theoretical and Practical Implications

Theoretically, this study contributes by empirically demonstrating indirect-only mediation of competitive advantage between innovation capability and business performance, while enriching NRBV with evidence of the contextual limitations of the green innovation proposition in regional non-metropolitan markets. Three practical recommendations follow for DIY property developers. First, investment in innovation capability should be directed toward market-perceived differentiation rather than isolated internal development. Second, green innovation implementation should be transformed from regulatory compliance into a substantive differentiation strategy, supported by market education and policy backing to overcome cost barriers. Third, developers should focus on building competitive advantage along dimensions relevant to the DIY market, namely housing concept uniqueness, developer reputation, price competitiveness, and added value that is difficult to imitate.

CONCLUSION

This study examined the effects of innovation capability and green innovation on business performance through the mediation of competitive advantage in the property industry in DIY. The testing of seven hypotheses shows that innovation capability has a significant effect on competitive advantage (H1), competitive advantage has a significant effect on business performance (H5), and competitive advantage demonstrates indirect-only mediation (also referred to as full mediation) in the relationship between innovation capability and business performance (H6). Green innovation, on the other hand, exhibits

no significant influence on competitive advantage or business performance, and the mediated pathway reflects no-effect non-mediation. The direct effect of innovation capability on business performance is also not significant, which is consistent with the indirect-only mediation pattern.

Theoretically, these findings confirm the central argument of the RBV that internal resources produce superior performance only when converted into competitive advantage. They also show that the NRBV argument on green innovation requires external support to operate, namely market readiness, policy support, and an enabling industry ecosystem, which are not yet fully developed in the DIY property market. Practically, because competitive advantage rather than innovation alone drives performance, developers should not present green features as purely technical specifications but should translate them into value that buyers can perceive directly, such as quantified electricity and water cost savings, thermal comfort, and estate reputation communicated in marketing materials. For policymakers, the absence of any Greenship certified landed housing in DIY implies that support should target the cost barrier specifically, through subsidized or simplified green building certification, consumer education campaigns on the long-term value of sustainable housing, and incentives that strengthen the supply chain for green building materials. For developer associations, a practical green housing guideline tailored to mid-scale developers would help standardize affordable green practices and lower the entry threshold for sustainable construction. These practical recommendations should primarily be interpreted within the context of regional landed housing developers operating in DIY, where the institutional environment and market characteristics differ from those of larger metropolitan property markets.

LIMITATION

This study has five main limitations. First, the geographic scope is limited to the DIY property industry with landed housing projects as the unit of analysis, so generalization to other contexts requires care. Second, the HTMT value between innovation capability and green innovation reached 0.935, above the conservative 0.90 threshold (Henseler et al., 2015); several re-modeling approaches were explored without resolving the pattern, suggesting that the empirical link may reflect structural characteristics of the DIY market and is acknowledged as a discriminant validity limitation. Third, the inner model VIF on the IC → BP path exceeded 5.0 (Hair et al., 2021), indicating potential collinearity that limits the interpretation of direct effects and requires cautious interpretation of the mediation results. The high HTMT and VIF values may reflect substantive overlap among strategic capability constructs in DIY developer practice, although potential measurement and collinearity issues cannot be ruled out. Fourth, the informed-respondent design allowed one respondent to provide responses for more than one project within their area of knowledge and responsibility, which may introduce within-respondent dependency despite the requirement to evaluate each project separately. Fifth, the cross-sectional design cannot capture the long-term dynamics of innovation effects on performance, especially given the long property project cycle.

Future research is encouraged to develop longitudinal designs to capture the temporal dynamics among innovation, competitive advantage, and business performance while addressing the methodological limitations identified in this study, particularly the conceptual proximity among strategic capability constructs and potential structural collinearity. Replication in regions with higher levels of green innovation adoption, such as Jakarta, Surabaya, and Bali, would further strengthen the external validity of the findings. Modeling green innovation as a higher-order dimension of innovation capability and incorporating contextual variables such as sustainability regulation, market education, and public policy support may also provide a more comprehensive

understanding of how environmental innovation translates into competitive advantage and business performance.

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DECLARATION OF CONFLICTING INTERESTS

The authors declare that there is no conflict of interest in the research, authorship, and/or publication of this article.

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