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Market Segmentation, Targeting, And Positioning Strategy For An Innovative Sustainable Product: A Case Study Of Poreblock By Reservoair

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Abstract

The escalating frequency of urban flooding necessitates the adoption of sustainable infrastructure innovations, such as permeable pavements (Poreblock). However, commercialization within Business-to-Business (B2B) construction markets remains stagnant due to the complex dynamics of multipolar Decision-Making Units (DMUs), cost sensitivity, and high epistemic thresholds. This study aims to develop an evidence-based Segmentation, Targeting, and Positioning (STP) strategy for sustainable materials in Indonesia. Employing a mixed-methods design, quantitative data from construction professionals were analyzed using Exploratory Factor Analysis (EFA) and K-Means Clustering, complemented by qualitative stakeholder interviews. The analysis identified three distinct behavioral segments: Performance-Oriented Decision Makers (gatekeeping architects with rigorous empirical demands), Sustainability-Driven Project Implementers (the primary target, pragmatically driven by green-building compliance), and Balanced Urban Developers (a bureaucracy-bound majority). The findings reveal that organizational governance and project compliance mandates are significantly stronger predictors of adoption readiness than traditional occupational demographics. To overcome the substantial upfront price premium of sustainable materials, this study recommends a positioning pivot from generic environmental messaging to Life-Cycle Costing (LCC) and Total Cost of Ownership (TCO). This research contributes to B2B marketing and Diffusion of Innovation literature by empirically contextualizing behavioral segmentation within project-based, risk-averse purchasing ecosystems.

Keywords: B2B Marketing; Market Segmentation; Decision-Making Unit (DMU); Sustainable Infrastructure; Life-Cycle Costing (LCC); Diffusion of Innovation.

A. INTRODUCTION

Rapid urbanization across Indonesian metropolitan areas has severely diminished natural land permeability, amplifying surface runoff and exacerbating the frequency of localized urban flooding. While permeable pavement technologies have demonstrated significant potential to reduce surface runoff and enhance infiltration, translating these sustainable innovations from laboratory and pilot demonstrations into widespread market adoption has proven uneven across project contexts.

A sizable body of stakeholder-focused research indicates that the commercialization barriers for sustainable construction technologies are predominantly driven by market factors—specifically risk perception, cost sensitivity, and fragmented decision-making—rather than intrinsic technical constraints (Barros et al., 2023; Emeka et al., 2024; Movaffaghi & Yitmen, 2023; Zhan et al., 2024). In business-to-business (B2B) construction markets, purchasing decisions rarely rely on a single buyer's preferences; rather, they involve a constellation of professionals, including architects, engineers, contractors, and developers. These decision-making units prioritize reliability, accountability, and long-term performance over isolated environmental benefits (Barros et al., 2023; Emeka et al., 2024; Zhan et al., 2024). Consequently, successful adoption requires strategies that address the complex decision-making ecology of projects, acknowledging how information flows and how specifications are generated and enforced across the design-to-build life-cycle (Uusitalo et al., 2024; Xie et al., 2024).

Poreblock, a locally developed permeable paving solution in Indonesia, exemplifies this challenge of commercialization. Despite demonstrating robust technical performance in testing environments, its market trajectory has been hampered by a lack of systematic market segmentation. The prevailing marketing approach has indiscriminately targeted architects and contractors without explicit segmentation by behavioral or organizational traits. As a result, Poreblock is frequently subjected to direct initial-price comparisons against traditional paving options, rather than being holistically evaluated on long-term performance, maintenance implications, and life-cycle economics. This misalignment aligns with broader

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findings in the literature, which emphasize that overcoming market barriers requires value propositions that are strictly aligned with the diverse incentives of asset owners, designers, and operators (Barros et al., 2023; Zhan et al., 2024, 2025).

To bridge this gap between the literature and practice, this study aims to develop an evidence-based Segmentation, Targeting, and Positioning (STP) strategy tailored for sustainable infrastructure innovations, using Poreblock as the primary case study. Specifically, this research investigates the variance in adoption readiness across professional groups, identifies high-priority targets based on their influence over specifications and life-cycle expectations, and formulates a value-based positioning strategy aligned with organizational buying behaviors. By integrating actor-centered segmentation and diffusion theories, this study contributes to B2B marketing literature by providing a contextualized framework that facilitates the commercialization of sustainable technologies within complex, project-based markets.

B. LITERATURE REVIEW

B2B Market Segmentation and Organizational

The Segmentation, Targeting, and Positioning (STP) framework serves as the foundational architecture for strategic marketing, enabling firms to navigate market heterogeneity through highly differentiated value propositions. Within Business-to-Business (B2B) contexts, traditional one-dimensional demographic segmentation paradigms are largely insufficient, as buyer behavior is shaped by complex procurement routines and multiple decision-makers rather than a single consumer persona (Andersson et al., 2024; Bilro et al., 2023). Instead, effective B2B segmentation necessitates a multidimensional approach that systematically incorporates firmographics, specific application scenarios, and organizational behavioral patterns (Ghosh & Dash, 2023; Neumann et al., 2023).

Unlike consumer markets, organizational buyers operate under strict rational and institutional parameters. Their evaluations are anchored on product reliability, life-cycle economic justification, and stringent risk mitigation rather than subjective preferences (Bilro et al., 2023; Chowdhury et al., 2023; Ghosh & Dash, 2023). Furthermore, the integration of digital readiness and the internal structure of the organizational buying center is increasingly critical in shaping how B2B firms segment, select, and adopt complex solutions across the project life cycle (Andersson et al., 2024; Guesalaga et al., 2024). Therefore, a robust segmentation strategy must reflect not only who buys and uses the product, but also how value is co-created and realized within the buyer's operational ecosystem.

The Decision-Making Ecology in Construction Projects

Procurement decisions within the construction industry are inherently collaborative, multipolar, and dynamic. The organizational "Buying Center" or Decision-Making Unit (DMU) is not a single buyer but a complex constellation of actors—comprising asset owners, lead architects, consulting engineers, procurement managers, and contractors—each possessing distinct epistemic needs, risk appetites, and project incentives (Aktuna & ESKİCİ, 2024; Ng et al., 2023; Woodhead et al., 2023). Asset owners and design leaders typically define high-level performance requirements and life-cycle expectations, thereby establishing the design brief that constrains subsequent procurement choices (Barros et al., 2023; Ng et al., 2023). Conversely, contractors act as downstream executors and risk-sharers, influencing how design intents are translated into constructible solutions, given lead times and reliability concerns (Woodhead et al., 2023).

Crucially, material specification decisions are frequently settled during the preliminary phases of project design. Consequently, professional intermediaries—notably architects and structural engineers—function as pivotal gatekeepers in the diffusion of new technologies. The absence of explicit requirements or specifications from these design professionals is a well-documented barrier that can stall the procurement of novel solutions (Barros et al., 2023; Kaewunruen et al., 2024). Furthermore, the evolving landscape of project delivery methods (e.g., Integrated Project Delivery and early contractor involvement) and the adoption of digital information brokers, such as Building Information Modeling (BIM) platforms, significantly alter how information flows and decision rights are allocated across the DMU (Abdalla et al., 2023; Gu et al., 2023; Wang & Chen, 2024). Effective targeting strategies must therefore account meticulously for hierarchical authority, the alignment of stakeholder incentives, and the specific

gatekeeping roles these actors occupy within the project's purchasing ecosystem (Abe et al., 2023; Uusitalo et al., 2024).

Positioning Sustainable Innovations through Performance Value

In B2B construction markets, the successful diffusion of sustainable innovations fundamentally hinges on reframing environmental attributes into measurable project value. According to Diffusion of Innovation (DOI) theory, adoption accelerates significantly when perceived benefits are tangible, verifiable, and economically justifiable, rather than when products merely satisfy normative environmental standards (Kohlbeck et al., 2023; Pourreza et al., 2024; Yarahmadi & Asadi, 2025). The contemporary literature on life-cycle economics and Product-Service Systems (PSS) further substantiates that long-term value—specifically operating efficiency, maintenance reductions, and life-cycle affordability—dictates organizational decision-making more profoundly than upfront green credentials alone (Kohlbeck et al., 2023; Leszczyński & De-León Almaraz, 2024).

Consequently, a robust positioning strategy must transcend generic sustainability claims. It must actively translate environmental features into concrete performance metrics, such as Life-Cycle Cost (LCC) optimization and structural reliability, tailored to the risk-averse, multi-actor Buying Centers typical of construction projects (Cardinali et al., 2024; Chowdhury et al., 2023; Homburg & Tischer, 2023). To effectively penetrate the DMU, value propositions must be co-created and meticulously aligned with specific stakeholder mandates (Johnston, 2023; Septyana & Saragih, 2024). For asset owners and developers, positioning must emphasize life-cycle affordability, asset resilience, and total cost of ownership optimization (Pourreza et al., 2024; Yarahmadi & Asadi, 2025). Conversely, for lead designers acting as primary gatekeepers, the narrative must pivot toward design compatibility, integration with BIM-enabled workflows, and audit-friendly performance data that mitigate early-stage design uncertainties (Aamir et al., 2023; Cardinali et al., 2024; Septyana & Saragih, 2024). Ultimately, environmental messaging should structurally support, rather than substitute, a rigorous performance-based narrative.

C. METHODS

This study adopted a robust mixed-methods research design to investigate the B2B market for sustainable infrastructure innovations systematically. The primary methodology is quantitative, using survey data from construction professionals to conduct a multidimensional market segmentation analysis. To triangulate these findings and provide contextual depth, qualitative stakeholder interviews were integrated into the research process. These interviews were specifically designed to complement the quantitative results by elucidating the underlying nuances of organizational decision-making ecologies and multi-actor value perceptions regarding the adoption of permeable pavements. Given the specialized and multipolar nature of the B2B construction market, a purposive sampling strategy was strictly employed. This non-probability sampling approach ensured that the selected respondents possessed highly relevant domain expertise and held substantive roles within their respective organizational Decision-Making Units (DMUs). The inclusion criteria required participants to have active professional experience in the construction sector and direct involvement in material specification or project procurement processes. The quantitative survey instrument was meticulously structured to capture the behavioral and organizational dimensions critical to sustainable innovation diffusion. The measurement items operationalized five key latent constructs: (1) flooding awareness perceptions, (2) perceived attributes of permeable pavements, (3) innovation adoption intentions, (4) organizational purchasing behavior, and (5) multidimensional value perceptions.

D. RESULTS AND DISCUSSION

Measurement Validation and Respondent Profiling

This study engaged construction professionals occupying strategic roles within their organizations' Decision-Making Units (DMUs). As detailed in the respondent profile (Table 1), the majority of participants were Contractors (32.3%) and Architects (31.3%). This composition is highly representative,

given that these professions act as primary gatekeepers who dictate material specifications and execute projects on-site. In terms of expertise, nearly half of the respondents (48.8%) were senior practitioners with industry experience ranging from 8 to over 15 years.

Table 1. Respondent Profile Summary

Respondent Profile	Category	Amount	%
Professional Role	Contractor	63	32.3%
	Architect	61	31.3%
	Consultant	44	22.6%
	Developer	21	10.8%
	Other	6	3.0%
Specialization	Residential & Commercial	107	54.9%
	Green Building	91	46.7%
	Landscape Architecture	82	42.1%
	Public & Special Building	49	25.1%
	Road & Pavement	41	21%
	Urban Planning	33	16.9%2
	Others	5	2.5%
Average Project Scale	< IDR 10 billion	66	33.8%
	IDR 3 – 10 billion	52	26.7%
	IDR 500 million – 2 billion	48	24.6%
	< IDR 500 million	29	14.9%
Usual Project Location	Jabodetabek	52	26.7%
	West Java	45	23.1%
	Kalimantan	33	16.9%
	Central Java	31	15.9%
	Bali	24	12.3%
	East Java	5	2.6%
	Others	5	2.6%
Years of Experience	1 – 3 years	41	21%
	4 – 7 years	59	30.3%
	8 – 15 years	59	30.3%
	>15 years	36	18.5%
Material Selection Involvement	Directly Involved	101	51.8%
	Part of the Decision Team	68	34.9%
	Indirect Involvement	26	13.3%
Prior Experience with Permeable Pavement	No	63	32.3%
	Yes	132	67.7%

Source: Research data, 2026

Crucially, 86.7% of respondents reported either direct involvement (51.8%) or participation in a decision-making team (34.9%) in the material selection process. This ensures that the analyzed data precisely reflects real-world Business-to-Business (B2B) procurement behavior. Furthermore, 67.7% of the participants had prior experience with permeable pavement systems. This level of prior exposure indicates that the respondents possess adequate technical literacy to objectively evaluate the product attributes and performance value of sustainable infrastructure innovations.

Prior to conducting the market segmentation analysis, the reliability and validity of the measurement instruments were rigorously evaluated. The reliability test demonstrated that all constructs possessed robust internal consistency, with Cronbach's Alpha values ranging from 0.869 to 0.920 (Table 2). These values substantially exceed the minimum thresholds recommended in statistical literature.

Table 2. Reliability Test Result

Item	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Flooding Awareness	.879	.879	2
Perceived Attribute of Permeable Pavement	.869	.869	2
Innovation Adoption	.920	.921	5

Item	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Organizational Buying Behavior	.902	.902	4
Value Perception	.874	.875	3

Source: Research data, 2026

Subsequently, instrument validity was assessed using the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. The analysis revealed high sample adequacy, yielding a KMO value of 0.789. Bartlett's test also produced highly statistically significant results (χ^2 = 1915.683, $p < 0.001$) (Table 3). These test outcomes definitively validate the questionnaire's multidimensional construct structure, confirming that the dataset is highly suitable for data reduction via Exploratory Factor Analysis (EFA) as a foundational step for market segmentation clustering.

Table 3. Validity Test Result

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.789
Bartlett's Test of Sphericity	Approx. Chi-Square	1915.683
	df.	120
	Sig	<.001

Source: Research data, 2026

Market Segmentation: Profiling the Decision-Making Units

The K-Means clustering analysis, using normalized factor scores from the EFA, yielded three statistically distinct market segments. These segments are delineated not merely by occupational roles but fundamentally by their organizational decision-making structures, innovation adoption readiness, and multidimensional value perceptions. The spatial distribution of these clusters is illustrated in Figure 1, mapped across two primary factorial dimensions: Value Perception & Flooding Awareness (X-axis) and Innovation Adoption Readiness (Y-axis).

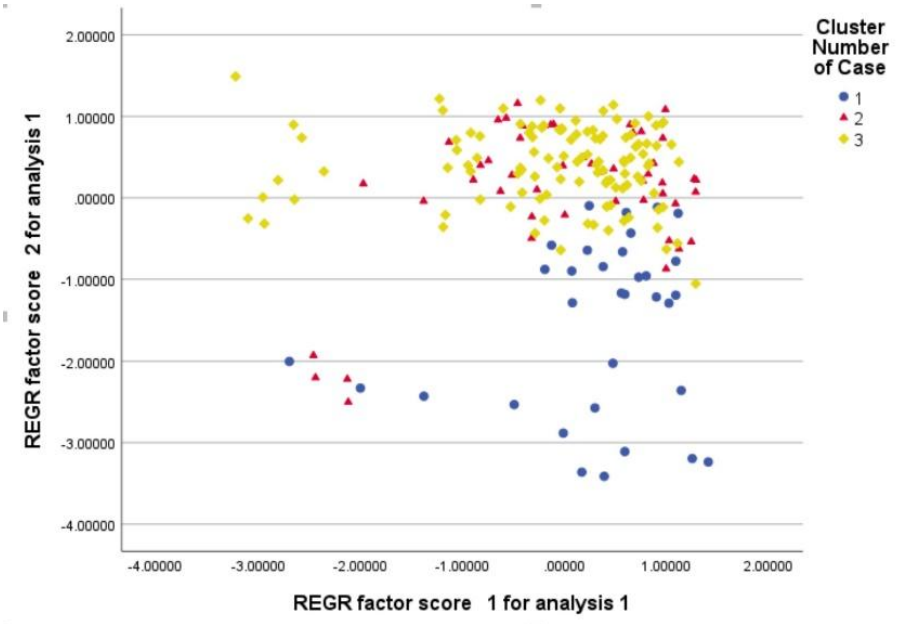

Figure 1. K-Means Scatter Plot

Source: Research data, 2026

Cluster 1: Performance-Oriented Decision Makers (16.9%)

This segment is predominantly composed of senior architects and principal consultants managing large-scale infrastructure and public projects (>IDR 10 billion). A counter-intuitive finding within this cluster is their "Low-Moderate" score for Innovation Openness. While literature often positions senior architects as "Early Adopters," this apparent conservatism is fundamentally a reflection of their

gatekeeping role within the DMU. In high-stakes infrastructure projects, these professionals are bound by strict structural liabilities, building codes, and long-term accountability. Therefore, their moderate openness does not indicate inherent resistance to sustainable technologies; rather, it indicates a high epistemic threshold. They demand rigorous, evidence-based empirical validation—such as structural integrity data and verified life-cycle performance—before integrating new materials, such as Poreblock, into their project specifications.

Cluster 2: Sustainability-Driven Project Implementers (25.6%)

Constituting a quarter of the market, this segment is dominated by mid-level contractors specializing in green buildings and commercial developments. Professionals in this cluster demonstrate a "Moderate-High" openness to innovation and a strong orientation toward sustainability. However, their position downstream in the project execution phase makes them highly sensitive to initial material costs. Their adoption logic is driven by the practical need to fulfill the environmental compliance and stormwater management criteria stipulated by project owners, forcing them to balance sustainability mandates with strict construction budgets.

Cluster 3: Balanced Urban Developers (57.4%)

Representing the largest market segment, this cluster comprises mixed professional roles (contractors, architects, and urban planners) operating within highly bureaucratic, formalized organizational settings. Decision-making within this segment is rarely autonomous; it is characterized by team-based consensus and requires multi-layered institutional validation. Consequently, while they show moderate innovation openness, the actual adoption process is protracted, heavily reliant on standardized documentation, institutional approvals, and proven historical precedents. The cross-tabulation and profiling results (summarized in Table 4) conclusively demonstrate that within B2B construction markets, behavioral traits and organizational governance structures provide a significantly more accurate predictor of adoption readiness than traditional occupational categories.

Table 4. Summary of Cluster Segmentation result

Characteristic	Cluster 1	Cluster 2	Cluster 3
Segment Name	Performance-Oriented Decision Maker	Sustainability Driven Project Implementers	Balanced Urban Developers
Segment Size	16.9%	25.6%	57.4%
Dominant Role	Architect & Consultant	Contractor	Mixed (Contractor, Architect, Planner/Consultant)
Decision Involvement	Mostly Direct	Mixed Involvement	Direct + Team
Experience Profile	Senior (>15 years)	Mid-Level (4-7 years)	Mixed Experience Level
Typical Project Scale	>IDR10 billion	IDR 5-20 billion	Mixed Scale
Specialization Focus	Infrastructure & Public	Green Building & Commercial	Residential & Urban Development
Sustainability Orientation	Moderate	High	High
Geographic Focus	Jabodetabek	Jabodetabek & West Java	Java Concentration
Innovation Openness	Low-Moderate	Moderate-High	Moderate

Source: Research data, 2026

Target Market Selection: Strategic Fit and Feasibility

In B2B construction markets, segment prioritization extends beyond numerical size; it is fundamentally predicated on contextual fit, decision-making relevance, and adoption feasibility. Based on these criteria, the three identified clusters were evaluated to formulate a strategic targeting hierarchy.

Primary Target: Cluster 2 (Sustainability-Driven Project Implementers)

Despite being the second-largest segment, Cluster 2 exhibits the highest strategic alignment with Poreblock's value proposition. Addressing a critical nuance highlighted in their behavioral profile, this segment is labeled "Sustainability-Driven" not necessarily due to altruistic environmental ethics, but

rather because these professionals operate within project ecosystems that mandate strict environmental compliance and green building certifications. Consequently, their adoption of permeable pavements is driven by the pragmatic necessity to fulfill stringent stormwater management and functional performance criteria. While they exhibit front-end cost sensitivity, their project environments compel them to adopt solutions that guarantee structural and environmental performance. By prioritizing this segment, Poreblock can enter markets where sustainable compliance is already institutionalized, thereby bypassing initial resistance to new decision-making criteria.

Secondary Target: Cluster 1 (Performance-Oriented Decision Makers)

Although representing the smallest numerical segment, Cluster 1 holds disproportionate influence within the organizational Decision-Making Unit (DMU). Comprising senior architects and principal consultants, these actors function as primary gatekeepers who dictate initial material specifications during the preliminary design phases. Targeting this segment is strategically imperative because integrating Poreblock into the early design brief systematically secures downstream procurement. Since sustainability orientation is secondary to performance in this segment, marketing efforts must strictly emphasize verifiable empirical data and technical reliability.

Long-Term Market Development: Cluster 3 (Balanced Urban Developers)

While Cluster 3 accounts for the majority of the market (57.4%), it has the lowest immediate targeting priority. The formalization and bureaucratic rigidity that characterize their organizational decision-making processes inherently slow innovation adoption. Procurement in this segment necessitates multi-layered institutional validation, extensive documentation, and historical precedent. Therefore, Cluster 3 is strategically positioned as a long-term development market that will naturally be penetrated once Poreblock establishes a substantial portfolio of successful implementations across primary and secondary targets.

Positioning Strategy: Communicating Life-Cycle Cost and Performance Value

To effectively penetrate the targeted segments, Poreblock's positioning strategy must decisively address the commercial realities of the B2B construction market. As detailed in the Competitor Analysis (Table 5), Poreblock faces a formidable adoption barrier due to its initial capital expenditure. The product's upfront procurement cost (IDR 180,000–300,000 per square meter) is approximately twice that of conventional non-permeable pavement alternatives (IDR 90,000–120,000 per square meter). In cost-sensitive project environments, positioning Poreblock as merely an "environmentally friendly" alternative is entirely insufficient to justify the substantial price premium to organizational buyers.

Table 5. Competitor Analysis

Aspect	Conventional Pavement	Grass Block	Poreblock (Permeable Pavement)
Primary Application	Parking, residential roads, pedestrian areas	Landscape area, parking lots	Town square, urban area, public spaces
Water Infiltration Capacity	None (impermeable surface)	Partial infiltration through the grass void	High infiltration through a porous concrete structure
Estimated Market Price	IDR 90.000 – 120.000 / m^2	IDR 120.000 –180.000 / m^2	IDR 180.000 – 300.000 / m^2 (depending on specification)
Structural Strength	High compressive strength	Moderate (void reduces load strength)	High (engineered porous concrete)
Maintenance Requirement	Low	Moderate (grass maintenance)	Low

Source: Research data, 2026

To overcome this initial price disparity, the marketing communication must pivot from upfront procurement costs to Life-Cycle Cost (LCC) and Total Cost of Ownership (TCO). The value proposition must systematically demonstrate that Poreblock's higher initial price is neutralized by its long-term economic and functional benefits. The communication strategy should explicitly highlight deferred financial savings, such as prolonged structural durability, significantly reduced maintenance frequencies, and the mitigation of secondary infrastructure damage—for instance, preventing the degradation of

surrounding asphalt caused by surface water pooling. By translating these engineering advantages into financial metrics, Poreblock can be positioned not as an expensive green material, but as a financially superior, risk-mitigating investment over a 5- to 10-year operational horizon.

Furthermore, this LCC-centric positioning must be tailored to resonate with the specific roles within the Decision-Making Unit (DMU). For the primary target (Cluster 2: Sustainability-Driven Project Implementers), LCC data provides the necessary financial justification to balance strict green-building compliance with stringent project budgets. For the secondary target (Cluster 1: Performance-Oriented Decision Makers), providing empirical LCC analyses and verifiable durability metrics directly satisfies their elevated epistemic thresholds. By equipping these gatekeeping architects and lead engineers with robust financial and performance data, Reservoair enables them to confidently defend the specification of a premium product to highly rational asset owners and developers.

Discussion

The empirical findings of this study fundamentally challenge the conventional assumption that the slow market penetration of sustainable infrastructure innovations, such as Poreblock, is primarily due to technological skepticism or a lack of environmental awareness. Instead, the segmentation analysis reveals that the primary barriers are deeply embedded within the organizational Decision-Making Units (DMUs) and their structurally misaligned evaluation metrics. By identifying three distinct behavioral segments—Performance-Oriented Decision Makers, Sustainability-Driven Project Implementers, and Balanced Urban Developers—this study demonstrates that adoption readiness is dictated by organizational governance, structural liabilities, and compliance mandates rather than individual occupational roles. For instance, the "Low-Moderate" innovation openness among senior architects (Cluster 1) is not indicative of conservatism but rather highlights an elevated epistemic threshold necessitated by strict building codes and accountability requirements. Furthermore, the strategic prioritization of Cluster 2 (Sustainability-Driven Project Implementers) demystifies the "environmental paradox" in B2B markets: sustainability is adopted not solely out of ecological altruism, but as a pragmatic functional response to institutionalized green-building compliance and stormwater management mandates. Ultimately, overcoming the substantial upfront cost barrier (a 2x price premium over conventional paving) requires a paradigm shift from transactional pricing to Life-Cycle Costing (LCC), aligning the innovation's long-term performance value with the risk-averse financial logic of the DMU.

Theoretical Implications

This research makes two distinct contributions to the existing literature on Business-to-Business (B2B) marketing and the Diffusion of Innovation (DOI) within project-based industries. First, it advances B2B market segmentation theory by empirically demonstrating that multidimensional behavioral and organizational traits (e.g., procurement bureaucracy, decision-making autonomy, and project compliance requirements) are significantly stronger predictors of innovation adoption than traditional occupational or demographic categories. Second, it enriches DOI theory by contextualizing it within the multipolar DMU of the construction sector. The study posits that the diffusion of sustainable materials is not an individual cognitive process but a negotiated, multi-actor consensus in which the innovation must simultaneously satisfy the structural rigor demanded by gatekeeping architects and the cost-efficiency required by implementing contractors.

Managerial Implications

For Reservoair and other sustainable material innovators, these findings provide a highly actionable, evidence-based commercialization playbook. The predominant marketing strategy—which relies heavily on generic environmental messaging and direct, upfront price comparisons—must be restructured immediately. Management should pivot towards role-specific, value-based positioning. For the primary target (Cluster 2 contractors), marketing collateral should transition from "environmental awareness brochures" to empirical "ROI and Life-Cycle Cost (LCC) Calculators." These tools must quantify, in financial terms, how Poreblock's durability and reduction in secondary infrastructure damage offset its initial procurement costs. For the secondary target (Cluster 1 architects), engagement should strictly focus on providing audit-friendly structural integrity data, BIM-compatible specifications, and proven pilot

precedents to lower their perceived risk and facilitate the inclusion of Poreblock into early-stage design briefs.

Limitations and Future Directions

While the mixed-methods approach and behavioral segmentation provide a robust foundation for this study, several limitations must be acknowledged. First, the quantitative survey is cross-sectional, capturing adoption readiness at a single point in time. The construction industry's perception of sustainable materials is highly dynamic; thus, future research should employ longitudinal designs to track how post-installation performance and inter-organizational word-of-mouth influence subsequent adoption rates over time. Second, the empirical context is geographically bounded to the Indonesian construction sector. While the behavioral DMU dynamics are theoretically generalizable, the specific regulatory incentives and green-building mandates vary across borders. Future studies should test this multidimensional segmentation framework in different emerging markets to validate its cross-cultural robustness and adaptability.

E. CONCLUSIONS

This study addresses the persistent stagnation in the commercialization of sustainable infrastructure innovations in emerging markets, using Poreblock as a primary case study. Through a mixed-methods investigation of B2B construction professionals, this research establishes that the sluggish adoption of permeable pavements is not rooted in technological deficiencies, but rather in the complex, risk-averse dynamics of multipolar Decision-Making Units (DMUs). The empirical findings conclusively demonstrate that multidimensional behavioral traits—such as organizational governance, project compliance mandates, and specific gatekeeping roles—provide a vastly superior basis for market segmentation compared to traditional occupational demographics.

By delineating the market into three distinct clusters, this study identifies Sustainability-Driven Project Implementers as the primary target due to their immediate need for functional compliance in green-building ecosystems, while recognizing senior Performance-Oriented Decision Makers as critical gatekeepers who dictate early-stage specifications. Crucially, to overcome the substantial upfront price premium inherent to sustainable materials, innovators must abandon generic environmental messaging. The positioning strategy must execute a definitive paradigm shift toward Life-Cycle Costing (LCC) and total cost of ownership. By translating environmental attributes into verifiable financial and structural performance metrics, sustainable infrastructure can satisfy the rigorous empirical thresholds of B2B buying centers, thereby bridging the gap between ecological innovation and commercial viability.

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