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From Physical to Digital: Rethinking Scale Models in Malaysian Property Marketing

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Abstract: *Large-scale physical models remain an important component in property sales galleries, providing potential buyers with a clear, tangible understanding of the layout, development scale, and overall design during the sales process. However, beyond their initial production time and cost, these models often create significant post-sell-out challenges for developers, particularly in storage, disposal, and logistics once the project is fully sold out. These post-sell-out challenges raise sustainability and asset-management concerns. This paper adopts a conceptual approach to examine the full lifecycle implications of physical scale models and to explore digital and hybrid alternatives as viable solutions in the Malaysian property marketing context. The study focuses on how different scale model approaches influence operational flexibility, long-term usability, and buyer experience. Drawing on technology adoption and consumer behaviour perspectives, the paper proposes a conceptual framework linking scale-model type to perceived usefulness, clarity of presentation, trust, and marketing outcomes. The paper further argues that hybrid approaches combining selective physical elements with interactive digital visualization may offer a practical way for developers to deliver experiential value while reducing post-sell-out burdens. This study contributes conceptually by integrating asset lifecycle considerations into discussions of virtual scale models in property marketing and practically by offering decision-support guidance for developers when selecting between physical, digital, and hybrid strategies. The paper also aligns with Sustainable Development Goal 11 (Sustainable Cities and Communities) by emphasizing sustainable asset management practices and reducing material waste in real estate marketing environments.*

Keywords: Physical Scale Models; Hybrid Visualization; Digital Twins; Asset Lifecycle Management; Property Marketing; Malaysia; Proptech; SDG 11

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1. Introduction

Digital transformation is increasingly reshaping real estate practices in Malaysia, with property technology (PropTech) influencing how buyers discover, evaluate, and decide on properties across physical and digital touchpoints (Al-haimi et al., 2025; Hartamas, 2025). Within this evolving landscape, sales galleries continue to rely heavily on large physical scale models as a central visual tool to present development layout, scale of project, overall design intent, project location, nearby amenities, and future development around the project. These models remain valued for their tangible presence and for their ability to support buyer confidence during early decision-making stages, particularly for large or mixed-use developments.

Despite their effectiveness during the sales phase, physical scale models introduce persistent challenges after the project sells out. As temporary or project-specific assets, they are subject to functional redundancy, storage burden, and end-of-life disposal costs, issues that are widely recognized in lifecycle costing and circular economy research within the built environment (Langston, 2008; Pomponi & Moncaster, 2017; ISO, 2017). Developers must often manage storage, maintenance, or disposal of these models, each of which incurs additional costs, space constraints, and operational complexity. In Malaysia's fast-moving and highly competitive property market, as new projects emerge and showroom spaces are renovated, existing models become obsolete.

In response to these challenges, digital twins and hybrid visualisation configurations are gaining attention as realistic alternatives to full-scale physical models. Digital twins provide scalable and updatable representations that can be reused across projects and marketing channels, reducing reliance on repeated physical fabrication and easing post-sell disposition concerns (McKinsey, 2024). Hybrid approaches combining selective physical components with digital overlays or supplementary interactive content offer a middle ground that preserves the experiential appeal of tangible models while enhancing flexibility, reach, and long-term usability (Chen et al., 2024). These approaches reflect broader industry efforts to adopt more sustainable, data-informed visualisation practices and to support clearer, buyer-centred decision-making processes in urban property markets.

While digital transformation and PropTech adoption in real estate have received increasing scholarly attention (Al-haimi et al., 2025; Naeem, 2023), and digital twin applications in the built environment are widely reviewed (Liu et al., 2024; Mousavi et al., 2024), limited research has examined how Malaysian developers strategically evaluate physical, digital, or hybrid scale-model configurations from a lifecycle and post–sell-out perspective.

Accordingly, this paper adopts a conceptual stance to examine the challenges associated with large physical scale models in Malaysian sales galleries and to evaluate the potential of digital twins and hybrid configurations as practical pathways forward. Based on recent industry and academic insights (Al-haimi et al., 2025; Hartamas, 2025; Naeem, 2023), this study examines how fidelity, interactivity, and representation choices influence buyers' perceptions, engagement, and decision-making. The paper further outlines evaluative criteria and a research agenda to support future empirical investigation, offering guidance for developers seeking to balance tactile credibility with scalable, sustainable digital solutions. In doing so, the study contributes to discussions on responsible asset management in property marketing and aligns with Sustainable Development Goal 11 (Sustainable Cities and Communities).

2. Literature Review

2.1 Context and scope: scale models in a transforming marketing environment

Large physical scale models have long served as effective tools for presenting development layout, massing, and finish quality within sales galleries, supporting buyer confidence during the pre-sales phase. However, once a project reaches sell-out, these assets often transition from value-generating displays to operational liabilities. Post–sell-out requirements related to storage, maintenance, disposal, and long-term asset stewardship introduce persistent logistical and sustainability challenges, particularly in fast-moving property markets (AlBalkhy et al., 2024; Moustafa et al., 2025).

At the same time, the Malaysian PropTech ecosystem is evolving rapidly, with increasing adoption of digital visualization across physical and online sales channels. Studies on digital twins in the built environment emphasize their potential to support reusable, updateable, and multi-channel representations, reducing dependence on static physical artefacts (Liu et al., 2024; Mousavi et al., 2024). These global findings highlight the relevance of lifecycle-aware visualization strategies, while also underscoring the need for Malaysia-specific frameworks that translate digital twin and hybrid concepts into local practice.

2.2 Physical scale models: value creation and post–sell-out liabilities

Physical scale models remain compelling during early sales stages due to their realistic credibility and visual clarity. However, their usefulness is often limited to a narrow temporal window. After a sell-out, developers must choose between continued storage, repurposing, or disposal, each carrying financial, spatial, and environmental costs. In Malaysia's dense showroom ecosystems, where projects turn over quickly and space is at a premium, these burdens are magnified by the size, fragility, and project-specific nature of large-scale models (Digital twins in built environment reviews, 2024; Malaysian digital twin in real estate, 2025). From an asset management perspective, the absence of a defined post–sell-out strategy exposes inefficiencies in how marketing assets are planned and managed across their lifecycle. Research in asset lifecycle management and circular economy highlights that short-lived, project-specific physical assets often generate disproportionate waste and cost when reuse pathways are not designed in advance (Lucas & Löschke, 2025; Moustafa et al., 2025).

2.3 Asset lifecycle thinking and post–sell-out pathways

Asset lifecycle management literature emphasizes the importance of planning end-of-life pathways during the early design stage to minimize waste and maximize value retention (Gurusinghe et al., 2025). Applied to sales gallery scale models, lifecycle thinking foregrounds a critical post–sale–out decision point. Developers typically follow one of four pathways: continued storage, repurposing, disposal or recycling, or conversion to digital or hybrid formats. Storage preserves the asset but incurs ongoing costs and space constraints; repurposing can extend use but is often limited by scale and specificity; disposal resolves space issues but raises sustainability concerns. Digital conversion or hybrid continuation, by contrast, enables informational and branding value to be retained without maintaining the physical asset.

Circular economy research reinforces the importance of reducing single-use assets and designing systems for reuse and adaptability (Circular economy overview, 2025). Within marketing environments, studies from retail and in-store management similarly highlight how extending asset lifecycles contributes to both cost efficiency and sustainability outcomes (Sustainability in retail/in-store management perspective, 2021). These insights strengthen the argument for reconsidering how scale models are planned, deployed, and retired within property sales galleries.

Table 1: Post–Sell-Out Lifecycle Pathways of Scale Model Strategies

Scale Model Strategy	Typical Post–Sell-Out Pathway	Operational Implications	Sustainability Implications
Physical	Storage / Disposal	Space constraints; recurring costs	Material waste; low reuse
Digital	Digital continuation / reuse	High flexibility; low physical burden	Minimal material impact
Hybrid	Partial retention + digital reuse	Moderate cost; adaptable	Reduced waste; extended lifecycle

2.4 Digital twins and digital visualization as lifecycle-efficient alternatives

Digital twins and advanced digital visualization tools offer scalable, updatable representations that can be reused across campaigns, showrooms, and online platforms. Their core advantages, ease of updating, multi-channel deployment, and reduced material dependency, directly address the post–sell-out challenges associated with physical models (Digital twins in built environment reviews, 2024; Malaysian digital twin in real estate, 2025). In practice, digital twins support in-gallery displays, online portals, and mobile experiences simultaneously, allowing developers to adapt content as projects evolve without reconstructing physical assets. Empirical studies on immersive visualization technologies further suggest that interactive digital representations can enhance clarity, perceived usefulness, and decision confidence when designed with appropriate fidelity and cognitive load (Hsiao et al., 2024; Lin et al., 2025).

From a sustainability and asset management perspective, digital representations reduce material waste, lower storage requirements, and support more responsible stewardship of marketing resources (McKinsey & Company, 2024; Chen et al., 2024; Naeem, 2023). While much of the digital twin literature focuses on operational buildings, the underlying lifecycle logic is directly transferable to sales gallery visualization assets.

2.5 Hybrid visualization as a pragmatic middle ground

Rather than positioning digital solutions as full replacements, hybrid visualization approaches integrate selective physical components with digital overlays or interactive content. Reported configurations in practice include physical models linked to tablet-controlled lighting systems, augmented reality overlays that display interior or phased development views, projection mapping onto massing models, and touch-sensitive physical models that trigger digital information displays. These configurations preserve key tactile cues while shifting repeatable, updateable information to digital layers.

Hybrid visualization approaches are supported by research on tangible user interfaces, which demonstrates that combining physical artefacts with digital information can improve understanding, trust, and interaction quality compared to purely physical or purely digital interfaces (Shaer & Hornecker, 2010).

2.6 Sustainability and buyer behaviour in Malaysia

Sustainability considerations increasingly shape decisions around marketing assets. Malaysia's Circular Economy Policy Framework signals national commitment to waste reduction, material stewardship, and sustainable procurement across sectors, including the built environment (MITI, Malaysia Circular Economy Policy Framework, n.d.). Within this policy context, digital twins and hybrid visualization approaches can be framed as enablers of sustainable asset management, supporting reuse, reducing physical waste, and facilitating data-driven decision-making (Naeem, 2023).

Buyer behaviour in Malaysia reflects a hybrid preference structure: tangible, in-person demonstrations remain important for credibility, while digital tools support convenience, comparison, and remote engagement. Hybrid visualization strategies align well with these preferences by combining physical presence with scalable digital access, reducing lifecycle risk while supporting evolving buyer journeys (Hartamas, 2025; McKinsey & Company, 2024).

Circular economy and sustainable building research increasingly emphasize reducing single-use physical artefacts and extending asset lifecycles through adaptability and digital substitution, particularly in temporary or marketing-driven environments (Lucas & Löschke, 2025; Moustafa et al., 2025).

2.7 Gaps in the literature and opportunities for Malaysia

Despite growing global literature on digital twins and hybrid visualization, Malaysia-focused research examining post–sell-out lifecycle challenges of physical scale models remains limited. Existing studies rarely provide concrete evaluation criteria or decision frameworks for selecting between physical, digital, and hybrid approaches in sales gallery contexts. There is a clear opportunity for empirical work, through case studies, pilot deployments, and field data, to examine how lifecycle impact, buyer engagement, governance, and sustainability outcomes interact in practice. A pragmatic, lifecycle-oriented framework tailored to Malaysia would offer significant value to developers, policymakers, and PropTech stakeholders (Malaysian digital twin in real estate, 2025; Digital twins in built environment reviews, 2024).

3. Conceptual Framework

This study proposes a four-stage framework linking Scale Model Strategy (SMS), Post–Sell-Out Lifecycle Pathway (PSOLP), Buyer Experience and Marketing Outcomes (BEMO), and Strategic and Sustainability Outcomes (SSO). The framework conceptualizes scale-model decisions as lifecycle-sensitive strategic choices rather than isolated marketing tools.

The first stage, Scale Model Strategy (SMS), refers to the developer's choice among physical, digital, or hybrid scale-model configurations. This decision shapes the second stage, Post–Sell-Out Lifecycle Pathway (PSOLP), which captures how the asset is managed after project completion, whether through storage, disposal, repurposing, or digital continuation.

These lifecycle implications influence Buyer Experience and Marketing Outcomes (BEMO), including information clarity, engagement levels, and perceived credibility. In turn, sustained buyer experience effects and lifecycle efficiency contribute to broader Strategic and Sustainability Outcomes (SSO), such as cost management, resource optimization, and alignment with sustainability objectives.

Importantly, the relationships across these stages are expected to be moderated by contextual factors, including project type, showroom size, and buyer segment. Together, the framework provides a structured lens for evaluating visualization strategies across their full lifecycle rather than solely during the pre-sales phase.

Figure 1: Scale Model Strategy–Post–Sell-Out Lifecycle–Buyer Experience–Sustainability Framework for Malaysian Property Marketing

4. Propositions and Research Questions

Drawing on the conceptual framework, this study advances a set of propositions to guide future empirical investigation into scale-model strategies in Malaysian property sales galleries.

P1: Digital and hybrid scale-model configurations are likely to reduce post–sell-out storage, disposal, and maintenance burdens relative to large physical scale models in Malaysian sales galleries.

P2: Hybrid scale-model configurations may preserve tactile credibility while enabling greater reuse and reach across marketing campaigns and channels.

P3: Higher representational fidelity in digital and hybrid configurations is expected to be positively associated with buyer engagement, perceived clarity, and trust.

P4: Project characteristics, such as development type and showroom scale, are likely to moderate the relative effectiveness of physical, digital, and hybrid scale-model approaches.

P5: Sustainability framing, particularly in relation to Sustainable Development Goal 11 (Sustainable Cities and Communities), may positively influence buyer perception and developer adoption of digital and hybrid scale-model configurations.

The following section outlines a conceptual methodological approach for how these propositions may be empirically examined in future research within the Malaysian PropTech context.

5. Methodology

5.1 Nature of the Study

This study adopts a conceptual, theory-building approach. It synthesizes Malaysia-focused contextual insights with international literature on digital twins, hybrid visualization, and sustainability in the built environment to develop a lifecycle-oriented, four-stage framework for scale-model use in property marketing. No primary data collection, experiments, or mixed-methods analyses are conducted in this manuscript.

The objective of the study is threefold: (1) to articulate a coherent conceptual framework linking scale-model strategy to post–sell-out lifecycle implications, buyer experience, and sustainability outcomes; (2) to map a set of clear, testable propositions (P1–P5) to this framework; and (3) to outline rigorous pathways for future empirical validation within Malaysia's evolving PropTech ecosystem. This approach is appropriate for an emerging research area where theoretical integration is still developing and where Malaysia-specific empirical evidence remains limited.

5.2 Framework and Core Constructs

The proposed framework links four sequential constructs: Scale Model Strategy (SMS), Post–Sell-Out Lifecycle Pathway (PSOLP), Buyer Experience and Marketing Outcomes (BEMO), and Strategic and Sustainability Outcomes (SSO). The relationships among these constructs are shaped by a set of **moderating factors**, namely project type, showroom size, and buyer segment.

Together, these constructs form the analytical backbone of the framework and guide the formulation of propositions and future empirical testing strategies. The five propositions (P1–P5) are embedded within the conceptual narrative to clarify expected relationships and boundary conditions.

5.3 Propositions for Future Empirical Testing

The following propositions are advanced to guide subsequent empirical investigation:

P1: In Malaysian sales galleries, digital twins and hybrid scale-model configurations are likely to reduce post–sell-out storage and disposal burdens relative to purely physical scale models.

P2: Hybrid configurations are expected to preserve tactile credibility while enabling reuse and updates across projects, thereby reducing lifecycle burden.

P3: Higher representational fidelity in digital and hybrid configurations is expected to improve buyer clarity and perceived credibility, leading to stronger engagement and inquiry likelihood.

P4: Project characteristics, including development type (e.g., luxury versus mass-market) and showroom size, are likely to moderate the relationships proposed in P1–P3.

P5: Framing scale-model strategies around sustainability principles aligned with Sustainable Development Goal 11 may enhance buyer perceptions of responsibility and willingness to engage with digital or hybrid offerings.

5.4 Future Empirical Validation Strategy

Future empirical validation of the proposed framework may adopt a multi-method design that combines qualitative and quantitative approaches within the Malaysian property context. Case-based investigations across selected developments could provide comparative insight into how physical, digital, and hybrid scale-model strategies are implemented and managed after project sell-out. Data collection may include semi-structured interviews with developers, showroom managers, and marketing professionals to understand decision criteria, operational constraints, and lifecycle considerations. Complementary survey-based studies or controlled showroom observations could assess buyer perceptions of clarity, engagement, and credibility across different visualization configurations.

Analytically, future research may employ cross-case benchmarking to identify contextual differences by project type or showroom scale, alongside lifecycle-oriented cost logic to compare storage, disposal, reuse, and digital continuation pathways. Where quantitative data are available, modeling approaches such as structural equation modeling could be used to test the relationships proposed in P1–P5 and examine moderating effects. Ethical considerations in such studies would include informed consent, data privacy, and transparent reporting of assumptions. Together, these approaches would allow for rigorous empirical examination of the framework while remaining sensitive to Malaysia's operational and regulatory environment.

5.5 Ethical Considerations and Limitations

In the present conceptual study, ethical responsibility centers on transparent reporting, careful articulation of assumptions, and avoidance of unsupported empirical claims.

A key limitation of the study is that the framework remains theoretical and context-specific to Malaysia. The generalizability of the proposed relationships to other markets should be assessed through future comparative research.

6. Conclusion and Future Research Directions

This paper proposes a Malaysia-focused conceptual framework to guide the transition from traditional physical scale models toward digital twins and hybrid visualization configurations in property marketing. By linking Scale Model Strategy to post–sell-out lifecycle pathways,

buyer experience outcomes, and broader strategic and sustainability implications (SMS → PSOLP → BEMO → SSO), the framework reframes scale models as lifecycle-bound assets rather than purely pre-sales marketing tools.

The framework suggests that digital and hybrid configurations may reduce storage and disposal burdens while preserving experiential value and enhancing buyer clarity and credibility. Hybrid strategies, in particular, offer a pragmatic balance between tactile engagement and digital scalability. By incorporating sustainability considerations aligned with SDG 11, the framework positions visualization strategy as part of responsible asset stewardship within Malaysia's evolving PropTech landscape.

Practically, the model encourages developers to evaluate visualization investments across the full project lifecycle rather than focusing solely on immediate sales impact. At a policy level, it supports alignment with circular economy principles through reuse, waste reduction, and improved lifecycle efficiency.

This study is conceptual and context-specific to Malaysia. Future research should empirically test the proposed relationships through case studies, pilot implementations, and quantitative modeling. Developing robust measures of fidelity, engagement, lifecycle implications, and sustainability signaling will further strengthen validation efforts.

Overall, the proposed framework offers a structured and adaptable blueprint for balancing buyer experience, lifecycle efficiency, and sustainability in property marketing as digital transformation continues to reshape the sector. The transition toward digital and hybrid visualization is therefore not merely a technological shift, but a strategic reconsideration of how marketing assets are planned, deployed, and retired.

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Conflict of Interest
The author declares no conflict of interest with respect to the research, authorship, and/or publication of this article.

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