Governing the City, Financing the Future: Sequencing Urban Development Management and Islamic Financial Engineering for Smart City Resilience in Saudi Arabia – a Conceptual and Methodological Framework

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Abstract: *This conceptual and methodological paper proposes a sequenced framework to explain how Urban Development Management (UDM) and Islamic Financial Engineering (IFE) operate in succession to build the Resilience of Smart Cities (RSC) in Saudi Arabia. Drawing on systems theory, the resource-based and dynamic-capabilities views, institutional theory and the objectives of the Shari'ah (maqasid), it develops four testable propositions. UDM is positioned as the enabling layer that makes resilience-oriented projects identifiable, bankable and governable, while IFE acts as the financing channel through which part of that effect reaches resilience outcomes. The paper then specifies a protocol for testing the propositions through a cross-sectional survey of specialized professionals, analyzed with partial least squares structural equation modeling (PLS-SEM), including mediation testing and predictive assessment. No empirical results are reported; the propositions are claims awaiting test. The framework offers researchers, urban authorities and Islamic financiers a reusable design for studying resilience-oriented urban development under Vision 2030.*

Keywords: Smart City Resilience, Urban Development Management, Islamic Financial Engineering, Mediation, PLS-SEM, Saudi Arabia.

1. Introduction of the Study

Saudi cities are being rebuilt at a pace and scale that few urban systems have attempted. Under Vision 2030, digital government, quality-of-life programs, large mixed-use developments and new financial instruments are being pursued together (Kingdom of Saudi Arabia, 2016). For planners, financiers and investors, the pressing question is therefore no longer only whether a city is smart, but whether it can keep functioning, adapt and recover under stress. That capacity does not follow automatically from technology; it reflects how a city's institutions, infrastructure and resources are organized and paid for (Meerow, Newell, & Stults, 2016; Sharifi, 2019). Two bodies of scholarship address this question, largely from separate sides. Urban governance research explains how planning, coordination and regulation shape a city's ability to prepare for and absorb shocks (Godschalk, 2003; Healey, 2006). Islamic finance research explains how Shari'ah-compliant contracts, asset-backed

structures and risk-sharing arrangements mobilize long-term capital on ethical terms (El-Gamal, 2006; Iqbal & Mirakhor, 2011). Their combination remains under-theorized. If resilience depends on both management capability and financing capability, the order in which the two operate, and whether one conditions the other, matters for theory and for practice.

This paper argues that the relationship is sequential. Urban Development Management (UDM), the set of coordinated planning, regulatory and governance functions through which a city directs its land, infrastructure, transport, environmental assets and hazard preparedness, creates the conditions under which resilience-oriented projects become identifiable, bankable and governable. Islamic Financial Engineering (IFE) then converts those conditions into funded and accountable projects, and the Resilience of Smart Cities (RSC) is the cumulative result. IFE is therefore treated not as a second, parallel predictor but as a channel that carries part of the influence of UDM. The study is conceptual and methodological and reports no empirical estimates. It extends the authors' earlier two-construct framework, which linked UDM directly to RSC (Kayali, Abu Talib, & Mohd Kassim, 2026), by adding financing as an intermediate capability, so that a single direct relationship becomes a sequenced and partially mediated structure. It makes three contributions. It reframes the governance–finance relationship in smart city resilience from additive to sequential. It grounds IFE in identifiable mechanisms and in the maqasid tradition rather than treating it as a generic financial variable. And it provides a measurement and analysis protocol, including mediation testing and out-of-sample prediction, that other researchers can reuse.

2. Statement of the Problem

Investment in smart technologies is often presented as a route to resilience, yet the literature repeatedly distinguishes being smart from being resilient: connectivity and data capacity describe the former, whereas absorptive, adaptive and recovery capacity describe the latter (Ahvenniemi, Huovila, Pinto-Seppä, & Airaksinen, 2017; Yigitcanlar & Kamruzzaman, 2018; Sharifi, 2019). Where planning is fragmented and agencies work in silos, technology leaves systemic vulnerabilities in place (Albino, Berardi, & Dangelico, 2015). Financing deepens the problem. Resilience-oriented assets such as redundant infrastructure, drainage and water systems, and green space are capital-intensive and slow to repay, and the financing arrangements behind them determine who bears risk and how accountable a project is to its stakeholders. Where Islamic finance is embedded in the legal and social order, the design of Shari'ah-compliant structures is a plausible determinant of whether such projects are funded and on what terms (Iqbal & Mirakhor, 2011). To the authors' knowledge, studies of smart cities seldom examine financing design, and studies of Islamic finance seldom address urban resilience, so the two literatures have developed largely apart.

Three gaps follow. The first is theoretical: the literature does not specify whether governance and Islamic finance combine in parallel, in sequence or conditionally. The second is contextual: Saudi Arabia, where both operate at scale under one national agenda, is a setting in which they can be examined together, yet, to the authors' knowledge, no integrated model has been proposed. The third is methodological: the constructs are broad and conceptually close, so loosely specified measurement can blur the distinctions on which a sequential argument depends, and testing a mediated structure requires procedures that go beyond reporting direct effects (Zhao, Lynch, & Chen, 2010; Nitzl, Roldan, & Cepeda, 2016). The framework developed below addresses each gap.

3. Literature Review

3.1 A. Resilience of Smart Cities

Holling (1973) separated stability, the tendency of a system to return to equilibrium, from resilience, the capacity to absorb disturbance and persist, a distinction that remains the root of urban resilience research. Reviews show that definitions are contested but converge on the ability of an urban system to maintain essential functions, adapt, and recover or transform after disruption (Meerow et al., 2016; Tyler & Moench, 2012). In a smart city these capacities are exercised through services, infrastructure and institutions that depend on digital systems. This paper therefore defines RSC as the ability of a digitally dependent urban system to sustain service continuity, adapt, recover and learn under stress. Technology contributes to that ability but does not guarantee it, so its determinants must be sought in how the system is managed and funded.

3.2 B. Urban Development Management as the Enabling Layer

Collaborative planning scholarship stresses that coordination among planning, regulatory and governance functions lets fragmented actors act on a shared picture of risk and priority (Healey, 2006; Innes & Booher, 2010). Hazard-mitigation research ties resilience to the same functions, namely land-use control, infrastructure standards and preparedness planning (Godschalk, 2003). The argument developed here adds a further, less examined function. The conditions that make a city well managed also make its projects financeable. Clear land and asset records, coherent regulation, coordinated agencies, credible project pipelines and transparent information are what lenders and investors require before committing long-tenor capital. UDM thus has two roles: it contributes to resilience directly, through planning, coordination and preparedness, and it prepares the ground on which financing can operate. The second role is the basis for treating UDM as an enabling layer.

3.3 C. Islamic Financial Engineering as a Financing Channel

IFE is the design and deployment of Shari'ah-compliant financial structures, governance arrangements and innovations to fund productive, development-oriented activity. Four mechanisms make it relevant to resilience-oriented urban projects. Asset-backing. Islamic contracts tie financing to identifiable assets and real economic activity (El-Gamal, 2006; Iqbal & Mirakhor, 2011). For resilience assets, this discipline calls for defined assets, clear title and reliable valuation, which depend on the quality of urban management. Risk-sharing partnerships. Equity-type arrangements such as musharakah and mudarabah distribute risk and return between financier and project (Iqbal & Mirakhor, 2011). They rely on transparent information and enforceable governance, which are products of institutional and regulatory quality.

Long-tenor capital mobilization. Instruments such as sukuk can raise long-horizon funds for defined asset pools (El-Gamal, 2006), but they need a visible pipeline of assets and a predictable regulatory setting. Shari'ah governance and disclosure. Independent Shari'ah oversight adds accountability and legitimacy to financing decisions (Islamic Financial Services Board, 2009). The maqasid al-Shari'ah supply a normative basis for directing such finance. Together with the principle of maslahah (the public good), they orient economic activity toward the protection of social welfare (Dusuki & Abdullah, 2007), and they have been articulated specifically as ends and means for Islamic finance (Laldin & Furqani, 2013). Protecting life and property from urban shocks can be read as a direct expression of this orientation, which makes resilience-oriented projects a natural object of Islamic development finance. This is a theoretical position that the proposed design can examine, not an empirical claim.

3.4 D. Theoretical Lenses

Four lenses support the sequencing logic. Following Whetten (1989), the framework specifies its factors, the relationships among them, the rationale for those relationships and the boundaries within which they are expected to hold. Systems theory. A city is a set of interdependent subsystems in which conditions in one part affect the others (von Bertalanffy, 1968). If governance subsystems determine the quality of land, regulatory and project information, they also determine what the financial subsystem can do, so sequencing follows naturally from interdependence. Resource-based view and dynamic capabilities. Valuable, hard-to-imitate capabilities organized to exploit resources underpin performance (Barney, 1991), and dynamic capabilities extend this to sensing, seizing and reconfiguring resources under change (Teece, 2007). UDM can be read as the capability to coordinate and reconfigure urban resources, and IFE as a complementary capability to mobilize and structure capital. Complementary capabilities are often most effective when one prepares the conditions for the other.

Institutional theory. Organizations and projects gain support when they conform to the regulatory, normative and cultural expectations of their environment (DiMaggio & Powell, 1983; Scott, 2008). Where Islamic finance is institutionally embedded, financing structures that carry Shari'ah legitimacy can align urban projects more closely with public expectations, which supports sustained funding and acceptance. Maqasid-based normative reasoning. The maqasid provide the ethical rationale for linking development finance to the protection of society's basic interests (Dusuki & Abdullah, 2007), complementing the descriptive logic of the other three lenses.

4. Proposed Conceptual Framework

The framework places RSC as the outcome, UDM as the enabling antecedent and IFE as the intermediate financing channel (Fig. 1). UDM is expected to influence resilience through two routes: a direct route through planning, coordination, preparedness and regulation, and an indirect route through the financing capability that UDM makes possible. If both routes operate, the relationship is one of complementary mediation (Zhao et al., 2010). The sequence is a theoretical ordering, not a claim of temporal precedence, and the four propositions below are stated as associations intended to guide testing rather than to report findings.

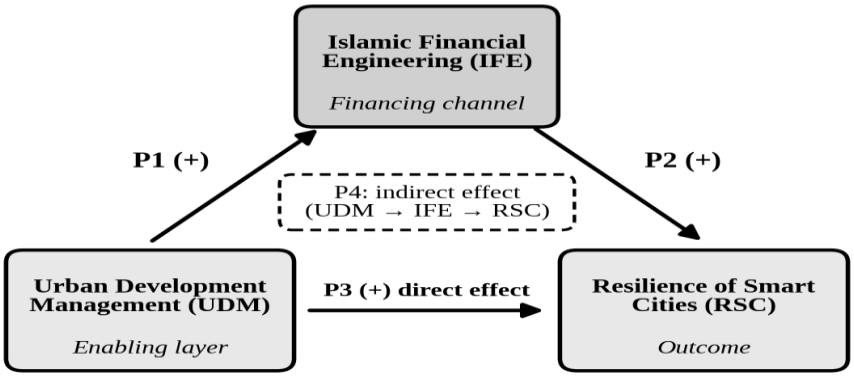


Figure 1: Proposed sequenced conceptual framework linking UDM, IFE and RSC. Solid arrows denote the direct paths (P1–P3); the dashed box denotes the indirect effect tested in P4. Complementary mediation is expected, with both the indirect and direct effects positive.

Proposition 1 (enabling). Stronger UDM is associated with stronger IFE capability in urban projects. Asset-backed and partnership structures require identifiable assets, transparent information, enforceable regulation and coordinated agencies, so cities that manage land, infrastructure and regulation coherently present financiers with projects that can be structured, priced and monitored on Shari'ah-compliant terms. Proposition 2 (financing). Stronger IFE is associated with greater RSC. Long-horizon, asset-linked and risk-sharing capital can fund redundancy, restoration capacity and environmental protection that short-horizon funding would not, while Shari'ah governance and disclosure strengthen accountability for how the funds are used. Proposition 3 (direct effect). Stronger UDM is associated with greater RSC over and above its effect through financing. Preparedness planning, land-use control, inter-agency coordination and regulatory coherence contribute to resilience whether or not a project is financed through Islamic instruments. This proposition corresponds to the direct relationship set out in the authors' earlier two-construct framework (Kayali et al., 2026).

Proposition 4 (mediation). IFE partially mediates the relationship between UDM and RSC, so that the indirect effect through IFE and the direct effect of UDM are both positive. Complementary mediation is regarded as the most plausible pattern. If the indirect effect were absent, a parallel rather than sequential account would be supported. If the direct effect were absent, UDM would operate only through finance, a stronger form of the sequencing claim that is judged less likely because many UDM functions operate independently of financing.

5. Proposed Research Methodology

5.1 A. Research Design

A positivist, deductive, quantitative, cross-sectional survey design is proposed. Theory-derived propositions are expressed as relationships among latent constructs and examined with perceptual evidence from informed professionals. PLS-SEM is the proposed estimator because the model contains several multi-indicator latent constructs, a mediating construct and a prediction-oriented aim, and because the method accommodates complex models with moderate samples (Hair, Risher, Sarstedt, & Ringle, 2019; Hair, Hult, Ringle, & Sarstedt, 2022). Because all constructs are measured at one time, the analysis can support structural and predictive interpretation but not proof of temporal precedence.

5.2 B. Population, Sampling and Sample Size

The target population is professionals in Saudi Arabia whose work gives them informed knowledge of urban development decisions and of how projects are financed. Eligible roles include urban and regional planning, municipal and infrastructure delivery, real-estate development, project and Islamic finance, Shari'ah advisory, smart city and digital government programs, and risk and policy. Purposive sampling is appropriate because the constructs require expert judgment rather than general opinion. To avoid dominance by one professional background, which could bias how respondents rate governance relative to finance, the design should set sector quotas and record each respondent's sector and years of relevant experience. Sample size should be planned before data collection. A minimum can be obtained from a power analysis for the regression with the largest number of predictors (Cohen, 1988) and cross-checked with the inverse square root method, which is tailored to PLS-SEM (Kock & Hadaya, 2018). The planned sample should exceed these minimums by a clear margin, because the indirect effect is the product of two paths and is therefore smaller and harder to detect than either path alone (Hair et al., 2022; Nitzl et al., 2016).

5.3 C. Construct Operationalization

All constructs are specified as reflective, multi-indicator scales, with indicators written to be conceptually distinct across constructs. Because UDM and RSC are conceptually close, UDM indicators should describe management practices and processes, whereas RSC indicators should describe resilience capacities and outcomes. IFE indicators should describe the financing capability applied to urban projects, not general banking activity. A seven-point agreement scale is proposed to allow finer discrimination among respondents. Table 1 sets out the proposed measurement domains.

Table 1: Proposed construct domains and measurement logic

Construct	Role	Proposed measurement domains	Distinguishing focus
UDM	Exogenous (enabling)	Land-use and spatial planning; infrastructure investment and coordination; mobility management; governance quality and stakeholder engagement; environmental planning; preparedness planning; regulatory coherence	Management practices and processes
IFE	Mediator (financing channel)	Shari'ah governance and compliance; asset-backed structuring; risk-sharing partnerships; long-tenor instruments; contractual diversity and product innovation; ESG and maqasid alignment; disclosure	Financing capability applied to urban projects
RSC	Endogenous (outcome)	Service continuity and redundancy; recovery; economic and social adaptive capacity; preparedness and learning; environmental responsiveness; robustness of digital systems	Resilience capacities and outcomes

Note. Indicative domains are drawn from the literature reviewed in Section III; the final item pool should be derived through expert review and piloting. Content validity should be established through literature-based item generation, structured expert review and a pilot administration. Whether any construct should instead be specified as formative or as a higher-order construct should be decided on conceptual grounds before estimation, using the criteria of Diamantopoulos and Winklhofer (2001)

and Jarvis, MacKenzie, and Podsakoff (2003). RSC is the most likely candidate for a multidimensional specification because it combines service continuity, recovery, adaptation and learning.

5.4 D. Data Collection and Quality Control

A structured, self-administered online questionnaire is proposed, available in Arabic and English. Translation should follow a forward and back-translation procedure with review by bilingual subject experts so that the two versions are equivalent. The instrument should open with participant information and consent, followed by eligibility screening and then the construct blocks. Procedural remedies against common method bias should be built in: anonymity, separate blocks for each construct, randomized item order within blocks and neutral wording (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Quality screening should flag invariant responding, implausibly short completion times and failed attention checks (Meade & Craig, 2012). Non-response bias can be examined by comparing early and late respondents.

5.5 E. Analytical Roadmap

The analysis should follow a pre-specified sequence, summarized in Table 2. Pre-specifying decision rules, including the treatment of weak indicators, limits analytical flexibility and supports replication.

Table 2: Proposed PLS-SEM evaluation roadmap

Stage	Focus	Evaluation criteria	Main sources
1	Data screening	Missing and out-of-range values; careless responding; early–late comparison; sector composition	Meade & Craig, 2012
2	Common method bias	Procedural remedies; full-collinearity variance inflation factors	Podsakoff et al., 2003; Kock, 2015
3	Measurement model	Outer loadings; Cronbach's alpha, rho_A, composite reliability; AVE; HTMT and Fornell–Larcker; pre-specified rule for weak indicators	Hair et al., 2019, 2022; Henseler, Ringle, & Sarstedt, 2015; Dijkstra & Henseler, 2015; Fornell & Larcker, 1981
4	Structural model	Collinearity; path coefficients with bootstrapped confidence intervals; R^2; f^2; Q^2 and PLSpredict against a linear benchmark	Hair et al., 2022; Shmueli et al., 2019
5	Mediation	Bootstrapped specific indirect effect; classification of mediation type against pre-stated decision rules	Zhao et al., 2010; Nitzl et al., 2016
6	Robustness	Rival parallel model; reversed ordering; second-order RSC; group comparison only after invariance is established	Hair et al., 2022; Becker, Cheah, Gholamzade, Ringle, & Sarstedt, 2023

Note. Criteria follow Hair et al. (2019, 2022) unless otherwise indicated. Three features of the roadmap deserve emphasis. First, indicators with outer loadings between 0.40 and 0.70 should be removed only if removal improves composite reliability or convergent validity without harming content validity, a rule that should be stated in advance (Hair et al., 2022). Second, because UDM and RSC are close, discriminant validity between them should be assessed with the heterotrait–monotrait

ratio (Henseler et al., 2015) and supported by the Fornell–Larcker comparison (Fornell & Larcker, 1981), since the sequential argument depends on their separability. Third, because PLS-SEM studies routinely stress prediction, the model should be assessed for out-of-sample predictive power as well as in-sample explanation (Shmueli et al., 2019).

5.6 F. Testing the Mediation Proposition

Proposition 4 should be tested with bootstrapped specific indirect effects, using percentile or bias-corrected confidence intervals, rather than the causal-steps approach, whose weaknesses are well documented (Zhao et al., 2010). The type of mediation is then classified from the signs and significance of the direct and indirect effects as complementary, competitive, indirect-only, direct-only or no effect (Zhao et al., 2010; Nitzl et al., 2016). The decision rule is stated in advance. Complementary mediation supports the framework; indirect-only mediation supports a stronger sequencing claim; a significant direct effect with no indirect effect supports a parallel account; and an indirect effect with the opposite sign to the direct effect indicates competitive mediation and calls for theoretical reassessment. Robustness checks should include a rival model in which IFE and UDM are parallel predictors, a reversed ordering, and a second-order specification of RSC if the conceptual review supports one.

5.7 G. Ethics and Data Stewardship

The study should obtain institutional ethics approval, give participants clear information on purpose and use, secure informed consent, anonymize responses and store data securely. The final study should state how item-level data can be made available to other researchers on reasonable request.

6. Scope of the Study

The framework is scoped to three constructs, UDM, IFE and RSC, within the Saudi urban context and as perceived by informed professionals. It deliberately excludes other candidate antecedents, moderators and objective project-level data, which are noted as extensions in Section IX. This restriction keeps the model compact enough for each proposition to be examined on its own terms.

7. Objectives of the Study

7.1 The paper pursues the following objectives:

To define UDM, IFE and RSC as measurable constructs in the Saudi urban context and to distinguish them conceptually. To justify, from systems, capability, institutional and maqasid-based reasoning, a sequenced relationship in which UDM enables IFE and both contribute to RSC. To state this relationship as four testable propositions, including a mediation proposition. To specify a PLS-SEM protocol, covering sampling, measurement, data quality, model evaluation and mediation testing, that later studies can apply and adapt.

8. Significance of the Study

Theoretical. The framework offers a sequenced account of governance and finance in smart city resilience. By specifying how UDM prepares the ground for IFE, it explains why the two may not be independent, and by pairing the propositions with explicit decision rules for classifying mediation it makes the sequencing claim falsifiable. It also grounds IFE in concrete mechanisms and a maqasid-based rationale, positioning Islamic finance as a development-finance capability relevant to urban resilience rather than a sector-specific topic. Urban authorities. If the propositions are supported, building project readiness (clear asset and title records, coherent regulation, coordinated agencies and a visible project pipeline) is not only an administrative aim but a precondition for accessing Shari'ah-compliant long-term capital.

Islamic financiers and public financing bodies. Structures could be designed around resilience assets, with disclosure and Shari'ah governance tied to resilience outcomes. Developers and investors. Project documentation that meets both planning and Shari'ah-structuring requirements would reduce the cost and delay of financing, and joint planning between urban and financial authorities would become a rational part of Vision 2030 delivery.

9. Limitations of the Study

As a conceptual and methodological paper, this study presents no empirical results and cannot confirm its propositions. The ordering of constructs is theoretical, and a cross-sectional design would support predictive rather than causal interpretation. Perceptual data from a purposive professional sample would not be representative of all Saudi cities or practitioners, and perceptions of governance, finance and resilience may be correlated through shared respondent characteristics. These boundaries are stated so that future studies can plan for them. Future research can extend the framework in several directions. Longitudinal designs could examine whether improvements in UDM precede growth in IFE capability and later resilience gains. Objective data, such as project-level financing records and resilience indicators, could complement perceptual measures. Multi-city and multi-group comparisons could test whether the sequence differs by city size, sector or institutional maturity. Moderators such as public–private partnership capability, regulatory maturity and Islamic fintech, together with a comparison against conventional financing structures, could clarify the conditions under which the sequence is strongest.

10. Conclusions

This paper has set out a conceptual and methodological framework for examining how urban development management and Islamic financial engineering work in sequence to shape smart city resilience in Saudi Arabia. It defines the three constructs, grounds their relationships in systems, capability, institutional and maqasid-based reasoning, expresses them as four propositions, and specifies a PLS-SEM protocol that includes mediation testing and predictive assessment. The framework does not claim that finance matters more than governance, or the reverse. It claims that their order and interaction matter, and it offers a way to find out. By stating its propositions as testable claims rather than findings, it gives researchers, urban authorities and Islamic financiers a common starting point for work on resilient urban development under Vision 2030.

10.1 Statement on the Use of AI and AI-Assisted Technologies

The authors used an AI assistant (Claude, Anthropic) during manuscript preparation to support drafting, structuring and language editing. The authors defined the research focus and constructs, reviewed and revised all content, checked the references and take full responsibility for the manuscript.

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