WHITE PAPER ARCHITECTURAL RESEARCH ON EFABISM AND ARCHITECTURAL THEORY

EFABism: Methods of Formalizing the Econometric Mathematics of Econo-Functional Aesthetic Balance

A Unified Quantitative Framework for Evaluating Architectural Design Through the EFABism Gravitational Field metaphor model of Economics, Functionality, and Aesthetics

Architect William J. Martin, AIA

Principal, WJM Architect | Westwood, NJ

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Official Framework and Research Agenda, Publication Version 1.0., 3 September 2026. Methods, notation, and practice tools will be revised. Do not treat coefficient sketches, case-study scores, or hedonic formulas as empirical results.

Abstract

EFABism — Econo-Functional Aesthetic Balance — is an architectural design philosophy formalized by William J. Martin, AIA, of WJM Architect in early 1990's. Its central claim is that architecture achieves its highest purpose when Economics (E), Functionality (F), and Aesthetics (A) are held in a deliberate, justifiable, and coherent relationship appropriate to a building's purpose, stakeholders, constraints, and time. This paper presents a working formalization of EFABism that integrates its original quantitative econometric framework with a corrected philosophical and structural foundation. The paper treats EFABism as operating on three distinct levels: (1) the philosophical claim that architecture operates under interacting gravitational forces of Economics, Functionality, and Aesthetics that must be held in deliberate and defensible relationship; (2) the practice framework — including the EFAB Weight Vector, Distortion Index, and Tradeoff Ledger — that helps architects disclose and reason through design tradeoffs in a structured and transparent way; and (3) the quantitative research program — including sub-pillar regressions and Hedonic Pricing Models — that provides bounded empirical evidence to inform the practice framework without claiming to prove the philosophy. The framework rests on a gravitational field model in which each EFAB domain exerts a force whose magnitude is determined by building purpose, stakeholder composition, cultural context, and time. The EFAB Distortion Index replaces the original Imbalance Index, measuring departure from declared intent rather than deviation from equality. The EFAB Tradeoff Ledger replaces the circular Objective Function as the primary disclosure tool, while a corrected and recalibrated Objective Function is retained as a decision-support heuristic. Sub-pillar regression models are presented as provisional research instruments with clearly stated assumptions, corrected building-science variables (ThermalR, not thermal mass), and honest limitations. Hedonic Pricing Models are reframed as tools for estimating perceived economic value rather than certifying intrinsic architectural worth. A case study of facade material selection in Northern New Jersey is presented as an illustrated decision exercise under a declared weight vector, with sensitivity analysis across alternative weightings. The paper concludes with a forward-looking research agenda.

Keywords: *EFABism, Econo-Functional Aesthetic Balance, gravitational field model, weighted-field model, EFAB Distortion Index, Tradeoff Ledger, hedonic pricing, architectural econometrics, post-occupancy evaluation, design valuation, Vitruvian triad, stakeholder-indexed values.*

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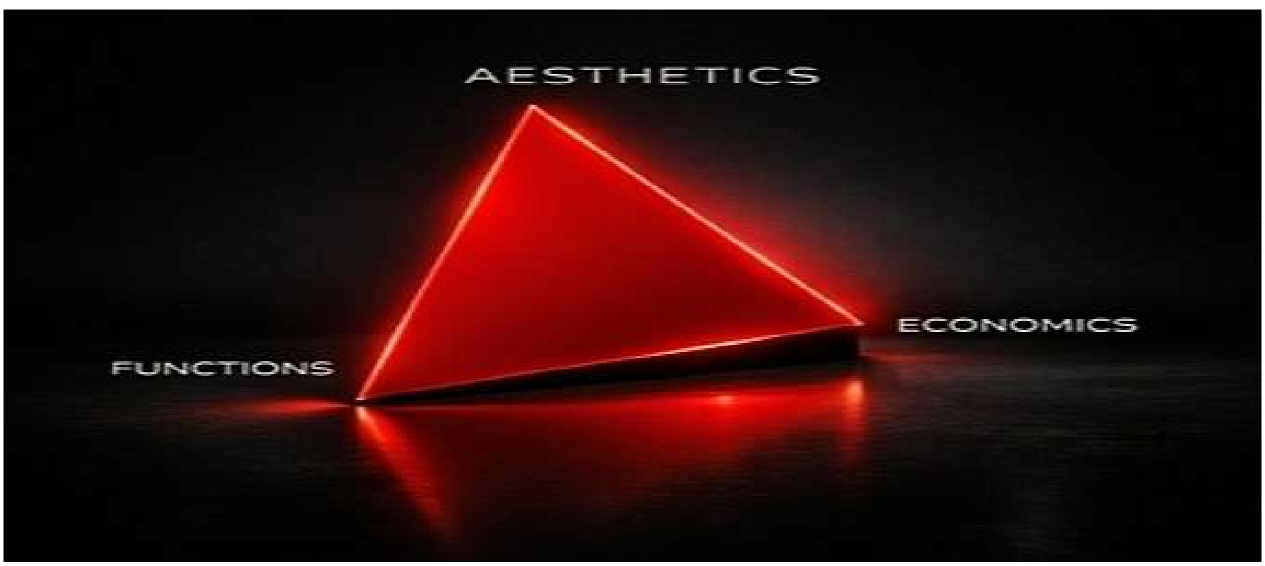

Figure 1: The EFABism Gravitational Field Metaphor Model

Section 1 — The EFABism Philosophy: Discipline Against Single-Variable Optimization

1.1 Origins and Core Tenet

EFABism — Econo-Functional Aesthetic Balance — was formalized in 1991 by William J. Martin, AIA, principal of WJM Architect, Westwood, New Jersey, as a structured philosophical and evaluative framework for architectural practice. It emerged from Martin's observation that the single most consistent failure mode in American architectural production was not any individual stylistic mistake, technical deficiency, or budget overrun — but rather the systematic subordination of all other architectural values to a single dominant priority: cost, or function, or aesthetic effect, each pursued in isolation to the progressive impoverishment of the others. The result of such single-variable optimization is architecture that may dazzle on one dimension while silently failing on two others, producing buildings that are cheap and handsome but uninhabitable, or functional and economical but devoid of civic meaning, or spectacular in their ambition but financially ruinous across their lifecycle.

The core tenet of EFABism, as revised and clarified in this paper, is as follows: *Good architecture establishes an intelligible and justifiable relationship among Economics, Functionality, and Aesthetics appropriate to its purpose, stakeholders, constraints, and time.* This formulation carries several deliberate implications that must be carefully distinguished from common misreadings. EFABism does not require equal weighting of the three domains. It requires that relative weights be chosen deliberately, disclosed transparently, and justified by the building's purpose and by the people who live with its consequences. The framework insists that architecture achieves its highest purpose — its most enduring social, cultural, and economic contribution — only when all three domains are simultaneously honored. A building is not excellent because it is cheap, or because it performs perfectly, or because it is beautiful in isolation. It is excellent because it is all three in a coherent and justifiable relationship, one that holds through time, serves the people who inhabit and surround it, and discloses honestly the tradeoffs that any specific realization of that relationship required. This is a demanding standard. It is also, Martin argued in 1991 and this paper reaffirms in 2026, the only standard proportionate to the full human significance of the architectural act.

1.2 The Three Domains

The original EFABism literature employed the term "pillars" to describe Economics, Functionality, and Aesthetics. This paper retires that term in favor of "domains" — a choice that is more than linguistic. Pillars suggest stable, separated structural members, each bearing its load independently and resting on a fixed foundation. The architectural reality is more dynamic and more interesting. The three EFABism domains interact continuously, reinforce one another under favorable conditions, interfere under unfavorable ones, and change their relative strength and internal character according to building purpose, stakeholder composition, cultural place, and time horizon. The word "domain" preserves the sense of bounded territory while allowing the relational, dynamic character of EFABism forces to remain visible.

Economics (E) encompasses cost efficiency, resource optimization, lifecycle value, minimization of financial waste, and socio-economic viability across the full service life of a building. Economics in EFABism is emphatically not reducible to initial construction cost — a limitation that distorts architectural decision-making as systematically as any other form of single-variable thinking. The domain includes lifecycle return on investment, long-term maintenance burden, energy cost trajectories across a declared service period, broader social and economic value to surrounding communities, and the environmental cost implications that properly belong within a fully indexed economic analysis. Critically, Economics must always be indexed to a stakeholder. The developer's first cost, the institution's operating budget, the tenant's monthly financial burden, the municipality's tax base, and society's environmental cost may all occupy entirely different positions on the economic spectrum of a single building. A facade system that appears economically optimal from the perspective of the developer's construction budget may impose significant deferred maintenance costs on future occupants who inherit the building. EFABism requires that this divergence be named, not assumed away.

Functionality (F) means the authentic meeting of real user needs — not merely technical compliance with a program, not merely conformity to a building code, but the demonstrable, reliable performance of a building for actual people across the full range of conditions they will bring to it. Functionality encompasses usability, spatial performance, structural integrity, environmental performance, energy efficiency, adaptability to changing occupancy patterns, and purpose-driven intelligence in the design of each occupied volume. A building functions not in theory but in practice: for the elderly visitor navigating its entry sequence, for the facilities manager responding to a systems failure at 2 a.m., for the worker seated at a workstation on the hottest afternoon of summer, for the parent steering a stroller through its circulation path. Functionality, like Economics, is stakeholder-indexed: the same spatial configuration may perform admirably for one user group while failing another entirely. The design team that evaluates functionality only from the perspective of its primary commissioning client is evaluating a partial function at best.

Aesthetics (A) encompasses intellectual and sensory beauty, spatial harmony, material craft, cultural resonance, and the emotional and intellectual significance that buildings accumulate or fail to accumulate across their service lives. Aesthetic value is shaped simultaneously by sensory response to material and light, compositional judgment based on proportion and sequence, familiarity and novelty operating in productive tension, memory and identity embedded in physical form, symbolism articulated or contested through design decisions, expert validation by professional and critical communities, social consensus shaped by cultural conditioning, and fashion operating at multiple timescales — the decade-long arc of stylistic preference and the century-long arc of cultural memory. These forces frequently operate in tension with one another, and this internal complexity is one reason aesthetic value resists the simple measurement techniques that economic and functional attributes invite. Aesthetics is also strongly time-indexed: reception changes as materials weather and develop patina, as the craft of detailing becomes more legible with proximity over years, as fashions reverse and once-rejected vocabularies gain renewed authority, and as cultural memory accumulates significance around a building's site, history, and inhabitation. The temporal dimension of aesthetic value is not a complication to be managed — it is a structural feature of the domain that any serious EFABism framework must accommodate.

1.3 The Gravitational Field Model

The central metaphor of the EFABism framework, as revised and deepened in this paper, is not the balance scale or the equilateral triangle — images that suggest static equilibrium among equivalent forces. The controlling metaphor is the gravitational field: Economics, Functionality, and Aesthetics are three gravitational vertices within a continuously changing architectural force field. The relative gravitational mass of each vertex — its pull on design decisions — depends on building purpose, stakeholder composition, available constraints, cultural moment, and time horizon. Design does not succeed by arriving at the geometric centroid of this field. It succeeds when the resulting field configuration is coherent, justified, and appropriate to the building's full set of human obligations.

The EFABism triangle is never equilateral in practice. Different buildings, different purposes, different weightings. Deliberate and justifiable asymmetry is not the exception — it is the architectural norm.

Four contrasting building archetypes illustrate the range of legitimate field configurations that EFABism recognizes and accommodates. Consider first the operating room or research laboratory. Here the Functionality vertex exerts dominant gravitational mass: infection control protocols, environmental monitoring requirements, procedural workflow, instrument access, and regulatory performance standards govern space configuration with near-absolute authority. Aesthetic deference in such a setting is not a failure of architectural imagination — it is professional discipline, a recognition that the consequences of aesthetic interference with functional requirements are measured in patient outcomes and research validity. The remaining aesthetic investment operates within the functional constraint rather than against it: material selection optimized for cleanability, light quality calibrated to task performance, spatial proportion that reduces disorientation for extended-stay occupants. These are not aesthetic concessions; they are the exercise of aesthetic intelligence within a field of declared priorities.

Consider second the war memorial or civic monument. Here Aesthetics and cultural meaning pull hardest, and they pull with obligations that transcend any single stakeholder's immediate economic preferences. A memorial that costs twice the original budget projection but produces genuine cultural permanence — a space that compels reflection, that gives form to loss and collective memory, that serves communities across generations — may represent sound EFABism judgment if the tradeoff was visible, disclosed, and chosen through legitimate deliberation. The EFABism framework does not penalize this choice. It asks only that the financial sacrifice be acknowledged honestly, that the stakeholders whose resources are committed understand what they are committing them to, and that the resulting work deliver the aesthetic authority its economic sacrifice demands.

Third, consider emergency shelter following a disaster. Here Economics and immediate Functionality govern with an urgency that admits no extended aesthetic deliberation at the moment of need. EFABism explicitly recognizes this as a justified field configuration — not as a failure to achieve balance but as a time-sequenced reading of the full problem. The aspiration toward aesthetic dignity in permanent replacement housing is part of the long-run analysis: A(t) is tracked through the life of the facility, and the EFABism framework insists that the aesthetic sequencing was deliberate and will be honored, not merely deferred indefinitely while cost pressure accumulates justifications for permanent aesthetic impoverishment. The difference between legitimate aesthetic sequencing and permanent aesthetic abandonment is precisely the kind of declaration EFABism requires at project outset.

Fourth, the luxury hotel. Here all three domains are active at high magnitude simultaneously — and the challenge of holding the field together is correspondingly severe. A hotel must achieve compelling aesthetic presence or it will not attract the premium market it requires to sustain its economics. It must deliver functional performance across an enormous range of user needs — from a single business traveler to a conference of five hundred — or its reviews will erode its market position. And it must manage lifecycle economics with discipline across a service model that imposes continuous wear on every surface. The EFABism challenge in this building type is not weighting — it is holding a high-amplitude field in coherent relationship as competing pressures pull in different directions, and disclosing honestly to the client which tensions are irresolvable within the declared budget without sacrificing one domain below the minimum threshold that building type and market position require.

The Empire State Building stands as a canonical example of EFABism achievement at the highest level of ambition. Completed in 1931 during the most severe economic contraction in American history, the building is aesthetically proportioned with extraordinary care — its setback massing responds simultaneously to the 1916 Zoning Resolution, to the functional requirements of natural light penetration across a large floor plate, and to compositional aspirations that produced one of the great skyline silhouettes in the history of urban architecture. Its Art Deco ornamental system is not decorative superfluity applied to a functional envelope; it is an integrated design intelligence in which spandrel panels, limestone courses, and aluminum crown elements participate in both aesthetic composition and material performance. Functionally, the building served its purpose as a large-scale multi-tenant office building across decades of shifting commercial market conditions.

Economically, it was built on time and under budget — a record of construction management discipline that remains remarkable at any era — and it has retained economic viability for nearly a century, demonstrating lifecycle economics that most buildings of any subsequent generation have failed to match. The Empire State Building is an EFABism achievement not because its three domains were weighted equally, but because all three were honored simultaneously at the highest available level of ambition and craft.

1.4 Equality, Coherence, and Justification — Three Distinct Concepts

The most productive misreading of EFABism is also the most common: the assumption that "balance" means equal weighting. This paper addresses that misreading directly and definitively. Equality is one possible numerical relationship among the three domains — a relationship that may be entirely appropriate for certain building types and stakeholder compositions, and entirely inappropriate for others. It is not inherently superior to any justified asymmetrical distribution. To treat equality as the normative destination of EFABism analysis is to misread the framework at its most fundamental level, converting a philosophy of disciplined intentionality into a mechanical averaging rule that would, in practice, produce mediocre architecture across every building type that has a legitimate claim to directional emphasis.

Coherence is the more demanding and more useful standard. It means that the three domains form an intelligible whole — that the design intelligence applied in each domain is consistent with and supportive of the design intelligence applied in the others, rather than operating in mutual ignorance or explicit contradiction. A building achieves coherence when its economic decisions reinforce its functional ambitions, when its aesthetic choices are materially consistent with its economic constraints and technically consistent with its functional requirements, and when the resulting design can be explained as a unified intention rather than a set of sequential compromises. Coherent asymmetry — a justified EFABism distribution in which one domain leads and the others follow in disciplined support — is architecturally superior to incoherent equality, in which the three domains produce contradictory signals that no design resolution can fully satisfy.

Justification is the ethical dimension of EFABism. It means that the chosen weights and the tradeoffs they necessitate are proportionate to the building's purpose, serve the people who will live with the consequences of its design, and were reached through a process that gave appropriate voice to all stakeholders whose interests the building affects. The EFABism framework succeeds when it evaluates intentional asymmetry and demands justification for every departure from the center — not when it penalizes conviction. A declared weight vector that allocates dominant mass to one domain is not a violation of EFABism as long as it was chosen deliberately, disclosed transparently, and justified by building purpose and stakeholder values. The violation would be concealing that allocation, or arriving at it through a post-hoc rationalization process that worked backward from a preferred design outcome to the weights that would appear to justify it.

1.5 Historical and Theoretical Lineage

EFABism does not arrive without predecessors. Its most immediate intellectual ancestor is the Vitruvian triad — *firmitas* (strength), *utilitas* (utility), and *venustas* (beauty) — articulated in Marcus Vitruvius Pollio's *De Architectura* (c. 25 BCE) and remaining the most durable multi-dimensional framework in the history of architectural theory. The resonance between the Vitruvian triad and the EFABism domains is genuine and worth acknowledging: EFABism shares Vitruvius's foundational conviction that architectural excellence is irreducibly multidimensional, that no building achieves full significance by excelling on one dimension while failing on others, and that the practice of architecture is in part the discipline of holding multiple, sometimes competing human obligations simultaneously in view. However, the correspondence between the two frameworks must be stated with care: EFABism is inspired by Vitruvius, not a direct operationalization of the triad. Economics in EFABism is not equivalent to *firmitas*; durability and structural integrity belong primarily to the Functionality domain in EFABism, though they carry lifecycle cost implications that enter Economics through the NPV analysis of maintenance and replacement. The correspondences between the two frameworks are suggestive and intellectually productive, but they are not exact equivalences, and forcing exact correspondence would misrepresent both systems. EFABism builds on Vitruvius's most important insight while acknowledging categorically that 21st-century practice contexts — in which lifecycle cost modeling, energy performance certification, post-occupancy evaluation data, computational design tools, and sophisticated real estate market analysis are all available to the design team — differ so substantially from Roman antiquity that a direct methodological translation would be intellectually unjustifiable.

The economic theoretical foundations of EFABism draw on Lancaster (1966), whose new approach to consumer theory established the analytical framework of decomposing product value into its constituent attribute contributions — a foundation directly underlying hedonic price theory and the HPM methodology deployed in Section 6. Rosen (1974) formalized hedonic price theory as an econometric instrument, providing the market-data methodology through which EFABism research can estimate the perceived economic value that market participants attribute to measurable functional and aesthetic attributes. Anselin (1988) established the spatial econometric methods — the spatial lag model, spatial weight matrices, Moran's I test — that address the geographic clustering of architectural market outcomes and are essential to any HPM methodology applied to real estate transaction data. Kahneman and Tversky (1979), through their development of Prospect Theory, provided the behavioral economic framework that EFABism needs to accommodate the well-documented reality that architectural decisions are not made by rational expected-utility maximizers — a reality Section 3 addresses directly. Sternberg (1999) examined the economics of symbolic meaning in the built environment, providing theoretical grounding for the recognition that aesthetic value in architecture is not merely a subjective preference but an economically consequential force that market mechanisms partially, imperfectly, and revealingly reflect.

EFABism is also, explicitly, a critique of architectural imbalance — a theory of what goes wrong when any single domain overwhelms the field. When Aesthetics is prioritized to the exclusion of other domains — as in certain high-profile buildings whose spectacular visual extravagance masks poor lifecycle economics, inadequate user comfort, or maintenance burdens that will be externalized to future occupants — the result is a building that dazzles briefly and disappoints enduringly: a cultural event that fails to become a cultural institution. When pure functional efficiency dominates without aesthetic or economic discipline, the built environment becomes progressively impoverished of the cultural meaning and civic dignity that give communities their spatial identity. When cost minimization overwhelms all other considerations — as it does systematically in low-bid procurement environments without adequate design oversight — the short-term savings are regularly exceeded by long-term cost escalation as deferred maintenance accumulates, system failures multiply, and occupants endure environments that fail their most basic functional obligations. EFABism offers a framework for recognizing these failure modes early, naming their mechanisms clearly, and providing architects with a structured vocabulary for resisting them in client and stakeholder conversations.

1.6 The Observer Must Enter the Frame

One of the most consequential structural requirements of the revised EFABism framework is one of the simplest to state: every EFABism score requires a declared observer. Without a specified observer — a named stakeholder or stakeholder group whose perspective governs the evaluation — EFABism scores float free of accountability, producing numbers that appear objective while concealing whose values and interests they actually represent. The formal notation introduced in this paper makes observer-dependence explicit and irreducible: E_s denotes Economics as experienced by stakeholder s; F_s denotes Functionality as experienced by stakeholder s; A_s denotes Aesthetics as judged by stakeholder or cultural observer s. No EFABism score is reportable without this subscript filled in.

The practical implications of this requirement are significant and sometimes uncomfortable. A prison designed to a high Functionality standard for the administering institution — optimized for security efficiency, staff workflow, and operational management — may produce an entirely different F_s for the person incarcerated within it, for whom the same spatial configuration may represent systematic functional degradation: limited access to natural light, constrained movement, environments designed to minimize the agency and dignity of their primary occupant. A developer-optimized condominium carries different E_s for the developer who realized a construction-to-sale return and for the buyer who inherits deferred enclosure work, rising maintenance assessments, and energy costs that the developer's economic analysis externalized to the future ownership structure. A school designed to minimize capital cost distributes different F_s to the school board that approved the budget, the facilities manager who maintains the building, the teacher who inhabits the classroom across a full instructional year, and the student seated at a desk on a hot September afternoon in a space without adequate ventilation. These divergences are not incidental — they reveal whose interests the design actually served, whose values the weight vector actually encoded, and whose costs were externalized into the future rather than acknowledged in the project's economic analysis. EFABism requires that this accounting be performed explicitly and honestly, not assumed away through the use of a single undifferentiated pillar score that conceals the distribution of EFABism experience across the actual population of building users and affected parties.

1.7 Time Belongs Inside the Model

Buildings refuse to stay still. A building delivered to the satisfaction of its commissioning client in the year of its completion is not the same building ten years later, twenty years later, or fifty years later — and the EFABism framework that does not account for this temporal evolution is evaluating a snapshot rather than a life. Interest rates change, affecting the NPV of lifecycle maintenance projections. Energy prices change, affecting the economics and functional performance calculations of envelope assemblies. Neighborhood character changes, affecting the market value of aesthetic presence and location attributes. Occupancy patterns change, generating new functional demands that original programs could not fully anticipate. Building function can change entirely — a factory becomes housing, a department store becomes a university, a warehouse becomes a creative industry hub — transforming the functional requirements that govern $F_s(t)$ across the service life.

Aesthetic reception changes in ways that are both predictable in their general pattern and difficult to forecast in their specific timing. Materials weather: concrete develops the patina of accumulated weather; brick develops the differential color variation of thermal cycling and biological growth; metal panels acquire the oxidation signatures of their climate exposure. Some of these changes reduce aesthetic authority; others increase it substantially. The craft of detailing becomes more legible over years as joints and transitions settle into their designed positions and the building's material logic becomes accessible to informed observation. Fashions reverse: the Brutalist concrete buildings of the 1960s that were widely rejected as oppressive in the 1980s and 1990s have, in many cases, acquired a cultural significance and aesthetic authority in the early 21st century that their original reception did not anticipate. Cultural memory accumulates around a building's site, history, and inhabitation in ways that change its aesthetic significance independent of any change in its physical character.

The formal notation that this temporal complexity requires is $E(t)$, $F(t)$, and $A(t)$ — the economic, functional, and aesthetic values tracked as functions of time — and, in the fully indexed form that observer-dependence requires: $E_s(t)$, $F_s(t)$, $A_s(t)$. This notation is not merely decorative; it carries a research obligation. Any serious EFABism evaluation program must specify not only the stakeholder group and the measurement methodology for each domain score, but also the time horizon across which values are tracked and the intervals at which they are updated. A building that scores well on all three domains at the moment of occupancy may score very differently at year fifteen, when deferred maintenance costs materialize, when the aesthetic vocabulary it represented has lost cultural currency, and when the functional demands of its program imposed have shifted under changed use patterns. Conversely, a building that receives an indifferent reception at opening may, two decades later, be recognized as an EFABism achievement whose temporal trajectory the initial evaluation failed to anticipate.

1.8 Power, Externalized Costs, and the Ethics of Balance

EFABism is not, and cannot be, a neutral optimization method. Power determines who gets to define balance. In most architectural production, the person or institution paying for architecture is not the person or community who will live most extensively with its consequences — and this divergence of commissioning authority from inhabited consequence is not incidental to architectural practice; it is structural. The owner who commissions a speculative office building will not occupy its spaces across a working lifetime. The municipal government that commissions public infrastructure will not navigate it daily in the conditions of age, disability, or weather that render designed environments hospitable or hostile. The developer who builds market-rate housing will not inherit the maintenance obligations that the building's envelope system will impose on future owners across a thirty-year service period. EFABism requires that this structural divergence between commissioning authority and inhabiting consequence be named within the analysis, not assumed away through the convenience of a single undifferentiated EFABism score.

Economic externalities — the displacement of costs from the commissioning analysis to future stakeholders, surrounding communities, or the environment — belong within E, properly indexed. Deferred maintenance costs externalized to future tenants through underspecified enclosure systems are an economic cost of the original design decision, whether or not they appear in the developer's pro forma. Environmental costs distributed to surrounding communities through material choices, stormwater management decisions, or energy system design are economic costs of the project, whether or not they enter the owner's lifecycle cost model. Coerced or excluded users belong within the Functionality analysis: spaces that perform admirably for the commissioning institution while producing harm, degradation, or systematically diminished experience for those subject to them fail the functional standard as soon as the stakeholder index is broadened beyond the commissioning client. Cultural authority and contested meaning belong within the Aesthetics analysis: whose aesthetic judgment is treated as authoritative in the evaluation process, and who is excluded from that determination — whether through lack of resources, professional credential requirements, or simply the design team's failure to consult affected communities — are questions that EFABism must surface rather than assume away. The framework becomes less tidy and more truthful when power enters the analysis. EFABism does not promise to resolve these power dynamics — no architectural framework can. But it insists on making them visible as a precondition for any evaluation that claims to assess the full EFABism performance of a building against its full range of human obligations.

1.9 The Need for Quantitative Formalization

While EFABism has provided a powerful qualitative lens for architectural criticism and practice guidance since 1991, it has not historically prescribed formal quantitative methods for verifying whether a design achieves EFABism balance, for comparing design alternatives under a declared weight vector, or for accumulating empirical evidence about the market and performance consequences of EFABism choices across a portfolio of completed projects. Econometrics — the application of statistical and mathematical methods to economic data for the purposes of empirical testing, measurement, and inference — provides the rigorous analytical toolkit that a formalized EFABism research program requires. However, this paper establishes a clear hierarchy before any equation is presented: econometrics serves the philosophy; it does not prove or replace it.

Post-occupancy evaluation data is already recognized within the profession as a practical mechanism for measuring architectural performance — systematic collection of energy performance metrics, occupant satisfaction indices, maintenance cost records, and spatial utilization data after occupancy provides the raw empirical material that econometric models require to produce meaningful EFABism estimates. The contribution of this paper is to formalize the analytical step that transforms POE data into structured EFABism intelligence: defining the variables, specifying the model forms, establishing the estimation procedures, and setting the reporting standards that give EFABism analysis its statistical credibility without overclaiming the certainty that statistical methods can confer. Econometrics does not replace the architect's judgment; it informs it with evidence. The judgment that decides which evidence matters, how to weigh it against stakeholder values and building purpose, and what tradeoffs are acceptable given the full human obligations of a project — that judgment remains irreducibly architectural, irreducibly professional, and irreducibly human.

Part Two: The EFABism Decision Framework

Section 2 — The EFABism Weighted-Field Model: Formalization

2.1 Conceptualizing Weighted Balance

The revised EFABism model replaces the original equilateral centroid with a weighted-field specification that preserves the framework's philosophical commitment to multidimensional excellence while providing the mathematical flexibility required to accommodate the full range of justified weight distributions that different building purposes, stakeholder compositions, and cultural contexts require. The foundation of this weighted-field specification is the EFABism Weight Vector — a declared set of relative weights that encodes the design team's and client's considered judgment about the relative priority of Economics, Functionality, and Aesthetics in the specific context of the project at hand.

The EFABism Weight Vector is written as $\mathbf{w} = (w_E, w_F, w_A)$, subject to the constraints that $w_E + w_F + w_A = 1$ and each $w_i > 0$. The simplex constraint ensures that the weight vector represents a complete allocation of design priority rather than an arbitrary scaling. The positivity constraint implements the EFABism requirement that no domain is assigned zero weight: any stakeholder consultation process that would reduce any domain to zero presence has allowed one set of priorities to extinguish a fundamental architectural obligation, producing a building that has abandoned its full human responsibility.

> ***Methodological Rule***
>
> *Weights must be declared at project outset through stakeholder consultation, based on building purpose, program, constraints, and client values. Post-hoc rationalization of weights — working backward from a preferred design option to the weights that would appear to justify it — is the single*

> *most serious methodological failure available to an analyst using the EFABism framework. It renders the framework's entire analytical structure meaningless.*

To illustrate the range of legitimate weight vectors: a sculptural pavilion — a building whose primary purpose is aesthetic demonstration and cultural provocation — might appropriately carry $w_A = 0.60$, $w_F = 0.25$, $w_E = 0.15$; an industrial research laboratory, where functional performance parameters govern user productivity and experimental validity, might appropriately carry $w_F = 0.55$, $w_E = 0.30$, $w_A = 0.15$; a neighborhood public library serving a diverse community with competing fiscal pressures might appropriately sit near equal weighting, perhaps $w_E = 0.33$, $w_F = 0.37$, $w_A = 0.30$. None of these distributions is inherently correct; all of them are potentially appropriate given their respective building purposes and stakeholder compositions. The EFABism framework evaluates each on its own declared terms.

2.2 The EFABism Weight Vector and Composite Score

Within the declared weight structure, pillar scores for each domain are measured on a common normalized scale. The pillar score vector is written $\mathbf{b} = (e, f, a)$, where $e, f, a \in [0, 1]$ represent, respectively, the Economics, Functionality, and Aesthetics scores for a given design option, measured against the operationalization procedures specified in Section 2.4, indexed to declared stakeholders and time horizons. The weighted EFABism Composite Score combines these domain scores under the declared weight vector:

$$\text{(Eq. 1)}\ \mathrm{EFAB}_{\text{composite}} = w_E \cdot e + w_F \cdot f + w_A \cdot a$$

The composite score defined by Equation 1 supports structured comparison among design alternatives when the weight vector is held constant across all alternatives under evaluation. It provides a single summary metric that compresses the information of the three-domain score vector into a scalar that can be ranked. However, this compression is not cost-free: the composite score conceals the internal distribution of domain performance that the Tradeoff Ledger preserves in detail. For this reason, the composite score should always be reported alongside the domain score vector and the Tradeoff Ledger, not in substitution for them. The composite does not establish that any weighting is superior to another — that determination belongs to the stakeholder consultation process — and it does not certify that a high composite score represents a genuinely excellent building; it certifies only that a building performed well on the declared weight vector.

2.3 The EFABism Distortion Index

The original EFABism paper introduced an Imbalance Index (Δ) that measured the dispersion of pillar scores around their arithmetic mean — a specification that carried two fundamental structural flaws. First, it would register Δ = 0 for a project that scored equally and poorly on all three dimensions, signaling "perfect balance" for a building that had failed comprehensively across all domains. Second, it would penalize deliberately asymmetric projects — memorials, research facilities, emergency shelters — that were designed with justified and transparent domain prioritization. In both cases, the Imbalance Index measured the wrong thing: it measured departure from equality rather than departure from declared intent, conflating a specific numerical relationship (equality) with the evaluative standard that EFABism actually requires (delivery of the declared design intention).

The revised framework introduces the EFABism Distortion Index (D) as a direct replacement. The Distortion Index measures departure from the declared intended score profile — the score targets that the design team and stakeholders established at project outset through the facilitated stakeholder consultation that produced the weight vector:

$$\text{(Eq. 2)}\ D = \sqrt{[\, w_E \cdot (e - \hat{e}_E)^2 + w_F \cdot (f - \hat{e}_F)^2 + w_A \cdot (a - \hat{e}_A)^2 \,]}$$

where êE, êF, and êA are the intended (declared) target score levels for the Economics, Functionality, and Aesthetics domains, respectively, set at project outset through the stakeholder consultation process. Under this specification, D = 0 means the project delivered exactly the intended score profile across all three domains — the definition of EFABism success under any justified weight vector. D > 0 signals unjustified distortion: actual performance departed from declared intent, in directions and magnitudes that the index's component terms identify for diagnostic investigation. Critical timing constraint: D is an ex-post measurement. It can only be computed after occupancy, when post-occupancy evaluation (POE) data or comparable performance evidence is available to determine actual pillar scores (e, f, a). D is not available during design selection and therefore cannot serve as a prospective design constraint. Note also on directionality: because differences are squared, exceeding a declared target score registers as distortion symmetrically with falling below it. This is appropriate when the declared targets are exact intended coordinates. If targets represent minimum acceptable thresholds rather than precise intended values, a one-sided shortfall formulation should be used instead; any EFABism report must state explicitly which interpretation applies.

> ***Critical Correction***
>
> *D can only be computed ex post, after occupancy and POE data collection. Its function is evaluative — assessing the fidelity of delivered performance to declared design intention — not prospective. For prospective design comparison among alternatives, the Tradeoff Ledger is the appropriate primary tool. Furthermore, D evaluates whether the declared intent was delivered; it does not evaluate whether the declared intent was itself wise — a question of justification requiring stakeholder deliberation, not mathematics.*

2.4 Pillar Score Operationalization

All pillar scores must be indexed to a declared stakeholder group and a declared time horizon before reporting. Any EFABism score reported without these specifications is analytically incomplete and professionally irresponsible.

The **Economics Score** (e), indexed to stakeholder s at time t, is derived from lifecycle cost analysis, return-on-investment metrics, and cost efficiency ratios relative to regional typological benchmarks. The primary data sources are construction cost records normalized by building type and regional cost index, NPV-discounted maintenance cost projections (with service period, nominal discount rate, and cost escalation rate assumptions stated explicitly in all reports), energy cost modeling calibrated to declared service period and energy price trajectory assumptions, and transaction price data normalized by typological peer groups and time-of-sale market conditions.

The direction of scoring must be stated: higher *e* values indicate superior economic performance relative to the declared benchmark for the declared stakeholder group.

The **Functionality Score** (*f*), indexed to stakeholder *s* at time *t*, is derived from occupancy performance metrics, user satisfaction data from standardized post-occupancy evaluation protocols, building energy performance ratings (normalized to a declared reference building of the same type and climate zone, with scoring direction explicitly stated so that higher values indicate better performance), and spatial utility indices including the net assignable area to gross floor area ratio. User groups must be specified before scoring begins. The common practice of inferring functional performance from design intent, rather than measuring it from occupant experience, is not sufficient for EFABism reporting purposes — declared intent and delivered performance are the quantities that the Distortion Index is specifically designed to distinguish.

The **Aesthetics Score** (*a*), indexed to stakeholder or cultural observer *s* at time *t*, is derived from expert design quality ratings by declared panels of qualified reviewers (with panel composition and weighting methodology disclosed), occupant well-being scores from validated POE survey instruments, material quality and aesthetic longevity indices with declared component weights, and market-revealed aesthetic premiums estimated from hedonic pricing models following the methodology of Section 6. The temporal dimension requires careful handling: aesthetic reception changes over time, and any aesthetic score must specify not only the observer but the time of assessment.

2.5 The EFABism Tradeoff Ledger

The original paper's EFABism Objective Function as primary decision tool carried a critical structural flaw: total design value V was defined as a composite of functional, aesthetic, and cost dimensions, then proposed for estimation by regressing its components against V itself — a tautology in which the dependent variable was functionally defined by the independent variables, and in which empirical estimation was mathematically circular. This paper replaces the Objective Function as the primary decision tool with the EFABism Tradeoff Ledger: a structured accounting format that makes the gains and sacrifices associated with each design option visible across all three domains without asserting a single universal value score that conceals the distributional complexity of those gains and sacrifices.

For each design option under evaluation, the Tradeoff Ledger records, in tabular format, the following information for each domain entry:

Domain	Gain [$E_s/F_s/A_s(t)$ improvement]	Sacrifice [$E_s/F_s/A_s(t)$ cost or loss]	Stakeholder	Time Horizon	Uncertainty Range
Economics (E)	Stated economic improvements for the declared stakeholder group	Stated economic costs, losses, or externalized burdens	Declared stakeholder	Declared years	± confidence range
Functionality (F)	Stated functional improvements for the declared user group	Stated functional limitations, constraints, or sacrifices	Declared user group	Occupancy period	± confidence range
Aesthetics (A)	Stated aesthetic gains for the declared observer group	Stated aesthetic limitations or receptions risks	Declared observer	Time of assessment	Stated cultural uncertainty

The Tradeoff Ledger does not produce a single winning number. It produces a structured disclosure. Design selection occurs through stakeholder deliberation over the disclosed ledger — through the application of the declared weight vector to the tradeoffs identified, weighted by the declared priorities, and negotiated through a legitimate consultative process. The Ledger explicitly accommodates risk and uncertainty ranges rather than point estimates; externalized costs that fall outside the commissioning stakeholder's direct accounting but within the full economic analysis; distributional consequences that identify who benefits from each gain and who absorbs each sacrifice; and time-differentiated impacts that distinguish near-term and long-term consequences of each design decision. This transparency is the primary ethical instrument of the EFABism practice framework.

2.6 The EFABism Objective Function as Decision-Support Heuristic

While the Tradeoff Ledger is the primary disclosure and deliberation tool of the EFABism practice framework, the EFABism Objective Function retains legitimate value as a decision-support heuristic — a quantitative instrument that supports the comparison of design alternatives when a weight vector has been declared, consistent measurement data are available across all options under evaluation, and the analyst is clear that the resulting composite score is a heuristic comparison metric rather than a measure of intrinsic architectural quality. In its corrected form, the Objective Function is written:

$$\text{(Eq. 3)}\quad E[V_i \mid F_i, A_i, C_i] = \beta_1 \cdot F_i + \beta_2 \cdot A_i - \beta_3 \cdot C_i$$

The variables are defined as follows: $E[V_i \mid F_i, A_i, C_i]$ is the predicted composite design value score for option i — a heuristic comparison metric, not a measure of intrinsic architectural worth; F_i is quantified functional performance for option i, derived through the operationalization procedures of Section 2.4; A_i is quantified aesthetic value for option i, derived through the same operationalization; C_i is the lifecycle cost of option i, defined as the sum of initial construction cost and the net present value of projected long-term maintenance and operational expenses across the declared service period, discounted at the declared nominal rate; β_1, β_2, and β_3 are weighting coefficients estimated from historical project data through the procedure of Section 2.7. Note on units and interpretation: if C_i is measured in dollars, the coefficient ratios β_1/β_3 and β_2/β_3 have units of dollars per unit of functional or aesthetic performance, respectively — they represent the implied cost-equivalent value, or willingness-to-pay, per unit of domain performance, not 'return per dollar.' The stochastic error term ε_i is present in any fitted regression for historical data (Equation 5) but is excluded from the prospective selection formula because its value is unknown for any future design alternative; the prospective score is therefore the conditional expectation $E[V_i \mid F_i, A_i, C_i]$ rather than a realized value. The design selection rule subject to budget and domain-floor constraints is:

$$\text{(Eq. 4)}\quad i^* = \arg\max_i \{ E[V_i \mid F_i, A_i, C_i] \} \quad \text{subject to} \quad C_i \le C_{max}, \quad e_i \ge e_{min}, \quad f_i \ge f_{min}, \quad a_i \ge a_{min}$$

The domain-floor constraints $e_i \ge e_{min}$, $f_i \ge f_{min}$, and $a_i \ge a_{min}$ ensure that the maximization of predicted design value does not occur through the abandonment of any domain. Without these constraints, the optimization could theoretically produce solutions that collapse one or more domains entirely in order to maximize performance on the domain with the highest β coefficient — a result that would violate the EFABism principle that all three domains must remain above a minimum presence threshold. The minimum thresholds emin, fmin, and amin are project-specific values established through stakeholder consultation at the outset of the design process, informed by building purpose and program requirements. This formulation preserves legitimate asymmetry — a memorial may legitimately declare amin at a high level — while preventing any domain from being reduced below an agreed floor. The Distortion Index D is intentionally absent from this prospective optimization. D is an ex-post instrument, computable only after occupancy; it cannot serve as a design-phase constraint. D has one job: after construction, measuring whether the completed building delivered the declared EFAB relationship.

> ***Key Insight***
>
> *The ratios $\hat{\beta}_1/\hat{\beta}_3$ and $\hat{\beta}_2/\hat{\beta}_3$ represent the functional and aesthetic "return per dollar," respectively — the composite design value improvement generated per unit improvement in functional or aesthetic performance, holding the other domain constant. A ratio $\hat{\beta}_2/\hat{\beta}_3$ significantly exceeding $\hat{\beta}_1/\hat{\beta}_3$ signals that investment in aesthetic quality delivers a stronger marginal return in the current regional context than equivalent investment in functional enhancement. This finding, where supported by empirical data, provides powerful evidence for aesthetic investment decisions that might otherwise face cost-reduction pressure from clients focused on short-term economic optimization.*

2.7 Coefficient Estimation

The weighting coefficients β_1, β_2, and β_3 in Equation 3 are estimated empirically from historical project data using ordinary least squares regression across a portfolio of completed projects for which POE data and market transaction data are both available. The estimated model takes the form:

$$\text{(Eq. 5)} \quad \hat{V}_i = \hat{\beta}_1 \cdot F_i + \hat{\beta}_2 \cdot A_i - \hat{\beta}_3 \cdot C_i \quad \text{[historical regression; } \varepsilon_i \text{ absorbed into residuals]}$$

These estimated coefficients are decision-support tools, not architectural truths. They encode the revealed preferences of a specific market, time period, building type, and stakeholder composition — and they will differ across regional markets, building types, and cultural moments, reflecting genuine variation in the economic weight that different communities and market conditions assign to functional performance and aesthetic quality. The estimates inform the quantitative entries in the Tradeoff Ledger and support the comparative scoring of design alternatives; they do not replace the stakeholder deliberation that gives those entries their normative meaning. An important conceptual distinction: the w values of the EFAB Weight Vector (wE, wF, wA) and the β coefficients of Equation 3 are fundamentally different in kind. The w values are declared normative weights chosen through stakeholder consultation; they answer the question 'What does this project deliberately value?' The β values are empirically estimated coefficients derived from historical transaction and performance data; they answer the question 'What relationships appear in historical market data?' One must not quietly substitute for the other. The numbers inform the conversation. They do not conclude it.

Section 3 — Irrational Actors, Outlier Architecture, and Cultural Contingency

3.1 Beyond the Rational Optimizer

The mathematical apparatus of the EFABism framework — weight vectors, composite scores, regression coefficients, NPV calculations — can easily imply a specific kind of human subject: a rational actor who seeks reasonable lifecycle value, occupies a building that performs its specified functions, and inhabits or purchases architecture that delivers a discoverable premium for genuine design quality. This person barely exists in architectural practice. Architecture frequently emerges from identities, compulsions, memories, status needs, fears, aspirations, rituals, and emotional attachments that resist ordinary optimization analysis. A congregation may accept difficult economics and considerable functional inconvenience because sacred meaning governs at a level below rational cost-benefit calculation — because the space must bear a specific symbolic weight, and no cheaper or more convenient alternative can carry it. A patron may pursue a building whose aesthetic ambitions far exceed any rational market premium because the building represents something about who they are and what they believe that no rational justification can adequately convey. A community may resist the demolition of a functionally obsolete building because the structure holds memory that the community cannot bear to lose, at any quantifiable price.

Kahneman and Tversky (1979) established formally, through the development of Prospect Theory, what architects have always known through professional practice: decision-making under conditions of significance, loss, and value operates through psychological pathways that diverge systematically and predictably from the expected utility maximization that classical economics assumes. Loss aversion — the tendency to weight potential losses more heavily than equivalent gains — shapes architectural decisions at every scale, from the client who cannot accept a budget reallocation that would improve the building's long-term economics because it feels like a present sacrifice, to the design team that cannot abandon a design approach that is not working because of the sunk cost of creative investment it represents. Reference dependence — the tendency to evaluate outcomes relative to a reference point rather than in absolute terms — shapes how clients receive cost estimates, design quality assessments, and maintenance projections. EFABism accommodates the irrational actor not as an anomaly requiring correction but as a legitimate subject of the framework's analysis. The requirement is not that decisions be rational in the economic-theoretical sense — it is that they be *articulate*: that the architect and client can say, with honesty and precision, what they are choosing, what they are sacrificing, and what they are exchanging, even when the motivation for that choice does not reduce to an optimization calculation.

3.2 Outlier Architecture

Some of architecture's most culturally significant buildings are outliers: Fallingwater, completed in 1939, which represents the resolution of a specific patron-architect relationship at a specific moment of formal ambition, at a cost that far exceeded any rational economic calculation; the Sydney Opera House, which exceeded its original budget by a factor that would have terminated the project at any conventional procurement standard, and which has since returned its investment through civic cultural and economic impact that no cost-benefit analysis conducted at the time of the cost overrun could have predicted; the Holocaust Memorial in Berlin, which represents a form of cultural and ethical obligation whose value cannot be measured in any currency; a Cistercian monastery, whose relationship to Economics is structured by an entirely different set of values than any commercial building type. These buildings do not represent median optimization problems. They do not fit comfortably within any regression analysis of typical building market transactions. The appropriate EFABism question for these buildings is not whether their weight vector resembles a typical building's — it emphatically does not — but whether the asymmetries were deliberate, the tradeoffs were disclosed, and the sacrifices were distributed through a legitimate process that gave adequate voice to those who would bear them.

The EFABism Distortion Index provides the analytical instrument precisely fitted to this question. If the declared weight vector for a memorial assigns near-dominant mass to Aesthetics and symbolic meaning — say, $w_A = 0.70$, $w_F = 0.20$, $w_E = 0.10$ — and the delivered building achieves the declared target scores under that declaration, then $D \approx 0$. Not because the building is modestly or conventionally weighted, but because it delivered exactly what it intended to deliver. Extreme asymmetry that matches declared intent is not distortion. It is commitment. The Distortion Index reaches its highest values not for buildings with unusual weight vectors but for buildings whose delivered performance diverges from their declared intentions — the building that promised economic discipline and delivered financial chaos, or the building that promised aesthetic excellence and delivered mediocrity, regardless of what its declared weight vector specified.

3.3 Culturally Contingent Aesthetics

Aesthetic reception is not universal, stable, or reducible to a single score that can be computed, reported, and treated as definitive across observers, time periods, and cultural communities. The complexity of aesthetic value formation is structural, not incidental: sensory response to material, light, sound, and space; compositional judgment based on learned conventions of proportion, rhythm, and sequence; the productive tension between familiarity and novelty; the accumulation of memory and identity through long-term inhabitation; the articulation or contestation of symbolism through formal choices; expert validation by professional and critical communities operating under shared professional standards; social consensus shaped by cultural conditioning; and fashion operating across multiple timescales from seasonal trend to generational reversal — all of these forces shape perceived aesthetic value simultaneously, often in tension, and none of them is stable across observers, time periods, or cultural contexts.

Brutalism provides the most instructive recent demonstration of aesthetic reception's temporal instability. Concrete buildings from the 1960s — celebrated for their formal honesty at construction, widely rejected as oppressive and ugly in the 1980s and 1990s, and now the subject of serious cultural and scholarly revaluation in the early 21st century — can remain physically unchanged while collective cultural perception travels a remarkable distance in a single generation. The board-formed concrete of the Brutalist vocabulary weathers slowly but significantly in temperate climates, acquiring the organic variation, differential staining, biological patination, and physical evidence of inhabitation that can transform material associations from institutional coldness to archaeological richness. The material is unchanged; the cultural apparatus through which it is perceived has shifted substantially. EFABism acknowledges this instability as a structural feature of aesthetic value — one that the $A_s(t)$ notation attempts to handle with intellectual honesty, flagging the observer-dependence and time-dependence of aesthetic judgment as ineliminable features of the domain rather than measurement problems awaiting better instruments.

Part Three: The Quantitative Research Program

Section 4 — The Role of Econometrics: Bounded Empirical Questions

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4.1 Giving Econometrics the Right Job

The single most important structural decision in the design of any quantitative research program is assigning each methodological layer the right question. The EFABism framework operates through three distinct tiers, each carrying a different burden of proof and a different analytical methodology, and the integrity of the entire structure depends on each tier being assigned only the questions it is equipped to answer.

The first tier is the philosophy. Architecture operates under interacting economic, functional, and aesthetic forces that must be held in deliberate and justifiable relationship — and the failure to honor any of these forces degrades the building's full human contribution in ways that are architecturally, socially, and culturally consequential. This claim rests on architectural intelligence accumulated across millennia of professional practice, on historical observation of how buildings perform across their service lives, on professional observation of how different forms of domain imbalance produce characteristic failure modes, and on the accumulated evidence of building performance and cultural reception across centuries of documentation. It does not require a p-value. A regression analysis that fails to find a statistically significant coefficient on an aesthetic quality variable in a particular market dataset does not refute EFABism's philosophical claim — it describes the measurement limitations of a particular dataset in a particular market context at a particular moment in time.

The second tier is the practice framework. The Tradeoff Ledger, the Weight Vector, and the Distortion Index help practitioners disclose and reason through design tradeoffs in a structured and transparent way. Their validity is practical, not statistical: a practice tool is valid when it helps practitioners make better decisions, communicate more clearly with clients and stakeholders, and maintain professional accountability for their design choices. These tools do not need to pass a statistical significance test; they need to support better architectural practice, and their evaluation is ultimately a matter of professional judgment informed by practical experience.

The third tier is the quantitative research program. Selected aspects of the EFABism force field — the magnitude of functional performance impacts from specific envelope design choices, the market premium that design quality commands in specific regional contexts, the lifecycle cost trajectory of specific material systems — can be measured and tested under defined conditions using econometric methods. This layer produces provisional estimates, bounded by the assumptions of specific model specifications, the quality and coverage of available data, and the inherent limitations of market-based measurements of architectural value. If an econometric result fails to replicate in an independent dataset, or if a coefficient estimate changes sign across regional markets, EFABism does not collapse — because the philosophy's architectural claim was never outsourced to a regression, and the practice framework's validity was never contingent on a particular empirical finding holding across all markets and time periods.

4.2 Data Requirements for Any Empirical EFABism Study

Before any econometric analysis is reported under the EFABism research program, the following requirements must be satisfied. These are not aspirational standards — they are minimum conditions for the results to be reported as EFABism research rather than as exploratory data analysis of uncertain provenance.

Sample-size rationale. For hedonic pricing models with spatial controls and multiple EFABism variable groups, a minimum of 200–300 complete observations provides a reasonable starting point for exploratory estimation. Smaller samples may support single-equation OLS estimation of individual sub-pillar regressions but cannot support the full SUR system or spatial lag model specifications. Any study reporting results from a sample below this threshold must explicitly label all findings as exploratory and must accompany coefficient estimates with confidence intervals that honestly represent the estimation uncertainty that sample size imposes.

Predeclared variable plan. All variables must be fully defined — including units of measurement, primary data sources, measurement instruments or protocols, and stakeholder index — before data collection begins. Post-hoc variable selection — choosing which variables to include based on which produce statistically favorable results — is a form of specification searching that systematically overstates statistical significance and produces findings that fail to replicate. The predeclared variable plan is the primary safeguard against this failure mode.

Missing-data treatment. The method for handling missing observations — complete case analysis, multiple imputation, or other specified procedure — must be stated explicitly before estimation, with justification for the chosen approach relative to the specific pattern of missingness in the dataset.

Training and test separation. For any machine learning augmentation of EFABism analysis, a held-out test set must be specified before estimation begins, and model performance must be reported on the test set rather than the training set. Test set performance is the relevant measure of generalizability; training set performance measures fitting, not prediction.

Robustness checks. Results must be accompanied by sensitivity analysis across alternative model specifications, alternative variable operationalizations, and alternative sample restrictions. A finding that holds across multiple reasonable specifications carries more evidential weight than a finding that emerges only under a specific combination of variable definitions and model choices.

Endogeneity awareness. Design quality, material investment, and functional specification are not randomly assigned across buildings. Higher-quality developers systematically select better locations; better locations attract greater aesthetic and material investment; unobservable building quality correlates with both observable design attributes and transaction prices. In the absence of corrective measures, this produces omitted variable bias in the functional sub-pillar regressions (Equations 6 and 7) and in the aesthetic premium regression (Equation 8), causing HPM-estimated coefficients to overstate the causal effect of design quality on transaction prices. Any empirical EFABism study must acknowledge this endogeneity risk explicitly in its methods section. Where feasible, studies should employ identification strategies that support causal interpretation — including instrumental variables estimation using plausibly exogenous instruments such as zoning history or architect credential variation, regression discontinuity designs around design-award or certification thresholds, or difference-in-differences specifications across before-and-after design events. Studies that do not employ such strategies must label their coefficient estimates as associational rather than causal findings, and must not present them as confirmation of EFABism's theoretical claims.

Uncertainty reporting. All estimates must be accompanied by standard errors and confidence intervals. Point estimates reported without uncertainty ranges do not provide the information needed to assess their reliability. For HPM estimates, confidence intervals should accompany all Pillar Value Share computations.

Distinction between exploratory and confirmatory analysis. Any analysis that was not prespecified in a predeclared plan before data collection is exploratory, and must be labeled as such. Exploratory findings generate hypotheses for subsequent confirmatory testing; they cannot themselves provide confirmatory evidence for EFABism's theoretical claims.

Replication materials. Data provenance, inclusion criteria, variable definitions, descriptive statistics, diagnostic test results, and complete regression tables must be documented sufficiently for independent replication. A finding that cannot be independently replicated from disclosed materials cannot be treated as an established EFABism empirical result.

4.3 A Construct Register

The following register defines the core variables of the EFABism quantitative research program, their units, sources, stakeholder indices, and time horizons. All studies conducted under this program must report variable operationalizations consistent with this register or must explicitly justify deviations from it.

Variable	Definition	Unit	Source	Stakeholder	Time Horizon
e	Economics score	[0,1] normalized	Lifecycle cost analysis / NPV	Owner or tenant, declared	Design horizon, stated years
f	Functionality score	[0,1] normalized	POE surveys / energy ratings	Occupant, declared user group	Occupancy period
a	Aesthetics score	[0,1] normalized	Expert panel ratings / POE well-being	Architectural jury + occupant	Year of occupancy; updated at declared interval
ThermalR	Whole-wall thermal resistance	RSI ($m^2 \cdot K/W$)	Assembly thermal modeling	Facilities manager	Service period
MaterialDurability	Expected service life of material system	Years	Manufacturer data / climate standards	Owner / future owners	Full service life
LayoutEfficiency	Net assignable area / gross floor area	Dimensionless ratio	Space utilization study	Occupant	Operating years
MaterialQuality	Material aesthetic longevity index	0–10 scale	Panel rating	Architectural critic + occupant	Long-term
DesignRating	Independent design quality score	0–10 normalized	Peer review or jury	Professional community	Year of completion
WellbeingScore	Occupant-reported	0–100 survey index	POE instruments	Building occupant	Occupancy years 1–5

Variable	Definition	Unit	Source	Stakeholder	Time Horizon
	experiential well-being				
BrandEquity	Market-observable resale or rental premium attributable to the design reputation of the architect of record, distinct from the intrinsic design quality measured by Design Rating	Index, 0–10 normalized	Transaction records; design award databases; published architect fee-premium studies	Market participant; professional community	Transaction date; updated at each market cycle
TransactionPrice	Observed market sale or rental price	$ per sq ft, 2026 constant	Transaction records	Market participant	Transaction date

Section 5 — Sub-Pillar Regression Models

5.1 The Functional Performance Regression

The functional sub-pillar regression is presented as a provisional research instrument — a model form that encodes reasonable architectural hypotheses about the determinants of functional performance, specified in a form that supports empirical estimation when appropriate data are available, but which is not itself an established empirical finding. Two functional outcome variables are estimated in separate single-equation specifications, reflecting the distinct measurement scales and determinant structures of energy performance and maintenance cost outcomes.

The first functional outcome variable (F1) is energy savings performance relative to baseline: the percentage reduction in site energy use intensity (EUI, kBtu/sq ft/yr) relative to a declared reference building of the same type and IECC climate zone. The second functional outcome variable (F2) is maintenance cost frequency: annual maintenance expenditure per square foot of gross floor area, expressed in constant 2026 dollars, for the declared service period. The separate estimation equations are:

(Eq. 6) $$F1_i = \gamma_0 + \gamma_1 \cdot \text{ThermalR}_i + \gamma_2 \cdot \text{MaterialDurability}_i + \gamma_3 \cdot \text{LayoutEfficiency}_i + \eta_{1i}$$

(Eq. 7) $$F2_i = \delta_0 + \delta_1 \cdot \text{ThermalR}_i + \delta_2 \cdot \text{MaterialDurability}_i + \delta_3 \cdot \text{LayoutEfficiency}_i + \eta_{2i}$$

Critical Building-Science

ThermalR in Equations 6 and 7 is whole-wall thermal resistance — RSI, measured in $m^2 \cdot K/W$ — not thermal mass. Thermal mass (effective areal heat capacity, $kJ/m^2 \cdot K$) and thermal resistance (RSI, $m^2 \cdot K/W$) are physically distinct properties that must not be conflated in any EFABism analysis. Thermal mass describes a material's ability to store and release heat over time, affecting time-lag behavior and the viability of night-flush passive cooling strategies. Thermal resistance describes resistance to steady-state conductive heat flow, directly determining heating and cooling load calculations across a season. For energy performance estimation in Climate Zone 5A (Northern New Jersey), whole-wall thermal resistance (RSI) is the primary determinant of heating load reduction in the envelope model, and the correct variable for the functional performance regression. Furthermore, exterior cladding type — fiber cement, metal panel, terra cotta — is not the primary determinant of whole-wall thermal performance. The primary determinant is the continuous insulation layer's RSI value. Cladding choices meaningfully differentiate on thermal mass, material durability, moisture management characteristics, and aesthetic longevity — all of which are relevant to EFABism analysis — but they cannot substitute for a properly specified continuous insulation layer in the whole-wall thermal resistance calculation.

The diminishing returns hypothesis for ThermalR — that marginal energy savings are large below a threshold T* and near zero above it — cannot be captured by a single linear coefficient γ_1 in Equations 6 and 7. A linear specification imposes a constant marginal effect at all levels of ThermalR, which is inconsistent with the threshold-saturation pattern the theory predicts. To operationalize this hypothesis, the regression must contain an explicit nonlinear structure, such as a segmented (piecewise linear) regression with an estimated or declared breakpoint at T*, a spline specification, a quadratic, a logarithmic transformation of ThermalR, or a saturating functional form. Any reported diminishing-returns finding must use one of these nonlinear specifications; a linear γ_1 alone cannot support the claim. The corrected and restated finding: beyond a threshold RSI value T* — to be estimated empirically for a defined climate zone and assembly type using one of the nonlinear specifications above — the marginal energy savings benefit of additional thermal resistance is expected to decrease substantially. Below T*, each additional unit of whole-wall thermal resistance is hypothesized to produce a meaningful reduction in site EUI. Above T*, the marginal response is hypothesized to approach zero. These are theoretical expectations that motivate the nonlinear research specification; empirical estimation with appropriate data is required to determine whether the threshold exists, where it falls, and how sharply the marginal response declines. Budget liberated by not over-specifying thermal resistance above T* may be reallocated to other domains; the magnitude of any resulting benefit depends on project-specific weights and market conditions and cannot be asserted in advance of empirical analysis.

5.2 The Aesthetic Premium Regression

The aesthetic sub-pillar regression is presented explicitly as a tool for estimating perceived economic value — the willingness to pay for design quality that market participants reveal through transaction prices — and not as a measure of intrinsic aesthetic value. This distinction is not merely cautionary language; it reflects a fundamental analytical point. The market partially and imperfectly captures aesthetic value, under conditions of a specific market, time period, building type, and cultural context. A market that systematically undervalues extraordinary design quality — through buyer ignorance, transaction cost barriers, or cultural conditions that do not currently reward architectural distinction — will produce HPM-estimated aesthetic premiums that understate the building's actual aesthetic significance. The regression measures market-revealed willingness to pay, which is evidence about perceived value; it does not establish intrinsic architectural worth. The aesthetic sub-pillar regression takes the form:

$$A_i = \alpha_0 + \alpha_1 \cdot \text{MaterialQuality}_i + \alpha_2 \cdot \text{DesignRating}_i + \alpha_3 \cdot \text{WellbeingScore}_i + \alpha_4 \cdot \text{BrandEquity}_i + \zeta_i \quad \text{(Eq. 8)}$$

The variables are defined as follows: MaterialQuality is the expert-rated index of aesthetic longevity and visual coherence for the primary material systems, on a 0–10 scale with declared panel composition and component weighting; DesignRating is an independent architectural design quality score from peer review panels or design juries, normalized to the [0,1] interval, with panel composition and scoring methodology declared; WellbeingScore is the occupant-reported well-being index derived from standardized POE survey instruments, capturing the experiential quality of inhabiting the building; and BrandEquity is the market-observable resale or rental premium attributable to design reputation, expressed in dollars per square foot above the declared market baseline, and estimated from transaction records for buildings associated with recognized architectural practices or design awards. Circularity warning: if the Aesthetics Score Ai is itself constructed as a weighted composite of MaterialQuality, DesignRating, WellbeingScore, and BrandEquity, then regressing those same variables against Ai in Equation 8 reproduces the construction formula rather than explaining an independent outcome — a circular specification in which the dependent variable is defined by the regressors. To avoid this, either (a) Ai must be independently observed from a source that does not employ these components as inputs (for example, an independent expert jury score or a market transaction premium estimated separately from the HPM), or (b) Equation 8 must be described as constructing an aesthetic index from its components rather than as a regression that statistically explains an independently measured aesthetic outcome.

The aesthetic pillar presents a uniquely challenging measurement problem. It involves both subjective phenomenological experience — what it feels like to inhabit the space, to encounter the building from the street, to move through its sequence of volumes — and objective market outcomes, in the form of transaction price premiums that willingness-to-pay reveals. These two dimensions of aesthetic value are theoretically related but empirically not always correlated: a building may produce profound experiential quality while commanding no measurable market premium, because the market in which it operates does not reward that quality with purchasing behavior. The regression bridges both dimensions by including survey-based measures (WellbeingScore) and market-revealed measures (BrandEquity) as simultaneous regressors, recognizing that each captures a different aspect of the full aesthetic value picture.

5.3 The Seemingly Unrelated Regressions System

When data quality and sample size support it, the functional and aesthetic regressions of Equations 6, 7, and 8 can be estimated jointly as a Seemingly Unrelated Regressions (SUR) system, exploiting the cross-equation error correlations that are architecturally expected — because the same building that performs poorly on energy efficiency is likely, for reasons related to design quality and material specification, to also underperform on maintenance cost and aesthetic market premium. The SUR system is:

$$\text{(Eq. 9)}\ [\, F1_i, F2_i, A_i \,] = f(\mathbf{X_i}\, ; \Theta) + [\, \eta_{1i}, \eta_{2i}, \zeta_i \,]$$

where $\Theta = \{\gamma 0 \ldots \gamma 3, \delta 0 \ldots \delta 3, \alpha 0 \ldots \alpha 4\}$ is the joint parameter vector of all three equations, and the joint estimation exploits the variance-covariance structure of the cross-equation error terms to improve estimation efficiency relative to separate single-equation estimation. The efficiency gain from SUR estimation is largest when the cross-equation error correlations are high and when the regressor matrices differ substantially across equations — both conditions that are plausible in architectural EFABism data, where omitted building-quality variables can induce correlated errors across functional and aesthetic performance equations. However, the SUR system is appropriate only under conditions that many current EFABism datasets will not satisfy: the sample must be large enough to support joint estimation — adequacy depends on the number of equations, parameters, cross-equation covariance structure, identification requirements, target statistical power, and data quality, and cannot be reduced to a universal minimum observation count — all variables must be correctly specified without meaningful misspecification in any equation of the system, and cross-equation error correlations must be expected on substantive architectural grounds rather than detected post-estimation and used retrospectively to justify the specification choice. In small samples, single-equation OLS with heteroskedasticity-consistent (HC) standard errors using the Huber-White sandwich estimator is both analytically safer and more honest about estimation uncertainty. The SUR system is a research aspiration for the program as data accumulate; it is not a current operational tool.

Section 6 — Hedonic Pricing Models for EFABism Market Analysis

6.1 Overview and Corrected Purpose Statement

Hedonic pricing models decompose observed market transaction prices into the implicit prices of the individual building and location attributes that constitute the transaction, revealing the market's willingness to pay for each attribute. The theoretical foundation of hedonic price analysis — established by Rosen (1974) and building on Lancaster's (1966) characteristic-space approach to product valuation — rests on the assumption that in a competitive market in equilibrium, observed transaction prices fully reflect the shadow prices of all attributes that market participants value, and that these shadow prices can be recovered through appropriately specified regression analysis of transaction price data on attribute vectors. In the EFABism research program, HPMs serve one bounded and precisely defined purpose: estimating the perceived economic value that market participants associate with measurable functional and aesthetic attributes of buildings, under conditions of a defined market geography, time period, building type, and transaction type. This boundary is important. HPMs can reveal willingness to pay for design quality as market participants perceive and value it. They cannot establish intrinsic architectural value, confirm the philosophical validity of a declared EFABism weight vector, or provide definitive EFABism certification of a building's quality. The EFABism Balance Certificate concept introduced in the original paper is retired in this revision — it claimed an objective finality that the underlying statistical models cannot support and that the philosophical framework does not require. In its place, Section 8.1 introduces the EFABism Balance Report as a professional disclosure instrument whose authority derives from transparency and declared assumptions rather than from statistical certification.

6.2 Core HPM Specification

The semi-log specification is the standard form for HPMs applied to real estate transaction data, preferred because it provides approximate percentage-change interpretations for small coefficient values and is consistent with the log-normality of price distributions observed in most real estate markets. The core EFABism HPM takes the form:

$$\text{(Eq. 10)}\ \ln(P_i) = \beta_0 + \beta_F \cdot \mathbf{X}_{F,i} + \beta_A \cdot \mathbf{X}_{A,i} + \beta_C \cdot \mathbf{X}_{C,i} + \varepsilon_i$$

where $\mathbf{X}_F$ contains the vector of functional attribute variables, $\mathbf{X}_A$ contains the vector of aesthetic attribute variables, $\mathbf{X}_C$ contains the vector of economic and location control variables, and ε_i is the stochastic error term. The semi-log form is preferred over the linear form for EFABism applications because it handles the right-skewness of transaction price distributions more effectively and because it provides a natural percentage-change interpretation for attribute premiums that is more meaningful to practitioners and clients than a dollar-per-unit coefficient.

> ***Critical Correction***
>
> *In the semi-log model, Pillar Value Shares cannot be computed by simply multiplying linear coefficient contributions by mean attribute values and dividing by mean price — this approximation, appropriate for the linear model, is unreliable in the semi-log form for large coefficients. The correct retransformation procedure must account for the nonlinear relationship between log-price and level-price, and all reported Pillar Value Shares from semi-log HPMs must be labeled as approximate and accompanied by confidence intervals that represent the full estimation uncertainty, including retransformation error.*

6.3 Functional and Aesthetic Variable Groups

The Functional Variable group ($\mathbf{X}_F$) includes: gross floor area (log-transformed to accommodate the nonlinear scale relationship between building size and price); the net-to-gross efficiency ratio measuring the fraction of gross floor area that is net assignable space; the whole-building energy use intensity rating (EUI, normalized to a declared reference building and direction-corrected so that higher variable values indicate better energy performance); a spatial usability score derived from occupant surveys or expert assessment; and a structural condition index based on physical inspection or building condition assessment. The Aesthetic Variable group ($\mathbf{X}_A$) includes: a design quality rating from an expert panel whose composition is declared, normalized to the [0,1] interval; a material quality index with component weights declared; architectural style dummy variables with reference category declared; and a visual appeal score from an occupant survey using a standardized, declared instrument. The Economic and Control Variable group ($\mathbf{X}_C$) includes: building age and physical condition index; GIS location coordinates and a neighborhood amenity index; walkability score and transit proximity measures; time-of-sale market cycle controls (year-quarter dummies or market cycle index); and a regional construction cost index benchmark with declared reference index and base year.

> ***Methodological Rule***
>
> *The Economic Pillar Value Share must not be computed as a residual ($1 - PVS_F - PVS_A - PVS_{controls}$). Computing the Economics domain value share as a residual assigns all model error, omitted variable bias, and scale artifacts to the Economics domain, producing results that are systematically biased in ways that cannot be assessed or corrected. Instead, explicitly economic attributes — lifecycle cost metrics, energy operating cost exposure, maintenance trajectory indicators — must enter $\boldsymbol{X}_C$ as independently specified variables whose coefficients can be estimated directly.*

6.4 Estimation Strategy (Three Stages)

Stage 1 — OLS Baseline. Equation 10 is estimated via ordinary least squares as the baseline specification. Prior to interpreting coefficient estimates, the following diagnostic tests must be conducted and reported: the White test for heteroskedasticity in the error term, with heteroskedasticity-consistent standard errors applied if the null of homoskedasticity is rejected; the Variance Inflation Factor (VIF) for each regressor, with VIF values exceeding 10 flagging problematic multicollinearity that requires resolution through variable selection, aggregation, or principal component reduction before coefficients can be reliably interpreted; and the Ramsey RESET test for functional form misspecification, with evidence of misspecification prompting investigation of nonlinear transformations, interaction terms, or alternative functional forms. All diagnostic test results — test statistics, degrees of freedom, and p-values — must be reported alongside coefficient estimates in the research output. Diagnostic results that are selectively omitted because they are unfavorable must be treated as a violation of the EFABism research program's reporting standards.

Stage 2 — Spatial Econometrics (when data supports it). Real estate transaction prices exhibit systematic spatial dependence — nearby properties tend to share price levels that reflect common neighborhood conditions, amenity access, and local market dynamics that the attribute vector cannot fully capture. When this spatial autocorrelation is present and not controlled for, OLS coefficient estimates are inefficient and standard errors are biased. The appropriate test for spatial autocorrelation in OLS residuals is Moran's I, computed on residuals from Stage 1 using a spatial weight matrix whose construction method — k-nearest neighbor, distance band, or contiguity-based — must be declared before estimation. When Moran's I rejects the null of spatial randomness, spatial dependence is confirmed in the OLS residuals, but Moran's I alone does not determine whether the appropriate specification is a Spatial Lag Model or a Spatial Error Model. That choice must be guided by additional diagnostics (such as the Lagrange Multiplier tests for lag and error dependence) and, crucially, by the substantive theoretical mechanism: if prices are directly determined by neighboring prices, the lag model is appropriate; if omitted spatially correlated variables drive the dependence, the error model is appropriate. After completing that determination, the selected model is estimated. For the Spatial Lag Model, the specification is:

$$\text{(Eq. 11)}\ \ln(P_i) = \rho \cdot \mathbf{W} \cdot \ln(\mathbf{P}) + \beta \cdot \mathbf{X} + \varepsilon$$

where W is the row-standardized spatial weight matrix and ρ is the spatial autoregressive parameter. As noted above, the specification choice between the Spatial Lag Model and the Spatial Error Model must be made on theoretical and diagnostic grounds before estimation; post-estimation selection based on which specification produces higher fit statistics or more favorable EFAB attribute coefficients is not acceptable.

Stage 3 — Machine Learning Augmentation (exploratory only). Nonlinear interactions among EFABism variables — for example, the interaction between design quality and neighborhood amenity context, or between material quality and building age — may not be adequately captured by linear regression specifications. Random forest or gradient-boosted regression tree methods (specifically XGBoost) can explore these nonlinear associations through their ability to detect interaction effects without pre-specification. SHapley Additive exPlanations (SHAP) values provide approximate marginal attribution of predicted price variation to individual variable contributions. All machine learning results are explicitly exploratory: they describe model-fitted associations in the estimation dataset, not architectural value, not causal effects, and not findings with the generalizability that confirmatory regression analysis with appropriate diagnostics provides. Stage 3 results must be labeled as hypothesis-generating in all reports and presentations.

6.5 Revised Pillar Value Share Computation

When a hedonic pricing model produces reliable semi-log coefficient estimates, economic premiums attributable to functional and aesthetic attributes can be estimated, but the computation requires care because of the semi-log model's retransformation requirements. In the semi-log specification of Equation 10, each coefficient βF or βA multiplied by its corresponding attribute vector XF or XA yields a quantity in log-price units, not dollar units. Dividing that log-price quantity by mean dollar price $\bar{P}$ does not produce a valid percentage share of price — the units are incommensurable. Two defensible approaches exist for estimating economic premiums from a semi-log HPM:

Approach 1 — Predicted-price counterfactuals: Compute the predicted price at the sample mean attribute values ($\hat{P}$base) and then at mean attribute values with one domain's attributes set to an alternative level ($\hat{P}$alt). The economic premium is $\hat{P}$alt – $\hat{P}$base in dollar terms, after proper exponential retransformation: $\hat{P} = \exp(X'\hat{\beta} + \hat{\sigma}^2/2)$ when residuals are approximately normal, or using a non-parametric smearing estimator when they are not.

Approach 2 — Approximate elasticity interpretation: For small attribute changes, the semi-log coefficient βk approximates the proportional change in price associated with a one-unit increase in attribute k (i.e.,

$\partial \ln(P)/\partial x_k \approx \beta_k$). This elasticity interpretation is valid only for small, interpretable changes in x_k and must be clearly labeled as an approximation, not a dollar share of value.

Any reported Pillar Value Shares or domain-specific economic premiums must be accompanied by confidence intervals derived from the coefficient covariance matrix through the delta method or bootstrap resampling, and must include a clear statement that the values measure market-attributed perceived value for the declared market, time period, building type, and transaction context — not intrinsic architectural worth, and not a generalizable finding about the universal market value of design quality. Claims that each domain owns a clean percentage 'share' of market value are not supported by the semi-log model without a defensible decomposition method; such claims should not appear in EFABism research reports.

Section 7 — Illustrated Decision Exercise: Facade Material Selection, Northern New Jersey

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> ***Important Label***
> *This case study is presented as an illustrated decision exercise, not an empirical finding. Scores, tradeoff entries, and regression results are constructed to demonstrate EFABism reasoning under a declared weight vector. They do not represent actual measured outcomes from a specific building project.*

7.1 Design Problem

A commercial and residential mixed-use facade project in Northern New Jersey — a region characterized by significant seasonal climate variance under IECC Climate Zone 5A, a sophisticated real estate market with documented design-quality premiums, and a mature regional construction industry with established competencies across multiple cladding systems. The BASE wall assembly is held constant across all three options under evaluation: a continuously insulated metal stud wall with a declared continuous insulation layer achieving the target RSI value for Climate Zone 5A, a fully adhered air barrier, a vapor retarder positioned within the assembly consistent with Climate Zone 5A hygrothermal requirements, and interior gypsum board with declared finish system. Only the exterior cladding type varies across options, permitting the analysis to isolate the EFABism contribution of the cladding selection from the whole-wall thermal performance, which is governed by the constant continuous insulation specification. The three options are: Option A, standard fiber cement panel — an established regional performer with moderate aesthetic flexibility, a well-understood installation methodology in the regional contractor market, and cost-competitive 30-year lifecycle economics; Option B, premium composite metal panel — enhanced aesthetic presence and market recognition potential, a high durability rating, moderate-to-high lifecycle cost relative to fiber cement, with installation requiring a fabricator experienced in metal panel systems; and Option C, architectural terra cotta — exceptional aesthetic authority, outstanding material longevity with a service life significantly exceeding the 30-year NPV analysis horizon, highest first cost and widest NPV uncertainty range, requiring specialized installation by a contractor with documented terra cotta experience. The service period for NPV analysis is 30 years. The nominal discount rate is 5%. All costs are stated in constant 2026 dollars.

7.2 Declared Weight Vector

The design team and client stakeholders establish the following weight vector at project outset through a facilitated stakeholder consultation conducted before any option-specific scoring is computed: $w_E = 0.35$, $w_F = 0.40$, $w_A = 0.25$. This distribution reflects the priorities of a cost-conscious mixed-use commercial and residential institution that places its highest priority on functional performance and long-term building quality, assigns strong secondary priority to economic stewardship across the 30-year service period, and recognizes that civic context and building legibility in a Northern New Jersey mixed-use setting require meaningful aesthetic investment — but at a level of priority that does not override the institution's economic obligations to its occupants, future owners, and operating budget. The weight vector is declared and recorded before domain scores for any option are computed.

7.3 Illustrative Tradeoff Ledger

Option / Domain	Gain	Sacrifice	Stakeholder	Time Horizon	Uncertainty Note
A — Fiber Cement: Economics	Lower first cost; competitive NPV at 30-year service period; well-established regional pricing	Higher maintenance frequency (painting/sealing cycle); potential mid-life panel replacement cost	Owner, future owners	30 yr	±15% NPV range; mid-life replacement timing uncertain
A — Fiber Cement: Functionality	Adequate thermal performance at stated assembly; well-understood installation details; minimal installer risk	Lower material longevity may require earlier replacement; modest occupant pride of place	Occupant, FM	Full service	Low confidence on subjective factors
A — Fiber Cement: Aesthetics	Flexible finishes; consistent appearance; broad regional market acceptance	Does not achieve design recognition premium; limited civic presence; no material distinction	Jury, market	Year 1; stable	Market-dependent; low cultural longevity trajectory
B — Metal Panel: Economics	Moderate first cost; lower maintenance cycle frequency than fiber cement; favorable long-run NPV	Premium over fiber cement at installation; specialist fabrication required; higher mobilization cost	Owner, future owners	30 yr	±12% NPV range; fabrication cost variable by market conditions
B — Metal Panel: Functionality	Superior material durability; strong long-term performance trajectory; low maintenance burden	Higher initial structural load contribution; detailing complexity at interfaces	Occupant, FM	Full service	Moderate confidence; execution-quality dependent

Option / Domain	Gain	Sacrifice	Stakeholder	Time Horizon	Uncertainty Note
B — Metal Panel: Aesthetics	Strong design presence; potential design recognition market premium; contemporary market positioning	Execution quality-dependent; aesthetic aging under some light conditions uncertain	Jury, occupant, market	Long-term	Culturally contingent; reception varies by neighborhood context
C — Terra Cotta: Economics	Longest material service life; potential historic preservation designation value; highest market premium trajectory	Highest first cost; specialized installation; widest NPV uncertainty range; longest payback horizon	Owner, future owners	50+ yr	Wide uncertainty; analysis horizon shorter than material life
C — Terra Cotta: Functionality	Excellent thermal mass contribution; outstanding material durability; superior rain-screen performance	Specialized repair requires skilled tradespeople; installation risk without experienced contractor	FM, owner	Full service	Moderate confidence; contractor capability is critical risk factor
C — Terra Cotta: Aesthetics	Exceptional aesthetic authority; strong civic presence; aesthetic reception trajectory improves with age and patination	Requires highly experienced design team; highest initial cost may constrain other design quality investments	All observers	Long-term	High positive aesthetic trajectory over time; strong cultural longevity

7.4 Illustrative EFABism Composite Scores

Design Option	*e* (Econ)	*f* (Func)	*a* (Aesth)	$EFAB_{composite}$	Interpretive Note
A: Fiber Cement	0.78	0.64	0.51	0.657	*Strong economic performance; functional and aesthetic limitations reduce composite under this weighting*
B: Composite Metal	0.64	0.79	0.76	0.730	*Balanced mid-range economic score; strong functional and aesthetic performance; leads composite under declared weights*
C: Terra Cotta	0.44	0.83	0.92	0.716	*Exceptional functional and aesthetic scores; economic drag under cost-priority weighting reduces composite below Option B*

Under the declared weighting of $w_E = 0.35$, $w_F = 0.40$, $w_A = 0.25$, Option B achieves the highest EFABism composite score despite not leading on any single domain individually. Option A leads on Economics; Option C leads on both Functionality and Aesthetics. Option B leads on no individual domain — yet it achieves the highest composite because its performance profile most efficiently matches the declared weight vector. This is the EFABism optimization criterion expressed in practice: not the cheapest, not the most functional, not the most beautiful in isolation, but the option that achieves the most efficient coherent triangular balance under the declared priority structure. The selection of Option B is justified not because it is the best building that money can buy, but because it is the best building available within the declared weight structure — and because that declaration was made before the scores were computed.

7.5 Sensitivity Analysis

The EFABism composite scores are recalculated under an alternative weight vector appropriate to a civic institution that places higher priority on long-term aesthetic legibility and material cultural authority: $w_A = 0.45$, $w_F = 0.35$, $w_E = 0.20$.

Design Option	$EFAB_{composite}$ (Original: w_E=0.35, w_F=0.40, w_A=0.25)	$EFAB_{composite}$ (Alternative: w_E=0.20, w_F=0.35, w_A=0.45)	Rank Shift
A: Fiber Cement	0.657	0.610	Third → Third

Design Option	EFAB$_{composite}$ (Original: w_E=0.35, w_F=0.40, w_A=0.25)	EFAB$_{composite}$ (Alternative: w_E=0.20, w_F=0.35, w_A=0.45)	Rank Shift
B: Composite Metal	0.730	0.747	First → Second
C: Terra Cotta	0.716	0.793	Second → First

Under the alternative weighting, Option C rises from second to first, while Option B falls from first to second. Option A remains third under both weight vectors. The rank reversal between Options B and C illustrates the core EFABism insight with precision: the optimal design choice is not an intrinsic property of the building options; it is a function of the declared weight vector, which is in turn a function of building purpose, institutional identity, and the considered values of the stakeholder community that the building serves. No option is inherently superior. The EFABism framework makes the weight dependency explicit, visible, and subject to principled deliberation — transforming what might otherwise be experienced as an arbitrary decision driven by budget pressure or personal preference into a structured, transparent, and accountable choice.

7.6 Diminishing Returns Finding (Corrected)

The functional sub-pillar regression applied to this case study illustrates the ThermalR diminishing-returns hypothesis using the wall assembly data. An important constraint applies: in this facade comparison exercise, the base wall assembly (including continuous insulation) is intentionally held constant across Options A, B, and C in order to isolate the cladding decision. Because ThermalR does not vary across the three options, it cannot explain differences in functional performance among them and cannot be used to detect or illustrate a threshold effect within this exercise. The correct interpretation of this structure is that the facade comparison is a cladding decision under a fixed thermal assembly — the best architectural reasoning for isolating the variable of interest — not a thermal sensitivity analysis. To illustrate the ThermalR diminishing-returns threshold, a separate analysis is required in which ThermalR actually varies across the observations or scenarios being compared; that analysis should be treated as a distinct illustrative exercise. Within this case study, the diminishing-returns finding is presented as a theoretical motivation for avoiding over-specification of the thermal assembly: specification resources consumed by exceeding a plausible threshold T* produce no measurable functional performance improvement and consume capital budget that could be reallocated across domains in proportion to the declared weight vector. The magnitude of any resulting composite performance benefit is project-specific and requires empirical estimation; it cannot be asserted as a general result or attributed to a specific dataset not presented in this paper.

Section 8 — Implications for Practice and the Profession

8.1 The EFABism Balance Report — Format and Required Components

The EFABism Balance Report replaces the original paper's EFABism Balance Certificate. The distinction between these two instruments is not merely terminological: it reflects a fundamental reorientation of what the primary professional EFABism output is designed to accomplish. A certificate claims objective quality; a report makes structured disclosures. The EFABism Balance Report is a professional disclosure document whose authority derives from the transparency, intellectual honesty, and internal consistency of its declared assumptions — not from a statistical certification process that would claim more analytical finality than the underlying models can support. The required components of a complete EFABism Balance Report are as follows.

First, the Declared Weight Vector: (w_E, w_F, w_A) with full stakeholder attribution — specifying which stakeholders participated in the facilitated consultation process that produced the vector — and a narrative justification of the chosen weights relative to the building's purpose, program, site, and stakeholder composition. Second, the Pillar Score Vector: (e, f, a) with a documented measurement pathway for each score, including data sources, measurement instruments or protocols, declared stakeholder index, declared time horizon, and estimated uncertainty range for each score. Third, the EFABism Composite Score (Equation 1) for each design option under evaluation, computed under the declared weight vector and accompanied by a sensitivity analysis showing composite scores under at least one alternative weight vector that represents a meaningfully different stakeholder priority structure. Fourth, the EFABism Tradeoff Ledger for each design option, populated with gains, sacrifices, stakeholder attributions, time horizons, and uncertainty notes in the format specified in Section 2.5. Fifth, when post-occupancy data are available from a completed project under evaluation: the EFABism Distortion Index D (Equation 2) comparing the intended score profile declared at design outset with the delivered score profile measured through post-occupancy evaluation, with narrative interpretation identifying which domains delivered as declared, which fell short, which exceeded expectations, and what the divergences reveal about the design and delivery process. Sixth, a data limitations and uncertainty statement that honestly characterizes the quality of the evidence underlying each reported score, identifies the distinction between exploratory and confirmatory results within any quantitative analysis, and specifies the conditions under which the reported findings should be revisited as new post-occupancy data become available.

8.2 Integration with Post-Occupancy Evaluation

Post-occupancy evaluation data represents the foundational empirical resource of the entire EFABism quantitative research program. Without reliable, well-instrumented POE data from a sufficiently large and diverse portfolio of completed buildings, the regression models of Part Three have no credible empirical basis, the Distortion Index cannot be computed, and the Composite Score's weight vector cannot be calibrated against historical outcomes. Each completed and monitored project becomes a data point that improves future EFABism analyses — but only if its POE data are collected according to the requirements of Section 4.2, using declared stakeholder indices, standardized measurement instruments, and reporting formats that support aggregation across projects and comparison over time.

The critical addition to the original EFABism approach to POE is the longitudinal requirement: POE data must be indexed to specific stakeholder groups and collected at multiple time points across the service life of the building, not merely at a single post-occupancy moment that captures the building's early-occupancy performance under conditions that may not represent its full service-life trajectory. A longitudinal POE program that tracks occupant satisfaction, energy performance, maintenance cost actuals, and market transaction premiums at years two, five, ten, and twenty provides the time-indexed EFABism values — $E_s(t)$, $F_s(t)$, $A_s(t)$ — that give the framework its analytical depth. These longitudinal data points are the empirical basis for testing EFABism's lifecycle performance claims: whether buildings designed under a declared EFABism weight vector with appropriate tradeoff disclosure actually deliver the intended domain scores over time, or whether systematic divergences between declared intent and delivered performance identify recurring failure modes that the practice framework should address. This creates a self-improving feedback loop between EFABism design intention and real-world performance validation — the kind of evidence accumulation that elevates a philosophical framework into a research program with genuine empirical grounding.

8.3 Vernacular EFABism and Regional Calibration

EFABism explicitly recognizes that balance is context-sensitive in ways that require regional calibration of the quantitative models rather than the application of universal coefficient values derived from any single market context. The calibration of regression coefficients and HPM estimates to specific regional markets is both analytically appropriate and professionally necessary. Coefficient estimates derived from Northern New Jersey commercial and mixed-use transactions will differ — predictably, systematically, and for architecturally meaningful reasons — from coefficients appropriate for coastal California, the Gulf South, the Upper Midwest, or international markets. These differences reflect genuine variation in climate and building physics (which shape the functional performance coefficients), material availability and regional supply chain economics (which shape the cost variables), labor market conditions for specialized crafts (which determine the installation premium for terra cotta and metal panel relative to fiber cement), cultural aesthetic preferences and design recognition (which shape the aesthetic premium coefficients), and the market premiums that specific communities have historically paid for measurable design quality. This regional variation is a feature of the EFABism framework — it encodes the insight that the gravitational field is constituted differently in different places, climates, cultures, and economies — and it is not a limitation to be overcome by seeking universally applicable coefficient values that would, in practice, obscure the very regional variation that gives EFABism analysis its contextual intelligence.

8.4 Rejection of Rigid Stylistic Dogma

EFABism explicitly and emphatically rejects any form of rigid stylistic dogma: any single formal vocabulary elevated to a prescriptive rule that all good architecture must follow; any insistence that one domain must always govern regardless of building purpose or stakeholder context; any framework that treats the practicing architect's habitual formal preference as a universal architectural principle. These forms of single-axis rigidity are, from the EFABism perspective, precisely the intellectual failure modes that the framework was designed to diagnose and resist. A design culture that systematically assigns near-zero weight to Aesthetics — in which w_A approaches zero as a programmatic commitment — abandons the cultural and civic obligations that give architecture its public dimension and its role in the formation of community identity. A design culture that systematically assigns near-zero weight to Economics — in which financial obligation to clients, occupants, and communities is treated as a constraint too pedestrian for architectural attention — ignores the fiduciary and civic responsibilities that the profession's public trust demands. A design culture that systematically diminishes Functionality — in which user performance, occupant comfort, and building reliability are subordinated to formal effect — produces spaces that harm their occupants as surely as any structural failure, though the harm is slower, more diffuse, and harder to litigate. EFABism requires that all three domains remain above a minimum presence threshold in any legitimate design process. No stakeholder consultation can reduce any domain weight to zero — because the complete absence of any domain signals a building that has abandoned a fundamental human obligation that the architectural profession, as a matter of professional ethics and public trust, cannot disclaim.

Section 9 — EFABism as an Open Research Framework

9.1 What This Paper Has Established

This paper has made the following contributions to the EFABism research program. First, it has separated the three distinct layers of EFABism — philosophy, practice framework, and quantitative research program — and assigned each its appropriate burden of proof, so that empirical challenges to specific regression estimates cannot be misread as challenges to the philosophical foundations that the architecture of the program rests on. Second, it has replaced the equilateral balance model of the original paper with the weighted-field model, providing a mathematical specification that accommodates the full range of justified weight distributions while preserving the philosophical commitment to multidomain coherence. Third, it has introduced the EFABism Distortion Index as a post-occupancy evaluative instrument that measures departure from declared intent rather than deviation from equality, correcting the most significant structural flaw in the original Imbalance Index. Fourth, it has replaced the circular Objective Function as the primary decision tool with the Tradeoff Ledger, while retaining the Objective Function in its corrected form as a decision-support heuristic with clearly defined interpretive limits. Fifth, it has corrected the building-science errors in the thermal analysis, establishing ThermalR (RSI, $m^2 \cdot K/W$) as the correct variable for whole-wall thermal performance estimation, distinguishing it from thermal mass, and clarifying the relationship between cladding type and thermal performance. Sixth, it has reframed the case study explicitly as an illustrated decision exercise with constructed scores, retiring the original presentation's implicit claim to empirical grounding. Seventh, it has repositioned the quantitative tools — sub-pillar regressions, HPMs, SUR systems — as provisional research instruments that produce bounded empirical estimates informing the practice framework without claiming to prove the philosophy. The framework that results from these revisions is less finished and more truthful than its predecessor. That is the appropriate direction of travel for a research program at this stage of development, and it is the only direction consistent with EFABism's own requirement for honest disclosure of what a given analytical instrument can and cannot claim.

9.2 Open Questions: The Research Agenda

The most productive questions in any research program are the ones it has not yet answered. The EFABism research agenda includes the following open questions, each of which represents a substantive domain of inquiry whose pursuit would materially advance the framework's analytical power and empirical grounding. Future EFABism refinements will clarify and correct the mathematics and create software analysis tools for practical use.

Stakeholder-specific fields. How do the economic, functional, and aesthetic domain values — E_s, F_s, A_s — differ systematically across the full range of stakeholders who inhabit, manage, commission, own, and are affected by a building? The theoretical expectation, grounded in the analysis of Section 1.6, is that these differences are substantial, systematic, and architecturally significant — that the facilities manager's Functionality score and the occupant's Functionality score measure different dimensions of the same building's performance, and that a framework that collapses them into a single undifferentiated index conceals the most important distributional information the EFABism analysis contains. Empirical investigation of stakeholder-specific EFAB scores across a portfolio of building types and occupancy conditions would provide the first systematic evidence about the magnitude and structure of these divergences.

Time-dependent values. How do $E(t)$, $F(t)$, and $A(t)$ evolve across a building's service life? The theoretical framework introduced in Section 1.7 identifies multiple mechanisms through which

EFABism domain values change over time — energy price trajectories, neighborhood change, material weathering, aesthetic fashion — but the empirical evidence on the magnitude and direction of these time-path changes is sparse, fragmented, and not yet organized within an EFABism analytical framework. Longitudinal POE studies that track domain scores at multiple points across service lives of twenty to fifty years would provide the first empirical basis for modeling the time paths of EFABism values and testing the framework's implicit claim that buildings designed for long-term lifecycle EFABism performance actually deliver superior time-averaged composite scores relative to buildings optimized for initial-occupancy performance.

Cultural contingency of aesthetic premiums. How does the magnitude and direction of market-revealed aesthetic premiums vary across regional markets and cultural communities? The HPM methodology of Section 6 can estimate aesthetic premiums in specific market contexts, but the theoretical relationship between measured market premiums and the broader cultural significance of architectural quality remains poorly understood. Markets that systematically undervalue design quality — because buyers lack the information, the resources, or the cultural conditioning to recognize and pay for it — will produce HPM aesthetic premium estimates that understate aesthetic value, potentially producing EFABism composite scores that systematically underweight aesthetics relative to its actual cultural and social significance. Understanding how aesthetic market premiums relate to underlying cultural values across regional and demographic contexts would substantially improve the EFABism framework's ability to represent aesthetic value honestly in its quantitative analyses.

Irrational actors in the EFABism field. How do decisions driven by identity, symbolism, aspiration, loss aversion, and reference dependence appear within EFABism analyses, and how should the framework accommodate these behavioral realities in its practice tools? Section 3.1 establishes the theoretical framework for understanding irrational actors within EFABism, but the translation of this theoretical accommodation into practical analytical tools — ways of recognizing, naming, and managing the influence of non-rational motivations on weight vector declarations and design choices — remains undeveloped. Behavioral EFAB research drawing on Prospect Theory and related frameworks from behavioral economics could substantially extend the practice framework's ability to support genuinely articulate design conversations even when the decision-making process departs significantly from expected-utility optimization.

Externalized costs and social accounting. Can EFABism develop a consistent methodology for incorporating social cost accounting — environmental costs, neighborhood externalities, public health impacts of building performance — into the Economics domain score? The theoretical claim of Section 1.8 is that these externalized costs belong in *E*, properly indexed to the stakeholder communities that bear them. But the practical tools for estimating, normalizing, and incorporating social costs into a lifecycle cost analysis that also serves as the basis for EFABism economic scoring remain largely undeveloped. Advances in social cost accounting methodology within environmental economics provide potential models for adaptation to the EFABism research context.

Outlier architecture and productive distortion. Can EFABism develop a theory of productive distortion — a framework for recognizing when and under what conditions an extreme, asymmetric EFABism weight vector produces buildings that serve human needs and cultural values in ways that median optimization could not have generated? The EFABism Distortion Index as currently specified evaluates whether a building delivered its declared intention; it does not evaluate whether extreme intentions are culturally valuable. A theory of productive distortion would extend the framework's evaluative capacity to assess the social and cultural contribution of deliberate outliers — the Fallingwaters and Sydney Opera Houses — on terms that the current framework acknowledges but does not formally analyze.

Legitimate versus coerced asymmetry. How do we reliably distinguish a justified asymmetric weight vector — one that reflects considered stakeholder values, building purpose, and cultural context — from a coerced one, in which power asymmetries in the commissioning relationship produced a weight vector that served the commissioning stakeholder's preferences at the expense of the interests of those who inhabit or are affected by the building? This is the most politically and ethically challenging question in the EFABism research program, and it is also, in some respects, the most important: a framework that can only evaluate declared intentions at face value, without tools for assessing whether declarations were made in conditions of legitimate deliberation, cannot fulfill the ethical obligations that Section 1.8 identifies as central to an honest EFABism practice.

Limits of market valuation. Under what conditions does HPM-estimated aesthetic premium meaningfully track architectural quality, as distinguished from fashion, scarcity, celebrity, or market illiquidity? The boundary between market-revealed aesthetic quality and market-revealed aesthetic fashion is analytically important but currently underdeveloped. A building whose design quality commands a sustained market premium across multiple transaction cycles and multiple decades of market conditions provides stronger evidence of genuine EFABism aesthetic value than a building whose market premium reflects the current fame of its architect, the novelty of a formal vocabulary that may not age well, or the momentary fashion preferences of a specific market segment at a specific time.

9.3 Closing Statement

The centroid of the EFABism triangle — the point at which Economics, Functionality, and Aesthetics would be weighted equally and delivered at equal performance — is a conceptual anchor, not a normative destination. No building occupies it. No building should be designed to occupy it as a goal in itself. The centroid is useful precisely because it provides the reference point against which declared asymmetries can be identified, measured, and evaluated. But the field around it — the vast, varied, contested territory in which buildings are actually made, where exchanges among economic stewardship, functional performance, and aesthetic meaning are negotiated, accepted, and sometimes imposed without adequate disclosure — is where EFABism does its most essential work.

EFABism matters not because it closes questions but because it gives architects, clients, and communities a disciplined vocabulary for making exchanges visible, deliberate, and defensible. The framework's requirements are not technical procedures — they are ethical commitments: weights must be declared before scores are computed; sacrifices must be named before stakeholders commit; the observer must enter the frame before the score can be read; time must live inside the model if the model is to describe buildings as they actually are; externalized costs must be acknowledged by someone in the analysis, even if the commissioning client cannot be required to bear them. These requirements are uncomfortable because they make concealment harder. That discomfort is precisely the point.

EFABism is not a completed theory. It is an organized commitment to asking, in every project, the questions that single-variable optimization would prefer not to answer: Who is this building for? What did it cost them? What was sacrificed, and who bore the sacrifice? How will it perform in twenty years? Whose aesthetic judgment was treated as authoritative, and who was excluded from that determination? Is the weight vector declared here a genuine reflection of this building's obligations, or is it a post-hoc rationalization of decisions already made for other reasons?

Architecture is entering an era of data-rich building environments, computational design intelligence, generative design modeling, and evidence-based professional practice. In this context, formalizing the mathematics of design philosophy is not a reductive act — it is a liberating one. The architect who can demonstrate, with statistical rigor and market-calibrated evidence, that a chosen design achieves superior EFABism balance relative to alternatives is not constrained by that evidence. They are empowered by it: empowered to defend investment in aesthetic quality against short-sighted cost-cutting by presenting market-calibrated premium estimates that quantify its economic return; empowered to justify functional excellence against stylistic imposition by presenting POE-grounded performance data that demonstrate its occupant impact; and empowered to demonstrate economic stewardship without sacrificing beauty or purpose by presenting lifecycle NPV analyses that reveal the true cost of false economies. The discipline of the EFABism framework is the discipline of accountability — the commitment to saying, clearly and publicly, what a building is trying to accomplish, for whom, at what cost, in whose interest, across what time horizon, and with what honest acknowledgment of what it could not achieve within the constraints it was given. This is what architecture owes the people who live with its consequences. EFABism is a framework for honoring that obligation.

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WHITE PAPER APPENDIX

Appendix — Glossary of Acronyms and Technical Terms

White Paper:	EFABism: Methods of Formalizing the Econometric Mathematics of Econo-Functional Aesthetic Balance
Author:	William J. Martin, AIA, Principal, WJM Architect, Westwood, NJ
Date:	September 2026
Document:	Appendix — Glossary of Acronyms and Technical Terms

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The following glossary defines all acronyms and initialisms used in this white paper, listed in alphabetical order, with a brief contextual explanation of each term's role within the EFABism framework.

Glossary

Acronym / Initialism	Definition and Contextual Role
A	**Aesthetics** — One of the three core EFABism domains. Encompasses intellectual and sensory beauty, spatial harmony, material craft, cultural resonance, and the emotional and intellectual significance that buildings accumulate across their service lives. Represented by the variable *a* (scored 0–1) and $A_s(t)$ in time-indexed, observer-indexed notation.
AIA	**American Institute of Architects** — The principal professional membership organization for licensed architects in the United States. Used in the paper as a credential designation for William J. Martin, AIA.
BCE	**Before Common Era** — Chronological notation used in the paper when referencing Vitruvius Pollio's *De Architectura* (c. 25 BCE), the foundational ancient text whose Vitruvian triad is identified as EFABism's most direct intellectual ancestor.
D	**EFABism Distortion Index** — A post-occupancy evaluative metric (Equation 2) that measures the weighted departure of delivered domain performance from the intended (declared) score profile established at project outset. D = 0 signifies that delivered performance matched declared intent across all three domains. D > 0 signals unjustified distortion. Replaces the original Imbalance Index (Δ).
E	**Economics** — One of the three core EFABism domains. Encompasses cost efficiency, resource optimization, lifecycle value, NPV-discounted maintenance projections, energy cost trajectories, and socio-economic viability across a building's full service life. Represented by the variable *e* (scored 0–1) and $E_s(t)$ in time-indexed, stakeholder-indexed notation.
EFAB	**Econo-Functional Aesthetic Balance** — The abbreviated form of the framework name, used throughout the paper in compound terms such as EFAB Weight Vector, EFAB Distortion Index, EFAB Tradeoff Ledger, EFAB Composite Score, EFAB Objective Function, and EFAB Balance Report.
EFABism	**Econo-Functional Aesthetic Balance (ism)** — The full name of the architectural design philosophy formalized by William J. Martin, AIA, in 1991. Its central claim is that architecture achieves its highest purpose when Economics (E), Functionality (F), and Aesthetics (A) are held in a deliberate, justifiable, and coherent relationship appropriate to a building's purpose, stakeholders, constraints, and time.
EUI	**Energy Use Intensity** — A building energy performance metric measuring site energy consumption per unit of gross floor area, expressed in kBtu per square foot per year (kBtu/sq ft/yr). Used in the paper as the primary dependent variable (F1) in the functional performance regression (Equation 6), representing energy savings performance relative to a declared reference building of the same type and IECC climate zone.
F	**Functionality** — One of the three core EFABism domains. Encompasses usability, spatial performance, structural integrity, environmental performance, energy efficiency, adaptability, and purpose-driven intelligence across the full range of occupant conditions. Represented by the variable *f* (scored 0–1) and $F_s(t)$ in time-indexed, stakeholder-indexed notation.
FM	**Facilities Manager** — A key stakeholder category used throughout the paper's stakeholder-indexed scoring system. The FM perspective is specifically cited in the Construct Register (Section 4.3) as the declared stakeholder for the ThermalR and MaterialDurability variables, representing the operational and maintenance interests of the entity responsible for long-term building management.
GIS	**Geographic Information System** — A spatial data platform used in the paper's HPM specification (Section 6.3) as the source for location coordinate variables (X_C) included in the Economic and Control Variable group of the hedonic pricing regression. GIS

Acronym / Initialism	Definition and Contextual Role
	coordinates enable spatial econometric modeling of transaction price variation attributable to location attributes.
HC	**Heteroskedasticity-Consistent (Standard Errors)** — A correction applied to OLS regression standard errors when the White test for heteroskedasticity rejects the null of constant error variance. The paper specifies HC standard errors using the Huber-White sandwich estimator as the appropriate inferential correction for small-sample EFABism sub-pillar regressions when SUR estimation is not supported by the available data.
HPM	**Hedonic Pricing Model** — An econometric method that decomposes observed market transaction prices into the implicit prices of individual building and location attributes, revealing willingness to pay for each attribute. In the EFABism research program (Section 6), HPMs serve a bounded purpose: estimating the perceived economic value that market participants associate with measurable functional and aesthetic attributes. HPMs replaced the retired EFABism Balance Certificate as market evidence tools.
IECC	**International Energy Conservation Code** — The U.S. model energy code that establishes minimum building envelope thermal performance standards by climate zone. The paper uses IECC climate zone classification (specifically Climate Zone 5A for Northern New Jersey) to specify the reference building against which functional energy performance scores are normalized in the functional regression and the illustrated case study.
kBtu	**KiloBritish Thermal Unit** — A unit of thermal energy equal to 1,000 British Thermal Units, used in conjunction with EUI (kBtu/sq ft/yr) to quantify site energy use intensity in the functional performance regression (Equation 6).
NJ	**New Jersey** — Abbreviated geographical reference used in the paper's case study (Section 7) and author affiliation. The Northern New Jersey context (IECC Climate Zone 5A) establishes the regional market, climate, and construction industry conditions for the illustrated facade material selection decision exercise.
NPV	**Net Present Value** — A discounted cash flow method used within the Economics domain scoring to project and compare the present value of lifecycle costs (initial construction plus maintenance and operational expenses) across a declared service period at a declared nominal discount rate. The paper specifies a 30-year service period and a 5% nominal discount rate for the Northern New Jersey case study. NPV calculations must state all assumptions explicitly, including discount rate, cost escalation rate, and service period.
OLS	**Ordinary Least Squares** — The baseline regression estimation method used in Stage 1 of the EFABism HPM estimation strategy (Section 6.4) and in individual sub-pillar regression estimation when sample size does not support SUR joint estimation. OLS estimates must be accompanied by diagnostic tests for heteroskedasticity (White test), multicollinearity (VIF), and functional form misspecification (Ramsey RESET test).
POE	**Post-Occupancy Evaluation** — Systematic data collection on building energy performance, occupant satisfaction, maintenance cost actuals, and spatial utilization after occupancy. Described in the paper (Section 8.2) as the foundational empirical resource of the EFABism quantitative research program. Without reliable POE data, sub-pillar regressions have no credible empirical basis and the Distortion Index cannot be computed. The paper requires longitudinal POE collection at multiple time points across a building's service life.
PVS	**Pillar Value Share** — An approximate metric computed from semi-log HPM coefficient estimates that quantifies the share of mean transaction price attributable to the functional attribute vector (PVS_F, Equation 12a) and the aesthetic attribute vector (PVS_A, Equation 12b). All reported PVS values must be labeled as approximate, accompanied by

Acronym / Initialism	Definition and Contextual Role
	confidence intervals, and interpreted as measures of market-attributed perceived value rather than intrinsic architectural worth.
PVS_A	**Aesthetic Pillar Value Share** — The approximate share of mean transaction price attributable to the aesthetic attribute variable group (X_A) in the HPM, computed per Equation 12b as $(\hat{\beta}_A \cdot \bar{X}_A) / \bar{P}$. Must be accompanied by confidence intervals and interpreted as market-revealed willingness to pay for aesthetic quality in the declared market context.
PVS_F	**Functional Pillar Value Share** — The approximate share of mean transaction price attributable to the functional attribute variable group (X_F) in the HPM, computed per Equation 12a as $(\hat{\beta}_F \cdot \bar{X}_F) / \bar{P}$. Must be accompanied by confidence intervals and interpreted as market-revealed willingness to pay for functional performance in the declared market context.
RESET	**Ramsey Regression Equation Specification Error Test** — A diagnostic test for functional form misspecification in OLS regression. Required by the paper's HPM estimation protocol (Stage 1, Section 6.4) prior to interpreting HPM coefficient estimates. Evidence of misspecification requires investigation of nonlinear transformations, interaction terms, or alternative functional forms before results are reported.
RSI	**Résistance Thermique SI** — The SI-system measure of whole-wall thermal resistance, expressed in $m^2 \cdot K/W$. Specified in the paper as the correct variable (ThermalR) for the functional performance regressions (Equations 6 and 7). The paper explicitly distinguishes RSI from thermal mass (effective areal heat capacity, $kJ/m^2 \cdot K$), noting that these are physically distinct properties that must not be conflated. RSI is the primary determinant of heating load reduction in Climate Zone 5A envelope modeling.
SHAP	**SHapley Additive exPlanations** — A method from cooperative game theory adapted for machine learning interpretability, used in Stage 3 (exploratory) of the HPM estimation strategy (Section 6.4) to provide approximate marginal attribution of predicted price variation to individual variable contributions in random forest or XGBoost models. All SHAP-based results are labeled explicitly as exploratory and hypothesis-generating, not confirmatory.
SUR	**Seemingly Unrelated Regressions** — A joint estimation method that exploits cross-equation error correlations to improve estimation efficiency relative to separate single-equation OLS estimation. In the EFABism framework (Section 5.3), the SUR system jointly estimates the functional performance equations (F1, F2, Equations 6–7) and the aesthetic premium equation (A, Equation 8) when sample size ($n \geq 200$) and data quality support it. Appropriate only when cross-equation error correlations are expected on architectural grounds, not selected post-estimation.
VIF	**Variance Inflation Factor** — A diagnostic statistic for multicollinearity in OLS regression. Required by the paper's HPM estimation protocol (Stage 1, Section 6.4). VIF values exceeding 10 for any regressor flag problematic multicollinearity requiring resolution through variable selection, aggregation, or principal component reduction before coefficients can be reliably interpreted.
WJM	**William J. Martin** — The abbreviated form of the author's name used in the firm name "WJM Architect," the Westwood, New Jersey architectural practice whose principal, William J. Martin, AIA, formalized EFABism in 1991 and authored this white paper.
XGBoost	**Extreme Gradient Boosting** — A machine learning algorithm based on gradient-boosted regression trees, used in Stage 3 (exploratory only) of the HPM estimation strategy (Section 6.4) to detect nonlinear associations and interaction effects among EFABism variables that linear regression specifications may not adequately capture. All

Acronym / Initialism	Definition and Contextual Role
	XGBoost results are explicitly labeled as exploratory and must not be presented as confirmatory architectural findings.
Δ	**Imbalance Index (original)** — The original EFABism metric from the 1991 paper that measured dispersion of pillar scores around their arithmetic mean. Retired in this paper and replaced by the EFABism Distortion Index (D) because it registered "perfect balance" for buildings that failed comprehensively on all domains equally, and penalized legitimate asymmetric weight vectors. The Distortion Index corrects both structural flaws.

Acronyms and initialisms that appear as single-letter domain variables (E, F, A) are defined both in this glossary and throughout the body of the paper. All variable operationalizations, including units of measurement, stakeholder indices, and time horizons, are specified in the Construct Register (Section 4.3) of the white paper. For equations referenced in this glossary, consult the corresponding numbered equation in the body text.

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