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From Daylight Performance to Design Decisions: A Performance-Informed Framework for Tessellated Geometric Façades †

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Abstract

Despite significant advances in computational daylight simulation, translating performance metrics into practical architectural decisions remains a major challenge in façade design. This paper proposes a Performance-Informed Design Framework (PIDF) that bridges this gap by systematically linking design context, daylight performance objectives, environmental evaluation, and tessellated façade design variables. Developed through literature synthesis and conceptual modelling, the framework introduces a Performance-to-Design Translation Matrix that converts quantitative daylight indicators into actionable architectural strategies. The proposed methodology supports evidence-based, context-responsive façade design and promotes a shift from performance evaluation toward performance-informed architectural thinking.

Keywords: practical implications; tessellated geometric pattern; façade design; perforation ratio; daylighting performance; visual comfort

1. Introduction

Daylighting is a fundamental aspect of sustainable architectural design, contributing to reduced energy consumption, improved visual comfort, enhanced occupant well-being, and higher indoor environmental quality [1]. Over the past two decades, advances in climate-based daylight modelling and building performance simulation have enabled architects and engineers to evaluate daylight conditions with increasing accuracy during the design process. Performance indicators such as Spatial Daylight Autonomy (sDA), Useful Daylight Illuminance (UDI), Annual Solar Exposure (ASE), and glare-related metrics have become standard tools for assessing the daylight performance of buildings [2,3]. Consequently, façade design has evolved from a predominantly aesthetic exercise into a performance-driven discipline in which geometric configuration, material properties, and solar responsiveness are systematically optimized to achieve environmental objectives [4].

Among emerging façade strategies, tessellated geometric façades have attracted considerable attention because of their ability to regulate daylight through controlled geometric variation [5]. Based on repetitive modular patterns, tessellated systems provide a flexible design language that enables architects to manipulate façade porosity, transparency, and

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solar permeability while preserving architectural coherence [6]. The integration of computational design, parametric modelling, and digital fabrication has further expanded their application by allowing designers to explore numerous geometric alternatives and evaluate their environmental performance through simulation [7]. Consequently, a growing body of research has demonstrated the influence of tessellation geometry, perforation ratio, module depth, and orientation on daylight availability, glare control, and solar exposure. Despite these advances, the majority of studies remain centered on performance evaluation or optimization, where simulation outputs are primarily presented as numerical indicators or optimal parameter combinations [8,9].

Although performance-based research has substantially improved the understanding of tessellated façade behavior, an important gap remains between computational evaluation and architectural decision-making. Architects are frequently presented with multiple performance indicators and optimization results but receive limited guidance on how these outcomes should influence façade design choices during the conceptual design stage. Existing studies rarely explain how numerical performance metrics can be translated into architectural variables such as façade openness, geometric organization, or spatial adaptation, leaving designers to interpret complex simulation outputs independently [10,11]. This disconnect limits the practical integration of building performance simulation into everyday design workflows and reduces the accessibility of performance-driven design for practitioners.

To address this challenge, this paper proposes a performance-informed design framework for tessellated geometric façades that systematically translates daylight performance objectives into architectural design decisions. Rather than introducing new simulation results or proposing another optimization method, the framework establishes a conceptual workflow that connects spatial function, daylighting objectives, performance evaluation, and façade design variables within a coherent decision-making process. By synthesizing established daylighting principles, computational design methodologies, and façade performance research, the proposed framework provides architects with a structured approach for integrating daylight considerations into the early stages of tessellated façade design. The study therefore seeks to answer the following research question: How can daylight performance evaluation be systematically translated into practical architectural decision-making for the design of tessellated geometric façades?

2. Conceptual Foundation

2.1. The Evolution of Performance-Driven Façade Design

Advances in computational design and climate-based building performance simulation have transformed façade design from an intuition-driven process into a performance-driven approach. Through parametric modelling, architects can evaluate environmental criteria such as daylight availability, visual comfort, and energy efficiency during the early design stages [12,13]. Tessellated geometric façades exemplify this paradigm by enabling systematic control of façade porosity and geometric organization to regulate daylight [14,15]. Although previous studies have significantly advanced the understanding of their environmental performance, their findings are predominantly presented as numerical metrics and optimization results, offering limited guidance for practical architectural design.

Recent work further demonstrates the potential of integrating parametric façade configurations with daylight performance assessment during architectural design. Alymani and Alqahtani [16], for example, developed a parametric shading workflow that evaluated multiple façade configurations using Useful Daylight Illuminance (UDI), Annual Sunlight Exposure (ASE), and glare-related indicators within a complex continuous-ramp museum. Their study demonstrates how parametric façade variables and climate-based

daylight simulation can be combined to explore performance trade-offs and identify context-responsive façade configurations. Such research reinforces the growing integration of performance evaluation and parametric façade design, while also highlighting the need to translate computational performance outcomes into more generalized architectural decision-making strategies.

2.2. The Gap Between Performance Evaluation and Design Decision-Making

Despite increasingly sophisticated daylight simulation tools, translating performance results into architectural decisions remains a significant challenge. Designers must interpret multiple, and often conflicting, performance metrics while simultaneously considering spatial function, user needs, and architectural intent. Although recent studies have increasingly integrated performance evaluation with parametric façade exploration and early-stage design decision-making, the translation of multiple quantitative performance outcomes into a structured and transferable architectural decision process remains comparatively underdeveloped.

Addressing this challenge requires a methodology that transforms performance evaluation into architectural knowledge rather than treating simulation metrics as the final outcome. Accordingly, this study proposes a Performance-Informed Design Framework that systematically links design context, daylight objectives, performance evaluation, and tessellated façade variables through a structured decision-making process. By translating quantitative performance evidence into practical design guidance, the framework bridges the gap between computational analysis and architectural practice, supporting informed and context-responsive façade design.

2.3. Comparative Positioning of the Proposed Framework

Existing performance-driven design methodologies have established important mechanisms for connecting architectural design with environmental performance assessment. Process-centric approaches, such as the Design Analysis Integration (DAI) framework, sought to connect design inquiries, analysis tasks, performance indicators, and simulation tools within the building design process [16,17]. More recent computational workflows have increasingly incorporated parametric modelling, multi-objective optimization, machine learning, and visualization to support the exploration and selection of high-performing façade alternatives [18,19]. For example, recent façade studies have integrated parametric variables with daylight, thermal, and energy indicators and used optimization or visual comparison to support early-stage design decisions [20,21]. Alymani and Alqahtani (2026) similarly demonstrate how parametric façade configurations can be evaluated through multiple daylight metrics and visual analysis to support the selection of performance-responsive configurations [22].

These approaches demonstrate substantial progress in connecting performance analysis with architectural design; however, their decision logic generally remains centered on defining simulation tasks, generating and evaluating alternatives, or identifying optimized solutions (Figure 1). Comparatively less emphasis has been placed on explicitly formalizing the intermediate interpretive step through which multiple performance conditions are translated into context-specific architectural actions before a particular façade configuration is selected. This distinction is particularly relevant for tessellated façades, where geometric variables such as porosity, pattern organization, module configuration, and depth can produce competing effects across different daylight objectives and spatial functions.

The proposed Performance-Informed Design Framework addresses this intermediate translation problem by introducing an explicit Performance-to-Design Translation Layer. Rather than replacing simulation, optimization, or existing decision-support tools, the PIDF

positions performance analysis within a broader decision sequence in which spatial function and project priorities guide the interpretation of multiple performance indicators, and that interpretation subsequently informs controllable façade variables. The contribution is therefore not the introduction of new daylight metrics, façade parameters, or computational optimization techniques, but the explicit organization of their relationships into a context-responsive design logic. Table 1 compares the principal characteristics of the PIDF with representative performance-driven and decision-support approaches.

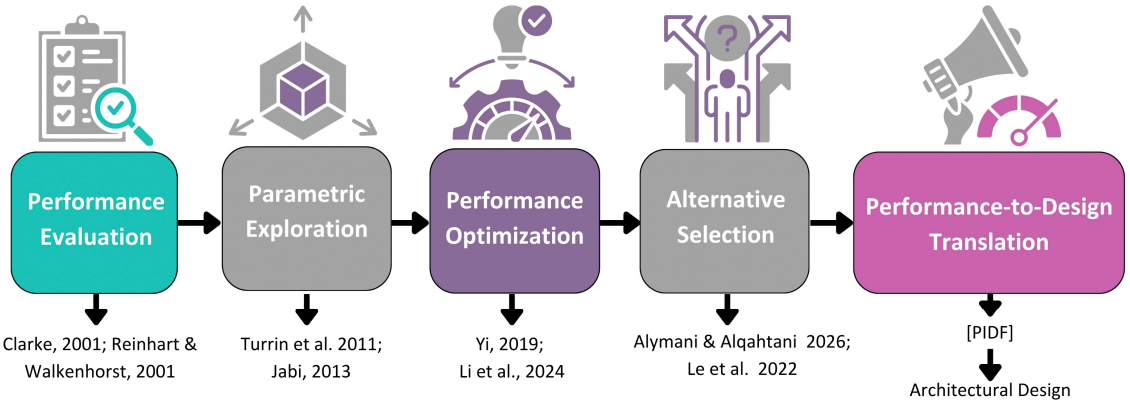


Figure 1. Positioning of the proposed Performance-Informed Design Framework within performance-driven façade design approaches [16–23].

Table 1. Distinctive characteristics of representative performance-driven design approaches.

Approach	Main Focus	Decision Logic	Performance-To-Design Translation
Process-centric frameworks [16,17]	Design–analysis integration	Analysis informs design process	Implicit
Parametric/optimization workflows [18,19]	Exploration and optimization	Performance-based ranking/selection	Limited
Recent façade decision-support approaches [22,23]	Prediction and alternative selection	Quantitative comparison	Partial
Proposed PIDF	Context-sensitive design translation	Interpretation → design response → refinement	Explicit

The comparative positioning indicates that the principal distinction of the PIDF does not lie in the individual performance metrics, façade variables, or iterative evaluation procedures, which are established within the literature. Rather, its contribution lies in explicitly formalizing the intermediate translation between performance evidence and architectural design action. Whereas performance-driven and optimization-based workflows primarily use performance metrics to evaluate, rank, or optimize alternatives, the PIDF introduces an interpretive layer in which performance conditions are considered in relation to spatial function and project priorities before being translated into controllable façade variables and potential design responses.

3. Materials and Methods

3.1. Research Design

This study adopts a conceptual methodological approach to develop a performance-informed framework that supports daylight-responsive façade design. Rather than generating new empirical evidence through simulation or experimentation, the research synthe-

sizes established knowledge from the fields of daylighting, computational design, building performance assessment, and façade engineering to formulate a structured decision-making methodology. The methodological objective is to establish a transparent and traceable relationship between established daylight performance concepts and the architectural variables that can be manipulated during façade design. The study therefore follows a structured framework-development approach based on literature synthesis and conceptual modelling, in which the primary outcome is the development of an artifact—in this case, a conceptual framework—that addresses an identified gap between computational performance evaluation and architectural practice.

The study is positioned within the broader methodological tradition of design science research, in which research addresses an identified problem through the systematic development of an artifact intended to provide a solution or structured approach [24,25]. In the present study, the artifact is the Performance-Informed Design Framework (PIDF), developed to address the identified gap between computational daylight assessment and architectural decision-making. Consistent with conceptual design research, the framework is developed through knowledge synthesis and conceptual modelling rather than through the generation of new empirical data.

The research methodology is structured into three primary phases: (i) establishing the study's theoretical foundation, (ii) synthesizing existing knowledge and developing relevant conceptual models, and (iii) integrating these variables into a cohesive framework that operationalizes daylight performance objectives into tangible architectural design decisions. To improve transparency and reproducibility, the framework-development process was further articulated through six sequential sub-steps: (1) defining the thematic scope, (2) identifying relevant knowledge domains and literature, (3) extracting and categorizing relevant concepts and variables, (4) synthesizing relationships among the extracted elements, (5) constructing the framework and its decision pathways, and (6) checking the internal consistency between performance objectives, indicators, and proposed design responses. Each overarching phase comprises two distinct sub-steps, which are schematically illustrated in Figure 2.

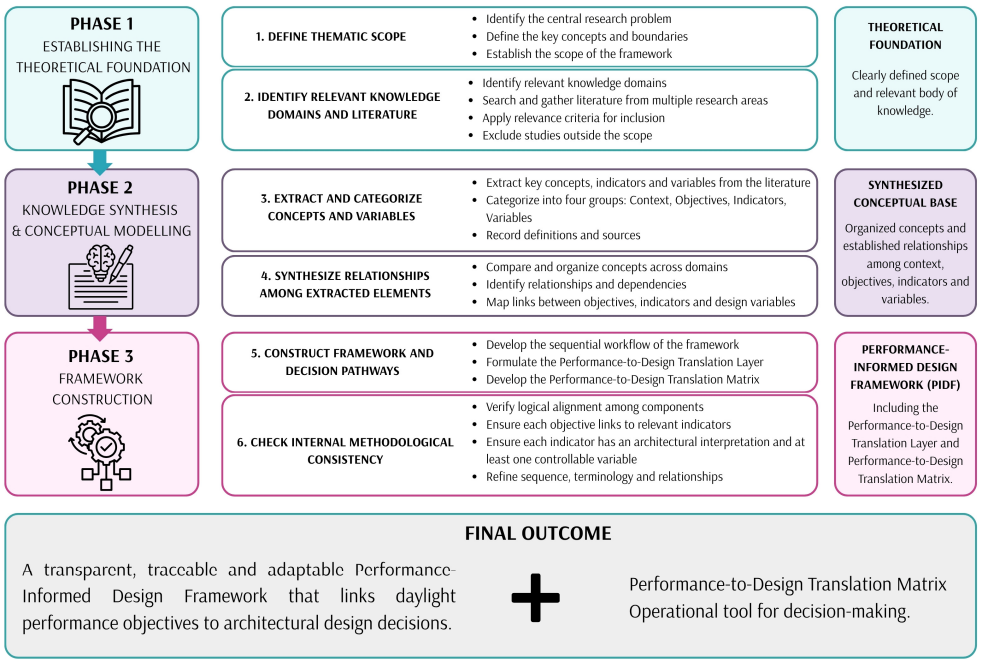


Figure 2. Research design process demonstrating the overarching phase research phases and the six sub-steps.

The framework-development process follows an iterative logic of problem identification, knowledge synthesis, conceptual abstraction, and framework construction. Literature-derived concepts are first identified and organized into relevant domains; these concepts are then abstracted into design and performance variables and their relationships are examined; finally, the resulting relationships are structured into the proposed framework and its Performance-to-Design Translation Layer. This process provides methodological traceability between the identified research gap, the synthesized knowledge base, and the resulting framework artifact.

3.2. Knowledge Base and Literature Synthesis

The proposed framework is grounded in a qualitative synthesis of established research on daylighting performance, climate-responsive façade systems, computational design, and building performance simulation. Rather than conducting a systematic literature review, the study adopts a narrative synthesis approach that integrates concepts from multiple research domains to establish the theoretical foundations of the framework. The literature was selected purposively according to its relevance to the central research problem, namely the relationship between daylight performance assessment, parametric façade design, and architectural decision-making. Publications were considered relevant when they addressed one or more of the following dimensions: daylight performance assessment; climate-responsive or performance-driven façades; parametric or geometric façade design; building performance simulation; and the integration of environmental performance into architectural design processes. Studies addressing building-performance domains unrelated to daylight-responsive façade design was excluded from the conceptual synthesis.

Four principal knowledge domains informed the framework development: (1) daylighting design, providing the environmental objectives and performance criteria related to daylight availability, visual comfort, glare control, and solar exposure; (2) climate-based daylight assessment, contributing standardized performance indicators such as Spatial Daylight Autonomy (sDA), Useful Daylight Illuminance (UDI), Annual Solar Exposure (ASE), and illuminance recommendations that are commonly employed to evaluate daylight quality [26–28]; (3) computational and parametric design, providing the architectural variables through which façade geometry can be systematically manipulated, including tessellation pattern, façade porosity, module configuration, and geometric organization; and (4) performance-driven architectural design, establishing the principles of integrating environmental analysis into iterative design processes and supporting evidence-based decision-making. These knowledge domains collectively provide the conceptual foundation from which the proposed methodological framework is derived.

Following the literature synthesis, relevant concepts were extracted and organized into four analytical categories: (i) design context, representing spatial, climatic, and functional conditions that influence façade requirements; (ii) performance objectives, representing the intended daylight and visual-comfort outcomes; (iii) design variables, representing façade characteristics that can be directly manipulated through architectural design; and (iv) performance evaluation, representing measurable indicators through which daylight outcomes can be assessed. This categorization provided a common structure for comparing concepts across the different knowledge domains and for establishing relationships between environmental objectives and architectural variables.

The inclusion of specific performance indicators and design variables was guided by their relevance to the scope of the framework and their potential to support architectural interpretation. Performance indicators were retained when they addressed complementary aspects of daylight availability, visual comfort, or excessive solar exposure and could therefore contribute to a design decision. Similarly, façade parameters were retained when they

represented controllable geometric or configurational characteristics of tessellated façades, including pattern geometry, porosity, module organization, and related geometric properties. Concepts that did not provide a direct connection to daylight-related architectural decisions or fell outside the daylight-focused scope of the study were not incorporated into the framework.

3.3. Conceptual Framework Development

Framework development was undertaken through an iterative process of conceptual modelling. Initially, the principal variables identified in the literature were classified into four categories: design context, performance objectives, design variables, and performance evaluation. The extracted variables were then mapped according to their functional relationships within the façade design process, allowing the study to identify how a project context establishes performance objectives, how those objectives determine relevant performance indicators, and how the resulting performance interpretation can inform controllable façade variables.

Relationships among these categories were then analyzed to establish logical dependencies within the façade design process. Particular attention was given to identifying relationships that could support a translation from quantitative performance evidence to architectural action. Rather than establishing a direct one-to-one relationship between an individual performance metric and a specific façade configuration, the conceptual modelling process considered multiple indicators in relation to spatial function, environmental priorities, and potential performance trade-offs.

The resulting framework organizes daylight-responsive façade design into a sequential workflow that begins with the identification of spatial function and environmental objectives, followed by the selection of relevant daylight performance indicators, the definition of façade design variables, and the interpretation of performance outcomes to support architectural decision-making. Unlike optimization-based approaches that seek a single best-performing solution, the proposed framework emphasizes informed decision-making by allowing architects to balance multiple daylight objectives according to project-specific requirements.

To enhance the practical applicability of the methodology, the relationships among design variables and performance objectives are represented through conceptual decision pathways rather than numerical optimization models. This abstraction enables the framework to remain adaptable across different building typologies, climatic conditions, and tessellated façade configurations while maintaining a transparent connection between environmental performance assessment and architectural design reasoning.

Finally, an internal consistency check was applied to the proposed framework by tracing the relationships among its principal components. Each performance objective was examined for its connection to relevant performance indicators, each indicator for its potential architectural interpretation, and each interpretation for its connection to at least one controllable façade variable. This process was used to refine the sequence, terminology, and relationships represented in the final Performance-Informed Design Framework (PIDF) and its associated Performance-to-Design Translation Matrix.

4. Result (Proposed Performance-Informed Design Framework)

The principal contribution of this study is the development of a Performance-Informed Design Framework (PIDF) that provides a structured methodology for translating daylight performance objectives into architectural decisions for tessellated geometric façades. Unlike conventional performance-driven workflows, where simulation outputs are often treated as the final product of the design process, the proposed framework positions environmental

evaluation as an intermediate step within architectural reasoning. In doing so, it establishes a transparent connection between computational assessment and practical façade design.

The framework is organized into five sequential stages (Figure 3). The first stage defines the design context, including climatic conditions, building function, spatial typology, façade orientation, and user requirements. These parameters establish the environmental conditions and functional demands that guide subsequent design decisions. Rather than beginning with façade geometry, the framework prioritizes understanding the architectural problem that the façade is intended to address.

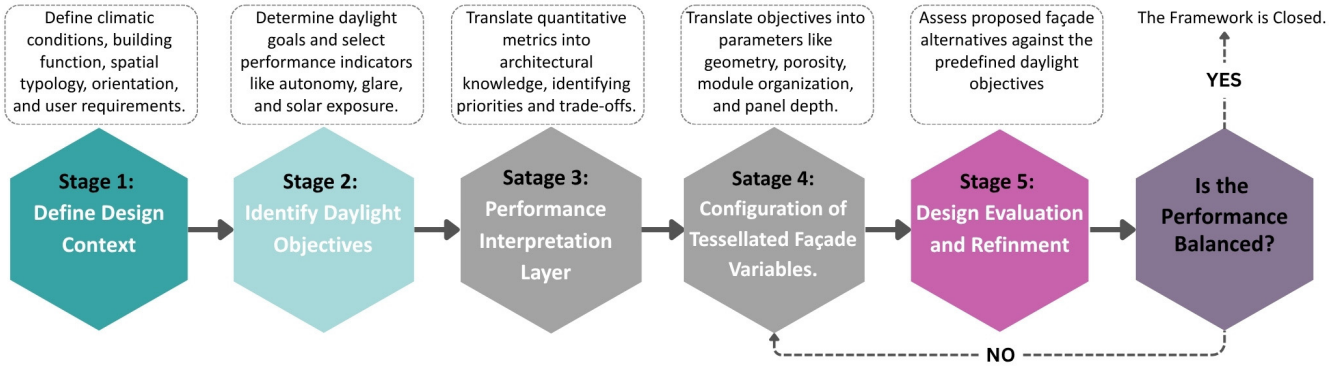


Figure 3. Proposed Performance-Informed Design Framework and its five sequential stages.

The second stage identifies the daylight performance objectives according to the characteristics of the design context. Instead of pursuing generic optimization, daylight goals are determined based on the visual and functional requirements of individual spaces. Appropriate performance indicators—including daylight availability, daylight autonomy, glare control, and solar exposure—are then selected to provide measurable criteria for evaluating façade performance.

The third stage represents the core methodological contribution of the framework: the performance interpretation layer. At this stage, quantitative performance indicators are translated into architectural design knowledge rather than interpreted as isolated numerical values. Relationships among multiple performance metrics are synthesized to identify design priorities, potential trade-offs, and acceptable performance ranges. This interpretive process enables architects to understand how environmental performance should influence façade design decisions while avoiding excessive reliance on optimization algorithms or numerical comparisons.

Table 2 presents the Performance-to-Design Translation Matrix, which constitutes the core component of the proposed Performance-Informed Design Framework. Rather than interpreting daylight performance metrics as isolated numerical outputs, the matrix synthesizes multiple performance indicators into a structured decision-support process that considers project objectives, spatial function, and environmental priorities simultaneously. By linking daylight performance objectives with relevant evaluation metrics, their architectural interpretation, and corresponding façade design responses, the matrix enables designers to translate quantitative environmental evidence into practical design actions. Consequently, the framework transforms performance evaluation from a descriptive analytical exercise into a prescriptive design-support methodology, facilitating informed façade design decisions while preserving architectural flexibility and responsiveness to context.

The fourth stage focuses on the configuration of tessellated façade variables. Environmental objectives established during the previous stages are translated into controllable architectural parameters, including tessellation geometry, façade porosity, module organization, panel depth, and orientation. Rather than prescribing a single optimal configuration,

the framework supports iterative exploration of alternative façade solutions while maintaining consistency with project-specific daylight objectives.

Table 2. Performance-to-Design Translation Matrix for Daylight-Responsive Tessellated Geometric Façades.

Design Objective	Primary Performance Indicators	Interpretation	Architectural Design Response
Increase daylight availability	sDA, Illuminance	Daylight is insufficient	Increase façade porosity or enlarge apertures
Improve visual comfort	UDI, Glare	Excessive direct sunlight	Reduce porosity, increase panel depth
Balance daylight and solar exposure	UDI, ASE	Competing objectives	Adjust tessellation density or pattern organization
Respond to space function	Combination of metrics	Performance priorities vary by use	Select façade strategy according to functional requirements

Finally, the framework concludes with design evaluation and refinement, where proposed façade alternatives are assessed against the predefined daylight objectives. The evaluation is iterative, allowing designers to adjust geometric variables until an appropriate balance between daylight availability, visual comfort, architectural expression, and constructability is achieved. The resulting workflow transforms computational daylight evaluation into a practical decision-support process that can be integrated into the conceptual stages of façade design.

Illustrative Application of the Framework

To illustrate how the proposed framework can operate as a practical decision-support methodology, an illustrative application is considered for an educational space requiring adequate daylight availability while limiting excessive solar exposure and visual discomfort. The example follows the sequential logic of the PIDF without introducing new simulation data or claiming empirical validation. First, the design context establishes the spatial function, façade orientation, climatic conditions, and user requirements. Second, daylight objectives are defined in terms of sufficient daylight availability and acceptable visual comfort. Relevant indicators, such as sDA, UDI, ASE, and glare-related measures, are then selected according to these objectives. Third, the Performance-to-Design Translation Matrix is used to interpret potential performance conditions and identify corresponding façade responses. For example, insufficient daylight availability may indicate a need for greater façade permeability, whereas excessive solar exposure or glare may suggest increased geometric depth, reduced porosity, or greater pattern density. Finally, the selected façade configuration is subject to iterative evaluation, allowing the designer to refine geometric variables according to the balance among daylight sufficiency, visual comfort, and architectural requirements. This illustrative sequence demonstrates how the framework can be operationalized as a structured design workflow, while recognizing that its effectiveness relative to alternative workflows requires future empirical validation.

Figure 4 illustrates how the six stages of the PIDF are operationalized in the illustrative classroom scenario, from defining the design context and performance objectives to interpreting performance conditions, translating them into façade design implications, and iteratively refining the design response. The figure emphasizes the explicit connection between performance evidence and architectural action while clarifying that the illustrated performance conditions are conceptual and are not derived from a new simulation dataset.

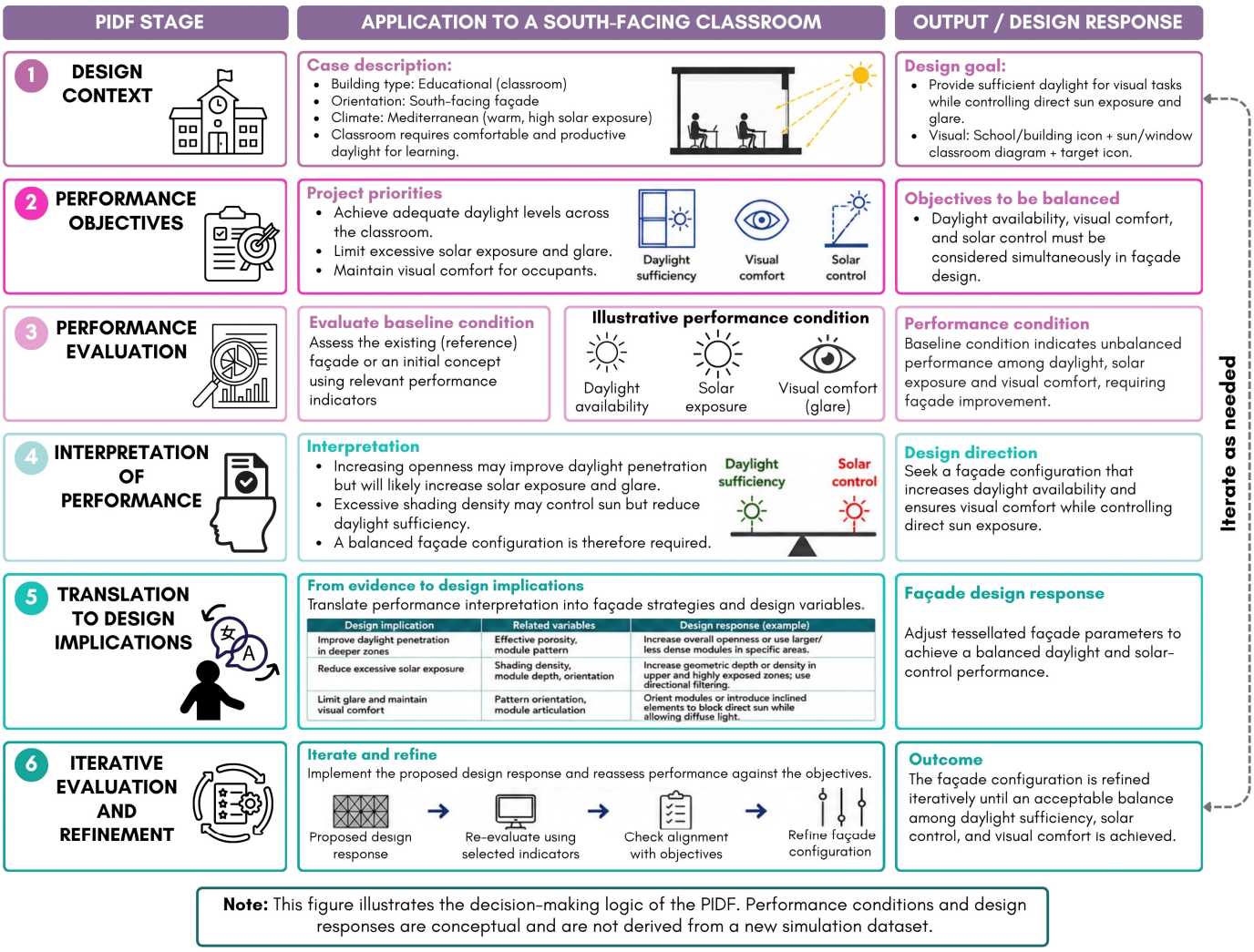


Figure 4. Illustrative application of the Performance-Informed Design Framework (PIDF) to a south-facing classroom façade.

Additionally, the operational logic of the PIDF is shown in Table 3 by applying its sequential stages to a representative educational space. The example illustrates that performance indicators are not treated as final ranking criteria but as evidence to be interpreted in relation to spatial function and project priorities. For instance, insufficient daylight availability may indicate a need to increase effective façade openness, whereas excessive solar exposure may instead require greater geometric filtering or shading density. Where these objectives conflict, the framework does not prescribe a single optimized solution; rather, it translates the identified performance conditions into alternative design directions that can be iteratively evaluated. The illustrative application therefore demonstrates the principal function of the Performance-to-Design Translation Layer: transforming quantitative performance information into context-sensitive architectural decisions.

The illustrative application demonstrates how performance evidence can lead to different façade design directions depending on spatial function and project priorities. Rather than treating performance metrics solely as criteria for ranking alternatives, the PIDF uses them to identify context-specific design implications. For example, insufficient daylight availability may indicate a need for greater façade openness, whereas excessive solar exposure or glare may suggest increased geometric filtering, shading density, or reduced porosity. Where these objectives conflict, the framework does not prescribe a single optimized solution; instead, it supports the identification and iterative refinement

of alternative design responses. This distinction represents a methodological contribution rather than a claim of superior performance, as the effectiveness of the PIDF relative to existing workflows has not been empirically established. Accordingly, the present application is intended as a proof-of-concept demonstration of the framework's operational logic rather than as empirical validation of its effectiveness.

Table 3. Illustrative application of the Performance-Informed Design Framework to an educational space.

PIDF Stage	Design Consideration	Decision/Output
1. Design context	Educational space; Mediterranean climate; façade orientation; occupancy and visual requirements	Context-specific daylight requirements established
2. Performance objectives	Adequate daylight availability and visual comfort	Daylight sufficiency and glare control identified as priorities
3. Performance evaluation	Evaluate the existing (reference) façade or an initial concept using relevant performance indicators	sDA, UDI, ASE and glare-related indicators considered jointly
4. Interpretation of performance	sDA, UDI, ASE and glare-related indicators considered jointly	Performance priorities and potential trade-offs identified
5. Translation to design implications	Tessellation geometry, porosity, pattern density and panel depth	Candidate façade strategies selected
6. Evaluation and refinement	Compare performance against predefined objectives	Façade configuration refined iteratively

5. Discussion

The proposed framework contributes to the growing field of performance-driven architectural design by addressing a persistent gap between computational analysis and professional design practice. While contemporary daylight simulation tools provide increasingly sophisticated environmental evaluations, their outputs often remain inaccessible to architects because they are expressed through multiple technical indicators that require specialized interpretation. The proposed Performance-Informed Design Framework responds to this challenge by introducing a structured translation process through which performance objectives, evaluation metrics, and façade variables are systematically connected. Rather than replacing computational simulation, the framework complements existing digital workflows by supporting evidence-based architectural reasoning during the conceptual stages of design.

The framework also demonstrates broad applicability beyond tessellated geometric façades. Although developed within the context of daylight-responsive tessellated envelopes, its underlying methodology can be extended to other adaptive façade systems, parametric building skins, and climate-responsive envelope strategies. By organizing the design process around contextual analysis, performance objectives, interpretation of environmental indicators, and architectural decision-making, the framework provides a flexible methodology that can accommodate different climatic conditions, building typologies, and design priorities. Furthermore, it offers educational value by providing students and practitioners with a transparent workflow that integrates computational analysis into architectural thinking rather than treating simulation as an isolated technical exercise.

Finally, the illustrative application delineates that the proposed PIDF can be operationalized as a structured sequence for translating daylight objectives into façade design decisions. However, this demonstration should not be interpreted as empirical validation of the framework. The present study does not quantify improvements in design efficiency,

decision quality, or performance relative to conventional or alternative workflows. Its contribution is instead methodological: it formalizes the decision logic required to connect performance evaluation with architectural design actions. Empirical validation through case studies, comparative design exercises, simulation-based testing, or expert evaluation would be necessary to determine whether the framework provides measurable advantages over existing approaches. This distinction is important in positioning the PIDF as a conceptual and methodological contribution rather than as an empirically validated design tool.

As illustrated in Figure 5, the principal distinction of the PIDF lies not in replacing established performance assessment or simulation procedures, but in explicitly formalizing the interpretive step that connects performance evidence to architectural action. While conventional workflows typically proceed from façade definition and performance simulation toward numerical comparison and selection or modification of alternatives, the PIDF introduces an explicit interpretive stage between performance assessment and design modification. In this stage, performance conditions are considered in relation to spatial function, user requirements, and project priorities before being translated into specific façade design directions. The comparison therefore highlights the principal methodological contribution of the PIDF: making the performance-to-design translation explicit and traceable, rather than presenting it as an implicit consequence of numerical performance comparison.

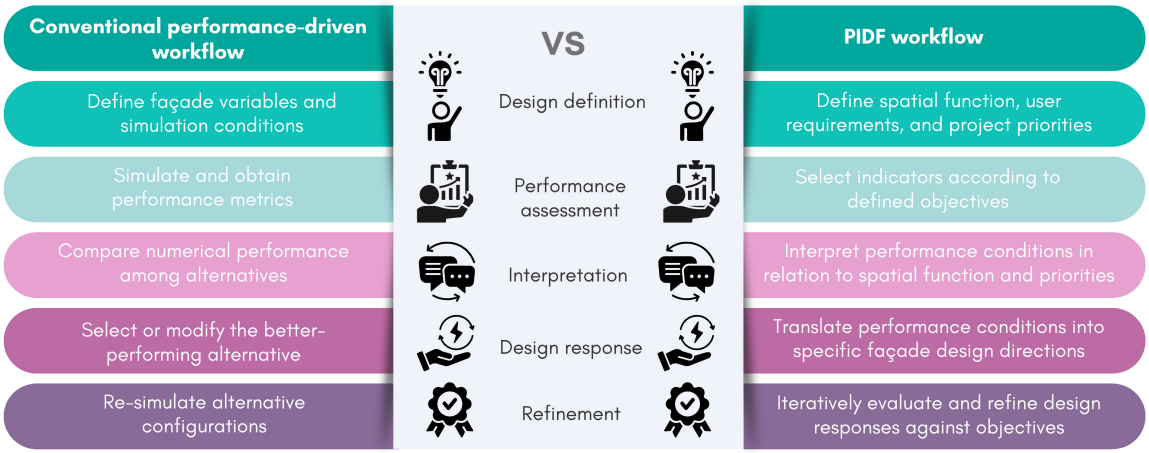


Figure 5. Comparison of decision sequences between a conventional performance-driven workflow and the proposed Performance-Informed Design Framework (PIDF).

Despite these contributions, several limitations should be acknowledged. The proposed framework is conceptual and has not yet been validated through application to multiple case studies or professional design projects. Consequently, its effectiveness in improving design efficiency and decision quality remains to be empirically assessed. In addition, the framework focuses exclusively on daylight performance and does not explicitly integrate other environmental objectives such as thermal comfort, energy consumption, ventilation, or life-cycle performance, all of which influence façade design. Future research should therefore investigate the implementation of the framework within multidisciplinary optimization environments, evaluate its usability in architectural practice, and expand its scope to support holistic performance-driven façade design.

The conceptual nature of the study also defines the scope of its claims. Although the illustrative application demonstrates how the PIDF can be operationalized, it does not provide empirical evidence of improved design performance, decision quality, or user outcomes. The framework should therefore be regarded as a methodological proof of concept rather than a validated decision-support tool. Claims regarding its effectiveness

should be established through future applications involving comparative design studies, simulation-based testing, or evaluation by practicing architects.

6. Conclusions

This study proposed a Performance-Informed Design Framework (PIDF) to address the gap between computational daylight evaluation and architectural façade decision-making. Through literature synthesis and conceptual modelling, the framework organizes spatial context, daylight objectives, performance indicators, façade variables, and iterative evaluation into a structured decision-making process. The proposed Performance-to-Design Translation Layer and Translation Matrix provide a systematic mechanism for interpreting performance evidence in relation to spatial function and project priorities and translating these interpretations into potential façade design responses. The illustrative application demonstrates how this decision logic can be operationalized in a representative educational façade design problem, while not constituting empirical validation of the framework's effectiveness. Accordingly, the contribution of this study should be understood primarily as methodological: the PIDF provides a structured basis for connecting quantitative daylight assessment with context-sensitive architectural reasoning rather than claiming to demonstrate superior design outcomes. By repositioning performance metrics from final evaluation criteria to evidence within an interpretive design process, the framework offers a transparent approach for incorporating environmental performance into façade design while preserving architectural flexibility. Its broader value therefore lies not in prescribing a single optimal façade but in establishing a more explicit relationship between what a façade performs, what a project requires, and how architectural decisions can respond to that relationship.

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Conflicts of Interest: The author declares no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

sDA	Spatial Daylight Autonomy
UDI	Useful Daylight Illuminance
ASE	Annual Solar Exposure
PIDF	Performance-Informed Design Framework

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