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COGNITIVE FRAMEWORK FOR LIGHTING DESIGN: PERCEPTIONS FROM CONTEMPORARY SRI LANKAN ARCHITECTS

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ABSTRACT

This paper is an investigation of Architects' perceptions of light effects and how they integrate them into the architectural design process. It is an exploration of the position that Architects rarely just illuminate a space; rather, they consciously or subconsciously build a composition using light. Drawing on Skarlatou's cognitive framework of luminous composition, the research examines the stages at which lighting considerations emerge and how cognitive lighting principles are applied. Through qualitative and interpretive inquiry, the study involved five Colombo-based Architects utilising in-depth, semi-structured interviews and retrospective protocol analysis. The data were analysed using thematic coding to identify patterns in the deployment of lighting principles across different design stages. The findings indicate that Skarlatou's principles remain relevant within the Sri Lankan context; however, their application is significantly influenced by the tropical climatic environment. The study reveals a consistent temporal sequence in lighting-related decision-making, beginning with abstract and metaphorical intentions, progressing to strategies of light positioning and distribution, and culminating in the detailed resolution of material–light relationships and technical specifications. The results further demonstrate the central role of experiential knowledge, intuition, and mental visualisation in guiding design decisions, with architects relying less on quantitative simulation tools during the early stages of design. This work contributes by demonstrating the significant influence of the tropical climatic context on the cognitive design process and a framework for understanding lighting design thinking.

Keywords: *Architectural Cognition; Design Process; Lighting Design; Luminous Composition; Tropical Architecture.*

1. INTRODUCTION

The profound connection between architecture, cognition, emotions, and general well-being is now widely recognised and extensively studied [(Abbas et al., 2024; Djebbara et al., 2019, 2021; Eberhard, 2009a, 2009b; Pallasmaa, 2015) as cited in Possati, 2026]. Within an interdisciplinary discourse, lighting emerges as a critical mediator between built form and human experience, influencing affective response, spatial comprehension, and behavioural orientation (Boyce, 2014).

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In architectural practice, considering the meaning of light within the design process leads to more sustainable solutions with an optimisation beyond the widely discussed economic and performance factors like efficiency or visibility (Schielke, 2019). Natural and artificial light jointly shape spatial legibility and emotional tone, often determining how architecture is perceived and experienced over time (Boyce, 2014). Despite this, lighting design is frequently treated as a secondary technical concern rather than an integral component of architectural conception, particularly during early design stages (Steane, 2011). Designers often oscillate between poetic, metaphorical descriptions of light and highly technical specifications relating to illuminance levels, luminance ratios, and material reflectance values. This discontinuity contributes to a misalignment between design intent and built outcome, a concern widely recognised in design cognition literature (Lawson, 2006; Cross, 2001; Schön, 2017).

To address this gap, the present study draws upon Skarlatou's framework of luminous composition (Skarlatou, 2011), which identifies five cognitive principles underpinning how designers perceive and manipulate lighting effects. While this framework provides a valuable foundation for understanding perceptual and compositional aspects of lighting, it does not explicitly account for how these principles unfold temporally during the design process, nor how they may be influenced by differing climatic contexts.

The primary research question guiding this study is:

At what stages do architects consider lighting effects during the design process, and how are Skarlatou's cognitive principles deployed in tropical architectural practice?

To address this question, the study explores two interrelated sub-questions:

1. How are Skarlatou's principles applied across different stages of the design process?
2. In what ways do climate and cultural context influence lighting cognition in tropical architecture?

The primary aim is to decode the cognitive processes through which architects in Sri Lanka develop lighting strategies by mapping Skarlatou's principles onto architectural design stages. In doing so, the study seeks to identify when, how, and why specific lighting principles are activated throughout the design process.

The research contributes to design cognition theory and climate-responsive architectural discourse by presenting a stage-oriented cognitive framework that positions lighting not as a late-stage technical consideration, but as an early-stage generative design driver. Methodologically, the study adopts a qualitative interpretivist approach supported by retrospective protocol analysis (Ericsson & Simon, 1993) and reflective practice theory (Schön, 2017), enabling reconstruction of tacit design cognition from completed architectural works.

2. BACKGROUND

2.1 LIGHT, PERCEPTION, AND ARCHITECTURAL EXPERIENCE

Light is widely recognised as one of the primary generators of architectural experience. Architectural theorists have consistently argued that spatial experience is inseparable from the qualities of illumination through which space is revealed and interpreted.

According to Pallasmaa (2024), architecture is fundamentally experienced through embodied perception, where light contributes to the multisensory understanding of space. Similarly, Zumthor (2006) identifies atmosphere as a central architectural quality produced through the interaction of light, materiality, temperature, sound, and memory.

Earlier phenomenological work by Norberg-Schulz (1980) similarly positioned light as a critical component of place-making, arguing that environmental character emerges through the interaction between natural phenomena and built form.

Research in environmental psychology further demonstrates that lighting conditions influence behaviour, cognition, and emotional well-being. Flynn (1977) established that variations in brightness, uniformity, and distribution significantly affect users' perceptions of spaciousness, clarity, privacy, and comfort. Subsequent studies have shown that daylight exposure influences productivity, mood, circadian regulation, cognitive performance, and overall health (Figueiro, 2017). Consequently, lighting design operates simultaneously within physiological, psychological, and experiential domains.

2.2 DESIGN COGNITION AND ARCHITECTURAL THINKING

The study of design cognition seeks to understand the mental processes through which designers generate, evaluate, and refine design solutions. Unlike analytical problem-solving models, architectural design involves ambiguity, uncertainty, and the simultaneous evolution of problems and solutions.

According to Cross (2001), designers possess unique forms of knowledge that differ from scientific and artistic modes of thinking. Design cognition involves solution-focused reasoning, abductive thinking, and iterative exploration. Rather than discovering predefined answers, designers construct possible futures through continuous reframing of design situations.

Similarly, Schön (2017) conceptualises design as a reflective conversation with materials and situations. Through reflection-in-action, architects continuously test design moves and reinterpret emerging consequences. This framework is particularly relevant to lighting design because many lighting effects cannot be fully predicted through abstract reasoning alone and must be explored through iterative visualisation.

Research by Lawson (2006) further demonstrates that architects move repeatedly between analysis, synthesis, and evaluation. Lighting considerations may emerge at multiple stages of this cycle, influencing spatial organisation, material selection, and environmental performance simultaneously.

Recent studies in design cognition increasingly acknowledge the role of tacit knowledge, intuition, and expertise. Experienced architects frequently rely upon accumulated mental schemas developed through repeated exposure to environmental and spatial conditions. These observations align with Schön's notion of knowing-in-action and suggest that lighting design may depend heavily upon experiential pattern recognition rather than explicit calculation alone (Schön, 2017).

2.3 COGNITIVE FRAMEWORKS OF LIGHTING DESIGN

Within lighting research, technical performance has historically dominated scholarly discourse. Metrics such as illuminance, luminance, daylight factors, glare indices, and

energy efficiency have frequently overshadowed investigations into how designers conceptualise luminous experiences.

A significant contribution to addressing this imbalance was made by Skarlatou (2011), whose doctoral research examined designers' perceptions of light effects within architectural practice. Drawing upon interviews and protocol analysis, Skarlatou identified five principles that structure designers' understanding of luminous composition:

1. Direction and position of the light source.
2. Geometry of light distribution.
3. Illumination perspective.
4. Abstraction in luminous composition.
5. Syntactic relationships between surfaces and light sources.

(Skarlatou, 2011)

Importantly, the framework demonstrated that designers frequently think in perceptual rather than quantitative terms. This insight aligns with broader theories of architectural representation, which suggest that design concepts often emerge as abstract mental constructs before becoming materially defined. However, Skarlatou's framework leaves several questions unresolved. Most notably, it does not explain how these principles are temporally deployed throughout the design process or how environmental conditions influence their prioritisation.

3. METHOD

3.1 RESEARCH PARADIGM AND METHODOLOGICAL APPROACH

This study adopts a qualitative interpretivist research paradigm to investigate how architects conceptualise and integrate lighting within the architectural design process. The interpretivist approach is particularly appropriate because architectural design is fundamentally a cognitive and experiential activity in which knowledge is constructed through perception, reflection, and professional practice (Creswell & Poth, 2018; Denzin et al., 2023).

Given that many design decisions occur internally and are not directly observable, a qualitative methodology was considered most suitable for accessing the tacit knowledge, experiential reasoning, and reflective judgement that characterise professional design practice (Cross, 2006; Schön, 2017).

To investigate these processes, the study employs a multiple-case study strategy. Case study research enables the exploration of complex phenomena within real-world contexts and is particularly valuable when examining professional decision-making processes (Yin, 2018). By analysing multiple architectural practices, the research identifies recurring patterns while also recognising individual variations in design thinking.

A principal methodological tool adopted in this research is Retrospective Protocol Analysis (RPA) (Ericsson & Simon, 1993). The use of retrospective protocols was especially appropriate because the research sought to understand design decisions embedded within completed architectural projects. Asking architects to reflect upon built

works enabled access to decision-making processes that evolved across multiple stages of design development and could not be observed directly in real time.

3.2 CASE SELECTION AND SAMPLING STRATEGY

A multiple-case study approach was adopted to capture a diverse range of professional experiences while maintaining a consistent architectural context. The study focused on residential and boutique-scale projects, as these project types typically allow architects greater control over experiential and lighting-related design decisions than larger commercial developments.

Participants were selected using purposive expert sampling. Purposive sampling is particularly appropriate when the objective is to obtain rich, information-intensive data from individuals possessing specialised knowledge and extensive professional experience (Creswell & Poth, 2018). The selection process, therefore, prioritised Architects recognised for their design quality and demonstrated sensitivity to lighting and spatial experience.

Five architects based in Colombo were selected. The sample intentionally represented different generations of professional practice to explore potential differences in design thinking associated with experience and technological change. Although the sample size is relatively small, it is consistent with qualitative design cognition studies that prioritise depth of understanding over statistical representation.

3.3 DATA COLLECTION PROCEDURES

Data collection was undertaken through in-depth semi-structured interviews supported by project documentation reviews. Interviews were organised according to the major stages of the architectural design process, enabling participants to reconstruct their decision-making chronologically from project inception to post-occupancy evaluation. This stage-based structure was specifically designed to investigate the temporal deployment of lighting principles throughout the design process.

Each interview lasted between 90 and 120 minutes and was audio-recorded with participant consent. Discussions focused on completed projects selected by the architects themselves, allowing participants to draw upon detailed memories of design decisions and project development. To enhance the richness and reliability of the data, verbal accounts were cross-referenced against project documentation, including sketches, drawings, photographs, renderings, and construction details. Such triangulation is recommended in qualitative research to strengthen interpretive validity and contextual understanding (Denzin et al., 2023).

3.4 DATA ANALYSIS

All interviews were transcribed verbatim and imported into NVivo qualitative data analysis software for systematic coding and analysis. A hybrid thematic analysis approach was adopted, combining deductive and inductive coding procedures.

The deductive coding framework was derived directly from Skarlatou's principles (P) of luminous composition:

P1: Direction and position of the light source.

P2: Geometry of light distribution.

P3: Illumination perspective.

P4: Abstraction in luminous composition.

P5: Syntactic relationships between surfaces and light sources.

These predefined categories provided the analytical structure through which existing theory could be examined within the Sri Lankan context.

Simultaneously, inductive coding was employed to identify themes that emerged directly from participants' accounts without being constrained by the original framework.

Through iterative analysis, two significant tropical-specific themes (T) were identified:

T1: Light Reduction and Solar Moderation.

T2: Heat–Light Decoupling Strategies.

Following initial coding, pattern coding was conducted to identify relationships between themes, design stages, and cognitive processes. The resulting data were organised into a stage–principle matrix, enabling systematic examination of how different lighting principles were deployed throughout the architectural design process.

4. RESULTS

The cross-case analysis of the five architectural practices revealed consistent patterns in the ways lighting principles were conceptualised, prioritised, and translated into built form. Analysis of interview transcripts, project documentation, and visual material demonstrated that lighting considerations emerged throughout the design process rather than being confined to technical detailing stages. While all five participants exhibited evidence of Skarlatou's principles, their deployment followed a discernible sequence that moved from abstract conceptual intentions towards increasingly spatial, material, and technical resolutions.

The findings are organised according to the principal themes identified through thematic analysis: (1) abstraction and metaphorical frameworks, (2) direction, position, and geometry of distribution, and (3) illumination perspective, and syntactic relationship of surface and source.

4.1 PRINCIPLE 4: ABSTRACTION AND METAPHORICAL FRAMEWORKS

The analysis revealed that abstraction constituted the primary cognitive entry point through which architects conceptualised lighting. Across all five cases, lighting decisions were initially framed not through quantitative criteria but through experiential aspirations, emotional narratives, and metaphorical constructs. Within the coding structure, P4 generated the highest concentration of references during the conceptual design stage, indicating its foundational role in lighting-related decision-making.

Rather than beginning with considerations of illuminance levels, fixture types, or daylight performance, participants consistently described desired atmospheres, emotions, and sensory experiences. These abstract intentions subsequently guided more concrete spatial and technical decisions.

Architect A repeatedly referred to the concept of a "womb" or "cave" as the governing metaphor for a residential project. The desired atmosphere was characterised by enclosure, mystery, refuge, and intimacy. Consequently, lighting strategies focused on

controlling and suppressing illumination rather than maximising it. Darkness was treated as an active design material, with selective openings and carefully controlled light penetration reinforcing the intended spatial experience.

Similarly, Architect B described aspirations of "cosiness" and "drama," employing lighting contrasts to create emotionally charged interior environments. Rather than seeking uniformly illuminated spaces, the architect intentionally developed zones of brightness and shadow to establish visual hierarchy and atmospheric depth.

Architect C framed lighting objectives through concepts of "silence," "stillness," and "monastic calm." In this case, shadow was not regarded as a deficiency of light but as a critical architectural device. Light reduction strategies were employed to create cool, contemplative environments that encouraged reflection and sensory awareness.

Architect D drew inspiration from culturally embedded experiences, particularly the visual qualities associated with the annual Perahera (Buddhist procession). Warm focal illumination, reflective surfaces, and controlled highlights were employed to recreate qualities of festivity, ceremony, and collective memory within contemporary architectural settings.

Across all cases, metaphors functioned as more than descriptive language. They operated as cognitive frameworks that informed decisions regarding orientation, aperture placement, material selection, and lighting distribution. These findings suggest that abstraction serves as a generative mechanism through which lighting intentions are translated into architectural form.

4.2 PRINCIPLES 1 & 2: DIRECTION, POSITION, AND GEOMETRY OF DISTRIBUTION

Following the establishment of conceptual intentions, architects consistently shifted their attention towards the spatial organisation of light. This phase corresponded closely with P1 and P2, involving decisions concerning the positioning of light sources and the distribution of illumination within space.

A recurring pattern observed across all projects was the deliberate avoidance of direct exposure to intense tropical sunlight. Unlike temperate-climate approaches that often prioritise maximising direct daylight penetration, participants consistently emphasised the importance of filtering, redirecting, and moderating incoming light.

Three primary positioning strategies were identified;

First, high-level light admission was frequently employed through clerestory openings, roof monitors, and elevated apertures. These devices enabled daylight to wash walls and ceilings indirectly while reducing visual discomfort caused by direct solar exposure.

Second, peripheral positioning strategies were commonly observed. Courtyards, verandas, transitional zones, and buffer spaces acted as intermediate layers that moderated daylight before it entered occupied spaces. Rather than functioning solely as spatial organisers, these elements served as environmental filters that softened light intensity and improved visual comfort.

Third, reflected-light strategies were consistently employed. Participants described the use of ceilings, walls, water surfaces, and reflective planes to redistribute daylight

indirectly throughout interiors. Such approaches reduced glare while maintaining visual brightness.

The geometry of light distribution emerged as an equally significant concern. All participants rejected the notion of uniformly illuminated environments. Instead, variation, contrast, and gradation were regarded as essential qualities of successful architectural lighting.

Architect B intentionally introduced areas of reduced brightness, arguing that occupants appreciate light more fully when it is experienced in contrast with shadow. This perspective reflects a broader preference for spatial diversity rather than visual uniformity.

Architect C frequently employed timber screens, perforated walls, concrete fins, and lattice elements to fragment incoming sunlight. These devices generated textured and dynamic lighting conditions characterised by shifting patterns of illumination. Participants often compared these effects to sunlight filtered through vegetation, indicating the importance of natural precedents in informing design decisions.

The findings demonstrate that distribution strategies in tropical architecture are primarily concerned with moderation rather than maximisation. Light is actively shaped, filtered, and transformed before reaching occupied spaces.

4.3 PRINCIPLES 3 & 5: ILLUMINATION PERSPECTIVE, AND SYNTACTIC RELATIONSHIP OF SURFACE AND SOURCE

The final group of findings relates to P3 and P5, which became increasingly prominent during design development and technical resolution stages.

P3 was frequently employed as a means of guiding movement, directing attention, and structuring spatial sequences. Participants consistently described lighting as a tool for choreographing user experience rather than merely providing visibility.

Several architects intentionally utilised contrasts between darker transitional spaces and brighter destination spaces to create anticipation and visual progression. Corridors, thresholds, and circulation routes were often maintained at lower illumination levels, while key spaces received concentrated daylight or artificial lighting emphasis. This strategy generated a sense of movement and discovery, encouraging users to navigate spaces according to carefully orchestrated visual cues.

The relationship between lighting and materiality emerged as another significant theme. Participants consistently emphasised that lighting effects could not be considered independently from the surfaces upon which they were projected. Material properties were therefore treated as integral components of luminous composition.

Architect C highlighted how natural weathering processes alter the interaction between light and material over time. Rough concrete, exposed brick, and untreated timber were selected not only for their tactile qualities but also for their capacity to reveal changing patterns of illumination and ageing. Light was understood as a mechanism through which material transformation becomes visible.

Similarly, Architect A described the strategic use of textured rubble walls to capture and diffuse light while simultaneously employing dark ceiling treatments to absorb

illumination. The resulting contrast reinforced the project's overarching conceptual framework of enclosure and refuge.

Across all cases, decisions regarding material selection were closely intertwined with lighting intentions. Surface texture, colour, reflectance, and ageing characteristics were repeatedly identified as critical factors influencing the perception of light within architectural space.

Collectively, these findings indicate that P3 and P5 are typically resolved during later design stages when conceptual aspirations are translated into detailed material and technical strategies. Nevertheless, their effectiveness remains dependent upon the abstract intentions and spatial decisions established earlier in the design process.

4.4 EMERGENCE OF TROPICAL-SPECIFIC PRINCIPLES (T1 AND T2)

The findings extend existing theories of design cognition by suggesting that environmental conditions influence not only architectural outcomes but also the underlying cognitive processes that generate them.

Two climate-specific principles emerged consistently across the data:

T1: Light Reduction and Solar Moderation

Unlike temperate frameworks that prioritise daylight acquisition, tropical lighting cognition prioritises the reduction, filtration, and modulation of excessive solar intensity. Architects repeatedly described strategies for “breaking,” “softening,” or “filtering” sunlight before it entered occupied spaces.

T2: Thermal-Luminous Decoupling

Participants consistently attempted to separate the beneficial qualities of daylight from its undesirable thermal effects. Courtyards, screened openings, indirect daylighting systems, reflective surfaces, and shaded transitional spaces were employed to maximise visual comfort while minimising heat gain.

Together, these principles suggest that tropical lighting design involves a preliminary stage of environmental moderation that precedes conventional compositional concerns. Consequently, climate-specific adaptations appear necessary when applying Skarlatou’s framework within tropical contexts.

5. DISCUSSION

5.1 THE TEMPORAL SEQUENCE OF LIGHTING DESIGN COGNITION

The principal theoretical contribution of this study lies in extending Skarlatou’s framework beyond a descriptive taxonomy of lighting principles to a temporally structured model of lighting cognition. While Skarlatou identified the perceptual and compositional principles through which designers understand lighting effects, the present study demonstrates that these principles are not deployed simultaneously. Instead, they emerge sequentially throughout the architectural design process. (see Table 1)

The cross-case analysis revealed a remarkably consistent progression across all participants, irrespective of age, professional experience, or stylistic orientation. Lighting design thinking began with abstraction and metaphorical framing (P4), progressed towards decisions concerning the positioning and distribution of light (P1 and P2), and

culminated in considerations of illumination perspective and material interaction (P3 and P5) (see Table 1). This sequence suggests that lighting cognition evolves from conceptual intentions towards increasingly spatial, material, and technical forms of resolution. This finding supports broader theories of design cognition (Dorst & Cross, 2001; Lawson, 2006).

Table 1: Stage-principal matrix with tropical adaptations

Typical Design Stage	Primary Principles	Key Questions	Tropical Strategies
Concept	P4: Abstraction T1: Light Reduction	What is the feeling or atmosphere I want to create? How do I manage excess light, or where does the light come from?	Define metaphor Identify "breaking" strategy. Reference vernacular wisdom
Schematic	T1: Light Reduction P1: Position P2: Distribution T2: Heat-Light	How do you filter light before entry? Where does light come from? How does it spread? How to separate light from heat?	Eaves/overhangs depth Courtyard placement Screen/buffer zones Vertical vs. horizontal entry Ventilation integration
Development	P2: Distribution P3: Perspective P5: Surface-Source	How do you refine the spread? How does light guide movement? Which materials for interaction?	Patching, diffusing, or dappled effects Brightness contrast for wayfinding Material sampling for texture syntax Weathering consideration and ageing
Detailing	P1: Position P5: Surface-Source	Will the exact fixture locations correlate with the abstraction? What are the technical specifications? Material-light details experimentation?	Hidden source detailing Colour temperature (2700-3000K) (feeling) Colour temperature (5000k-6500K) (Task) Recessing/reflection details CRI value is key in choosing luminaries.
Post-occupancy	All principles	What worked and what didn't? What to do differently next time?	Build an experiential library (archive). Document lessons learned. Refine mental imagery.

(Source – Author)

The results also reinforce Schön's (2017) conception of reflective practice. Architects did not begin by calculating illuminance levels or selecting luminaires; rather, they first imagined desired experiences and atmospheres before progressively translating these intentions into architectural form.

The proposed temporal model (see Figure 1), therefore, transforms Skarlatou's framework from a static set of principles into a dynamic process-oriented theory capable of explaining how lighting-related decisions emerge and evolve throughout architectural design.

Concept Stage	This stage is universally dominated by *P4* and the emergent *T1*. Architects set lighting goals metaphorically before any spatial drawing occurs
Schematic Stage	The focus systematically shifts to *P1* and *P2*. Abstract goals are used to inform the physical placement of apertures and the general spread of light.
Design Development	The process involves *P3* for choreographing user movement. It also involves *P5* as they integrate specific material textures.
Detailing	*All principles* are translated into precise, quantifiable technical specifications.

Figure 1: Temporal sequence of lighting design cognition (Source – Author)

5.2 CLIMATE AS A COGNITIVE MEDIATOR: BEYOND TEMPERATE MODELS OF LIGHTING DESIGN

A second and arguably more significant contribution of the study concerns the role of climate in shaping design cognition. Although Skarlatou's framework provides a valuable account of how architects conceptualise lighting effects, it was developed within a temperate context where daylight is frequently regarded as a scarce resource requiring maximisation.

The findings demonstrate that this assumption does not hold within the tropical conditions of Sri Lanka. Across all cases, architects consistently approached light not as a scarce commodity to be captured but as an abundant environmental force requiring moderation, filtration, and control. The predominance of terms associated with reduction, filtering, shielding, and breaking light suggests a fundamentally different cognitive orientation towards daylight. (see Figure 2)

Tropical Principle T1	Light Reduction (Breaking Light). Before tropical architects ask, "Where should light come from?" (P1), they explicitly ask, "How do we reduce or filter this overwhelming light?"
Tropical Principle T2	Thermally Decoupled Illumination. The research highlighted the phenomenon of "light-heat inseparability." Because every additional lux of direct natural light brings thermal energy, distribution strategies must simultaneously manage heat.

Figure 2: Tropical-specific findings: the emergence of light control (Source – Author)

This observation aligns with broader literature and traditional tropical design strategies - including verandas, courtyards, screens, deep overhangs, and vegetation buffers - that are fundamentally concerned with transforming intense sunlight into visually comfortable and thermally manageable conditions.

The study, therefore, proposes that climate functions as a cognitive mediator. (see Figure 2) Rather than merely influencing the physical performance of buildings, climatic conditions shape the very way architects conceptualise design problems and formulate solutions.

5.3 EXPERIENTIAL KNOWLEDGE, MENTAL VISUALISATION, AND REFLECTIVE PRACTICE

One unexpected finding concerns the relatively limited reliance on quantitative simulation tools during the early stages of design. Four of the five participating architects reported that lighting decisions were primarily guided by mental visualisation, accumulated experience, and intuitive judgement rather than by lux calculations or daylight simulation software.

This finding provides strong empirical support for Schön's (2017) concept of knowing-in-action. The senior architects in this study demonstrated particularly strong reliance on experiential reasoning. Rather than modelling lighting performance digitally at the conceptual stage, they described mentally simulating spatial experiences based on previously encountered projects, environmental observations, and accumulated design knowledge.

The predictability of the tropical climate partially explains this phenomenon. Unlike temperate regions characterised by significant seasonal variation, Sri Lanka experiences relatively stable solar conditions throughout the year. As a result, architects can draw upon a consistent experiential archive of environmental observations that remains transferable across projects.

Importantly, the findings do not suggest that digital tools are irrelevant. Rather, simulation technologies appear to function primarily as validation instruments during later stages of design development rather than as generators of initial design ideas. This distinction highlights the continued importance of intuition, imagination, and experiential knowledge within contemporary architectural practice despite increasing technological sophistication.

5.4 GENERATIONAL SHIFTS AND THE PERSISTENCE OF VERNACULAR KNOWLEDGE

The study also identified notable generational differences in cognitive approaches to lighting design. Senior practitioners tended to operate primarily as visual thinkers and verbal conceptualisers, relying heavily on metaphorical reasoning, memory, and intuitive judgement. In contrast, younger practitioners frequently utilised digital modelling platforms and real-time rendering software as extensions of their design thinking processes. However, the findings indicate that digital technologies supplement rather than replace conceptual reasoning. Even among younger practitioners, atmospheric intentions and experiential goals continued to precede technical modelling activities.

Equally significant is the persistence of vernacular environmental knowledge. Participants rarely reproduced traditional architectural forms directly. Instead, they abstracted underlying environmental principles and reinterpreted them through contemporary design solutions. Traditional courtyards evolved into deep light wells, lattice screens became timber trellises, and shaded transitional spaces were reconfigured through modern materials and construction techniques. The findings suggest that vernacular precedents remain influential not because of their aesthetic characteristics but because they embody generations of environmental adaptation and climatic intelligence.

6. CONCLUSIONS

This study demonstrates that Skarlatou's five principles of luminous composition provide a robust cognitive framework for understanding how architects conceptualise and deploy lighting within architectural design practice. However, the findings also indicate that the application of this framework is not universal in its original form. Rather, it is fundamentally shaped by climatic context, which influences both the cognitive entry points and the sequential development of lighting decisions.

A key theoretical contribution of this research is the transformation of Skarlatou's static typology into a dynamic, process-oriented model of lighting cognition. The identification of a consistent temporal deployment sequence - moving from abstraction (P4), through spatial organisation (P1 and P2), and culminating in material and syntactic resolution (P3 and P5) - reframes lighting not as a set of isolated perceptual categories, but as an evolving cognitive process embedded within architectural design thinking. (see Table 1)

In addition, the study identifies two climate-specific extensions to the original framework: Light Reduction (T1) and Thermal-Luminous Decoupling (T2). These findings demonstrate that temperate-based lighting theories cannot be directly transposed onto tropical contexts without conceptual adaptation. The resulting stage-principle matrix (see Table 1) therefore functions not only as an analytical framework but also as a practical design instrument for integrating lighting as a generative design force rather than a late-stage technical concern.

From a pedagogical perspective, the study suggests the need for a reorientation in the teaching of architectural lighting within tropical regions. Instead of privileging primarily quantitative approaches to daylight analysis, architectural education should place greater emphasis on experiential learning, environmental observation, and physical modelling. Developing students' capacity for mental visualisation and their ability to abstract design principles from vernacular and climatic precedents can strengthen their ability to respond effectively to complex environmental conditions. Furthermore, cultivating an awareness of how expert designers structure and translate lighting intentions across design stages may contribute to a more reflective and cognitively informed design pedagogy.

Overall, this research contributes to architectural knowledge by linking climate, cognition, and design process within a unified framework. It demonstrates that lighting design is not solely a matter of technical optimisation or aesthetic composition, but a situated cognitive activity shaped by environmental conditions, experiential knowledge, and culturally embedded design practices.

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