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Reframing Iranian Architectural Identity in Contemporary Product Design: A Design-Based Study of a Culturally Grounded Lighting Artifact

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Abstract

Despite the increasing prevalence of meaning-oriented and identity-driven methodologies in product design in recent decades, the systematic transformation of architectural history into contemporary, manufacturable items remains insufficient, particularly in non-Western contexts. Despite Iran's extensive architectural tradition, rooted in regional identities, symbolic philosophies of light, and geometric systems, numerous contemporary goods prioritize superficial adornment above profound design principles. This study addresses the gap by proposing and implementing a design-based methodology to integrate Iranian architectural legacy into contemporary product design. This research employs a Design-Based Research (DBR) methodology, complemented by qualitative-descriptive analysis, to create Noor-Avan, a modern table lamp that embodies architectural identity, modular customization, and multisensory engagement, while ensuring industrial viability. The research formulates a conceptual framework based on four interconnected dimensions: visual identity and cultural semiotics, the symbolic functions of light in Iranian architecture, architectural-to-product translation methodologies, and identity-driven customization. These dimensions direct a multi-phase design process that includes conceptual analysis, creation of design criteria, iterative ideation, prototyping, and user testing. The results indicate that architectural concepts, like gereh-chini geometry, light-shadow articulation, and regional motifs, can be converted into scalable, manufacturable components while preserving cultural significance. The study finishes by offering a reproducible theoretical and methodological framework for culturally informed product design, enhancing the debate on design thinking by connecting architectural history, user-centered customization, and modern industrial production.

Keywords

Iranian Architecture, Cultural Product Design, Identity-Based Customization, Lighting Design, Design-Based Research (DBR), Visual Identity, Industrial Design; Noor-Avan, Geometric Patterns; Multisensory Experience.

Introduction

In recent decades, product design research has shifted from an exclusive emphasis on functionality and aesthetics to approaches that prioritize meaning, including cultural identity, symbolic significance, and user experience. This broader approach has a lengthy history of applying architectural concepts to industrial and commercial design. A distinctive characteristic of modernist architectural forms, exemplified by the Bauhaus, is the deliberate integration of all three facets of architectural thought: architectural rationale, innovative materiality, and industrial production. Numerous historical instances demonstrate that while architectural theory has been applied in product design, universal shapes, structural rationality, and material efficiency are often intertwined with culturally particular, identity-driven narratives.

This constraint is particularly significant in relation to Iran. Iranian architecture serves as a sophisticated medium for self-expression, utilizing sacred geometry, symbolic light, ornamental structures, and spatial hierarchies that transcend mere formal composition to encompass metaphysical, emotional, and sensory dimensions. Despite Iran's diverse architectural styles, contemporary industrial products frequently fail to systematically and theoretically integrate these concepts into everyday objects. Numerous contemporary products depend on superficial embellishment or direct imitation of conventional patterns, resulting in designs that are either ornamental items lacking functionality or nostalgic replicas devoid of a coherent concept or applicability in an industrial context.

The incorporation of architectural concepts into product design has been a recognized practice for several decades, especially during the modernist movement of the Bauhaus and other similar groups. Nevertheless, a significant portion of the current research focuses on Western structures or utilizes form as a reference point, failing to offer systematic design rationales applicable to designers from non-Western cultures. In the Iranian cultural context, although architectural features like geometric lattice patterns, light symbolism (e.g., light as a representation of spirituality), and spatial hierarchy are present, there is no direct and explicit approach to translating these architectural designs into mass-produced products manufactured in a manner akin to Western industrial design.

Moreover, despite the extensive focus on customization in the academic discourse around product creation, its function as a cultural instrument that links user identity, regional symbols, and architectural history have been neglected. Contemporary customization techniques mostly emphasize functional variation or the optimization of consumer preferences, rather than tailoring product design to reflect individual cultural identity and the significance of architecture.

This research study will attempt to fill two major gaps in the literature regarding the relationship between cultural identity and user experience, specifically:

- There are no existing frameworks for translating architectural principles into products that consider different cultures; and
- The theoretical literature on customizing products as a means of mediating cultural identity and user experience is relatively undeveloped.

Accordingly, the central research question guiding this study is:

How can Iranian architectural principles be systematically translated into contemporary industrial product design through a design-based research framework?

This project not only yields practical results but also offers a new theoretical contribution to design research by introducing a systematic and replicable framework for transforming architectural legacy into modern product design. This research redefines the translation process as a complex system that incorporates cultural semiotics, symbolic light theory, modular customization, and industrial feasibility, contrasting with

historical precedents where architectural influence on products was mainly formal or stylistic, all within a Design-Based Research (DBR) framework.

This study's originality resides not in the simple incorporation of architectural influences but in the formulation of a design approach that allows cultural significance, user identification, and manufacturability to coexist within a singular product. The research offers a novel viewpoint on identity-focused and experience-based product design by framing the product as a cultural interface instead of a static item, especially in non-Western and context-sensitive industrial settings. This study presents a transferable design framework that operationalizes cultural identity through design-based research, rather than simply introducing a product.

Figure 1 delineates the principal research deficiencies highlighted in the literature, emphasizing the inadequate incorporation of Iranian architectural identity, symbolic light philosophy, and identity-centric customizing in modern industrial product design.

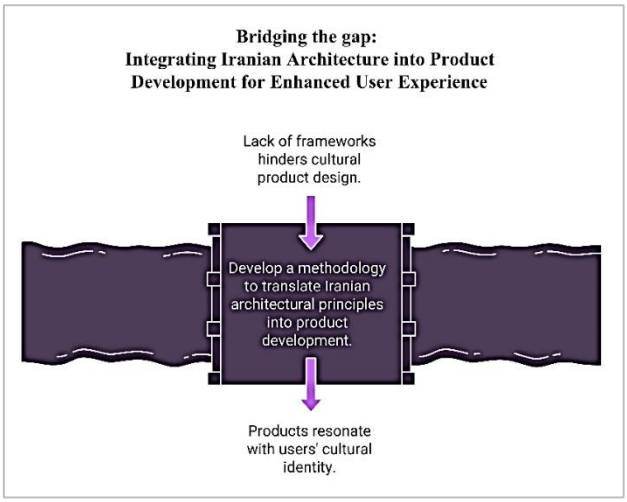

Figure 1: *Main identified research gaps*

Literature Review

1. *Visual identity and meaning in design*

Contemporary product design increasingly depends on visual identity and significance, particularly regarding the cultural context of product creation and the relationship modern customers have with their cultural history. According to (Lo, 2025) aimed to ascertain if the reinterpretation of traditional Chinese artistic motifs is evident in the Guochao phenomenon and to demonstrate how the transformation of semiotic and cultural capital can bolster national identity in the context of interior textiles. The study's findings indicate that if traditional motifs evolve into more abstract forms or are integrated with current designs, they will retain their cultural relevance; also, the study provides insights into the necessity of culturally relevant product design in relation to cultural symbols.

Generally, future directions should focus on enhancing collaboration between architects, lighting designers, and technology developers to create innovative solutions that address both aesthetic and functional needs. So, in accordance with the mentioned sentence, the investigation of modular and adaptable lighting systems, as proposed by Jara-Villagrana et al., may augment the versatility and sustainability of lighting products within architectural frameworks. The findings indicate that modularizing lighting, irrigation, and monitoring systems facilitates adaptable, cost-effective, and scalable solutions, thereby improving research

reproducibility and the transfer of innovation in resource-constrained agricultural environments through methodical, user-centric engineering (Jara-Villagrana et al., 2025).

According to additional studies, lighting can be regarded as an architectural component that influences spatial perception. The significance of lighting in establishing atmospheres is especially vital in settings like libraries, where it can improve user experience and comfort (Umayrah et al., 2024). In another investigation, Recent technological breakthroughs have created new opportunities for incorporating architectural features into lighting design. The utilization of holographic installations, as examined by Azevedo, facilitates the development of dynamic lighting effects that can engage with architectural structures (Azevedo et al., 2022). According to another study, despite the encouraging progress in incorporating architectural features into lighting solutions, numerous hurdles persist. The calibration of lighting systems to attain optimal performance under diverse situations, as emphasized by Burdziakowski et al., is essential for assuring accuracy and dependability in photogrammetric applications (Burdziakowski & Bobkowska, 2021).

This research conceptualizes visual identity as a multifaceted system for constructing meaning, rather than only an aesthetic layer. The relationship of shape, materiality, geometry, pattern, and visual rhythm conveys and perceives cultural tales. Previous studies indicate that visual identity serves as a conduit between cultural history and current design expression, facilitating the reinterpretation of ancient symbolic systems in contemporary circumstances. Accordingly, in the proposed conceptual framework, visual identity operates as a foundational construct that guides the formal, material, and compositional decisions of the Noor-Avan lamp, ensuring that cultural meaning is embedded at the perceptual level of the product rather than applied as surface decoration.

2. *The role of light in Iranian culture*

The use of light in Iranian culture and architecture has both a strong symbolic and functional role to play in those cultures and their respective architectures. Several studies indicate that light is used as an essentially metaphysical marker in Iranian architectural heritage, and that light functions as both a marker of Meta physicality and a means of creating space.

A very recent study conducted in the year 2023 has examined the quality of life/death as compared to light/darkness, and how traditional Iranian homes represent these philosophical concepts through the way they are spatially arranged (Rismanian, 2023). Likewise, in the same year (Iskandar et al., 2023) have presented evidence for the dual nature of light as both a spiritual and aesthetic aspect in religious architecture. Another study explores how Quranic concepts of light, darkness, and spiritual guidance influence Iranian architectural design. Through qualitative analysis, it reveals how light and shadow are strategically used in mosques to create meaningful, spiritually resonant spaces aligned with Islamic teachings (Alborzi et al., 2019). In another investigation, researchers examine natural light utilization in Iranian residential architecture through qualitative analysis of three historic houses in Kashan, and the findings reveal that light is strategically integrated through architectural elements to serve dual roles: ensuring visual comfort and energy efficiency while imbuing spaces with spiritual and aesthetic meaning, thereby harmonizing functional performance with profound cultural and perceptual values (Habib, 2013).

Additionally, recent studies of Iranian architecture include the impact and implications of light within the context of architectural analysis. For example, (Abarghouei Fard et al., 2025) discuss the relationship that exists between interior spaces, outdoor spaces, and the experience of light within courtyard homes, and (Ostovar & Atighechi, 2024) demonstrate that celestial symbols, specifically the sun and moon, are representative of the spiritual authority within Sassanid and architectural artwork. Another article demonstrates light's influence on spatial quality in three iconic Iranian mosques using descriptive-survey methods. Results confirm that light serves as a key independent variable, significantly enhancing spiritual, aesthetic, and perceptual qualities, such as sanctity, movement, clarity, and belonging, while shaping memorable, dynamic, and meaningful architectural experiences (Alborzi et al., 1396).

Finally, psychologically conducted research studies, such as (Gourand et al., 2022) Supports the fact that illumination significantly impacts emotional and psychological well-being; however, it also contributes to an individual's understanding of overall cultural and perceptual significance.

Light is seen as having an otherworldly aspect in classic Iranian architectural texts. In one such work, by Shariatmadari, the author illustrates how the light in both Zoroastrian and Islamic tradition moves from 'illuminating' the space to becoming a 'divine' symbol of pureness, cosmic order, and spiritual essence (Shariatmadari, 2019). The example that Aghapour (2021) uses in his research shows how the use of diffuse, purposeful light within a historic building contributes to 'mystical' spaces that, while functional, offer more than just utility (Aghapour, 2021).

The reviewed literature sheds light on Iranian culture as a dual-functional phenomenon that transcends technical illumination and operates as a symbolic, spiritual, and experiential medium. Across architectural, philosophical, and psychological studies, light is consistently associated with concepts of clarity, transcendence, balance, and emotional regulation. These findings indicate that light in Iranian architectural tradition is intentionally manipulated to shape spatial perception, emotional atmosphere, and metaphysical meaning. Within this study, light is therefore conceptualized as a cultural-symbolic design element that informs both the functional and experiential dimensions of the product. This understanding directly informs the conceptual framework by guiding lighting strategies related to intensity, diffusion, layering, and dynamic control in the Noor-Avan lamp.

3. *Translating architectural elements into product design*

Across many different cultures, there has been extensive research into how the architectural characteristics of a culture's past have been interpreted in product design today. (Hu et al., 2022) create a quantitative aesthetic model for designers to create visual compositions, and how to systematically optimize illumination and geometric structures for balance. (Qin & Ng, 2020) Apply Metaphor Theory to develop a framework to convert Traditional Cultural Property (TCPs) into current product characteristics without losing the symbolic authenticity that the TCPs represent for consumers, while also considering the needs of consumers today.

Three studies were conducted that explored the Education and Conceptualization approaches of how to integrate a culture's heritage into Design Artifacts. (El-Khouly, 2021) demonstrates how programming and interactive coding can be used as a way of reinterpreting the traditional geometric patterns into an interactive, responsive architectural prototype. (Setlhatlhanyo et al., 2019) demonstrate that ethnic motifs that have traditionally inspired products are still present in modern product aesthetics and are important to use in the Education of Design.

The recent research completed on contemporary interior design (Rashdan & Ashour, 2024), identifies many strategies, Historical Revival, Eclectic Historicism, and Free Historicism, that allow for the balance of the heritage of a culture and the modern-day functional requirements of the product designer.

The expansive body of research unveils a tapestry of innovative methodologies for weaving cultural elements into contemporary frameworks:

- Reinterpretation and symbolic abstraction breathe new life into traditional narratives (Yijing & Sharudin, 2023).
- Digital extraction, alongside the transformation of age-old motifs, reshapes our aesthetic experiences (Wu, 2024).
- A fascinating cross-industry fusion of intangible cultural assets propels creative synergies (Wang et al., 2025).
- Multi-objective optimization, rooted in the intricate models of cultural DNA, paves the way for nuanced applications (Zhang & Zhang, 2024).
- The AI-driven reconstruction of traditional symbols reimagines heritage in the digital age (Zhang & Xu, 2024).

- Hierarchical models that connect cultural norms with product layers reveal the complexities of our consumer landscape (Khodashenas & Gilani, 2024).

Collectively, these studies illuminate an escalating global fascination with the interplay of cultural identity and product innovation. Through the lenses of computation, abstraction, and interdisciplinary collaboration, we witness a vibrant confluence of tradition and modernity.

Based on another investigation, researchers study the symbolic role of light from ancient Mithraism into later Iranian art through a comparative analysis of mythological and historical sources. The results reveal that many light-related motifs from Mithraism persisted as meaningful symbols or ornamental forms in subsequent artistic traditions, while some were omitted due to ideological shifts (Rostam Beigi, 2011). Another study analyzes the symbolic influence of Suhrawardi's Philosophy of Illumination on Timurid architectural motifs. Results reveal that radial geometric patterns, such as Shamse and stars in tilework, systematically embody light as a divine symbol, reflecting mystical concepts of unity, manifestation, and spiritual presence through structured, non-random ornamental design (Rouzbahani, 2018). Another research in 2016 examines how light and decorative motifs in five traditional Iranian bathhouses (Qajar & Safavid periods) influence environmental health and spatial quality. Using Delphi and Q-factor analysis, it finds that symbolic use of light and ornamentation significantly enhances user well-being, comfort, and the desire to inhabit such spaces, promoting a healthy architectural environment (Mansoori et al., 2016). Another investigation examines stained glass in Nasir al-Molk Mosque, analyzing its integration of light, color, and mystical geometry. Findings reveal that combining Sufi-inspired color symbolism with precise craftsmanship creates spiritually resonant spaces that induce relaxation, preserve heritage, and demonstrate how light in Iranian architecture merges aesthetic, scientific, and contemplative dimensions (Tousian Shandiz & Haji Ghafouri, 2022).

The reviewed studies collectively demonstrate that the translation of architectural principles into product design requires systematic abstraction, reinterpretation, and technological mediation rather than direct formal replication. Architectural elements such as geometric logic, lattice structures, ornamental depth, and spatial layering can be transformed into product-scale components through modularization, material optimization, and fabrication-aware design strategies. In this research, architectural-to-product translation is conceptualized as a structured design process that bridges spatial logic and object-scale manufacturability. This construct forms a central pillar of the conceptual framework, enabling the conversion of Iranian architectural patterns, such as gereh-chini and carved surfaces, into scalable, producible, and functionally integrated components of the Noor-Avan lamp.

4. *Customization in product development*

In today's dynamic landscape, customization and mass personalization have emerged as pivotal strategies in product development. (Pallant et al., 2020) Identify four distinct user segments include Non-Customizers, New Customizers, Active Customizers, and Lapsing Customizers. This segmentation underscores the rich heterogeneity in consumer demand, necessitating flexible and adaptable design approaches. Further exploring this realm, (Trentin et al., 2025) reveal that a synergistic blend of knowledge absorption, modularity, and online configurators dramatically elevates customization capabilities. This finding reinforces the significance of integrated systems in fostering product flexibility. Moreover, (Powell & Yang, 2023) introduce the concept of preference clustering, demonstrating how this technique can streamline design processes by uncovering patterns of cross-product generalization, ultimately slashing both time and costs. In parallel, (Pandremenos & Chryssolouris, 2014) champion the notion that modular architecture serves as a facilitator for customization, even amid imperfect optimization. Their work highlights how it provides essential structural pathways for variation. These insights resonate profoundly with products like Noor-Avan, which hinge on interchangeable components and regional identity modules. Here, customization transcends mere functionality, acting as a vital bridge that connects cultural representation with user engagement.

The literature on customization highlights its role in enhancing user engagement, emotional attachment, and perceived product value by aligning design outcomes with individual preferences and identities. Beyond functional variation, recent studies emphasize customization as a cultural and symbolic interface between users and products. In the context of this research, customization is conceptualized as an identity-driven mechanism that enables users to actively participate in the representation of cultural meaning. This perspective extends mass customization toward cultural personalization, where interchangeable components function as carriers of regional and symbolic identity. Consequently, customization is positioned within the conceptual framework as a key strategy for transforming the Noor-Avan lamp from a static cultural object into an interactive and user-defined cultural artifact.

5. *New product development*

Recent strides in product development illuminate the transformative power of computation, digital fabrication, and AI-enhanced methodologies. (Yixiong et al., 2020) Conduct a thorough review of data-driven design strategies, revealing how AI significantly refines decision-making processes at every stage, from initial requirement analysis to final optimization. In a compelling study, (Tao & Hui, 2024) illustrate that the fusion of parametric modeling and 3D printing paves the way for embedding traditional art concepts into cultural-creative products, resulting in elevated user satisfaction. Adding another layer, (Jiangbo, 2025) advocates for the algorithmic reconstruction of traditional motifs, demonstrating that digital techniques can uphold authenticity while simultaneously expanding the realms of innovation. Collectively, these findings underscore a paradigm shift towards intelligent, culturally attuned, and technologically integrated product development. This evolution mirrors the design and engineering philosophies embraced in the Noor-Avan project, where tradition and modernity converge to create impactful solutions.

Collectively, the literature review establishes four interrelated theoretical constructs, visual identity, symbolic light, architectural-to-product translation, and identity-based customization, which form the conceptual foundation of this study. These constructs are not treated as isolated themes but as interconnected dimensions that jointly inform the design-based research process. The conceptual framework presented in the following section is directly derived from this theoretical synthesis and serves as an operational model for addressing the research question through systematic design exploration and product development.

Conceptual Framework

The purpose of this study's conceptual framework is to establish a systematic process through which product designers can derive new products from existing structures and allow for the inclusion of culture as part of a comprehensive methodology for the development of products. As such, this study does not merely describe how cultural influences affect the design of products: rather, it provides a methodology for developing culturally specific product components from existing structural elements. By bridging the gap between architecture and industrial design, the conceptual framework outlines how cultural concepts can be identified, isolated, and transformed from architectural concepts into manufacturable components using the process of design-based research.

At its essence, this framework is anchored in four interwoven theoretical dimensions:

1. Visual identity construction
2. Cultural semiotics of light
3. Architectural-to-product translation
4. Identity-driven customization

These theoretical dimensions do not function as abstract concepts in isolation; rather, they are operationalized across the sequential working phases of the conceptual framework, ensuring a direct link between theory, design action, and product realization.

The combination of these different dimensions creates a methodology that extends beyond simply taking something from a culture to create an object for sale, but provides an opportunity to develop a design methodology based on understanding the cultural significance of the objects created, therefore developing more meaningful connections between the designer and their products. This approach strengthens the conceptual rigor of the design process while fostering a deeper and more meaningful relationship between cultural context and product development.

The framework that is established through this methodology uses visual identity theory to understand how form, materiality, pattern, and light and shadow interact to denote and transmit cultural meaning through designed objects. In Iranian architecture, identity comes not only from single motifs but arises from the intricate relationships among geometric rules, modular repetition, proportional harmony, and the light and shadow interaction that creates depth within an architectural structure. The framework allows for taking these concepts and translating them into the defining parameters of product size and shape, density of pattern, layering of materials, and structure rhythm for Noor-Avan to achieve the goal of representing Iranian cultural identity through a systematic abstraction rather than a literal representation of that culture.

The second aspect of the framework explores the cultural semiotics of light in a way that illuminates light as more than just a source of light; it can serve as a conduit for spirituality, perception, and spatial hierarchy, based on the Iranian philosophy of architecture that embraces light as a primary carrier of meaning. Thus, the theoretical foundation provided by this perspective serves as the basis for Noor-Avan's dual-lighting approach, which integrates and synthesizes functional illumination with atmospheric light to provide a rich architectural experience; i.e., the creation of complex patterned shadow, increasing perception of depth of space, and creating a sense of place, and doing this all within the context of a domestic product.

The third aspect of the framework establishes an important architectural-to-product translation process that is currently lacking in design literature. While the history of design contains many examples of how architecture has influenced product design, there has been little documentation of the processes by which architecture can create inspired product designs. By introducing a structured translation model, the study formalizes a process through which architectural form can be systematically transformed into product design through abstraction, modular decomposition, material optimization, and fabrication constraints. As a result of abstraction, modular decomposition, material optimization, and fabrication limitation, and the establishment of a robust methodology to permit the reinterpretation of traditional elements such as gereh-chini and lattice structures as viable components for industrial use, without compromising their cultural integrity.

The framework ultimately will introduce identity-driven customization (IDC) as a theoretical extension of architectural translation. IDC is an alternative model to mass customization. Traditional mass customization has primarily focused on functional aspects of variation. In contrast, the IDC model proposed in this research views customization as the place where culture and the user interact to create meaning from their cultural background. As such, the IDC model will allow for the creation of many interchangeable panels inspired by the rich Islamic architectural heritage of Iranian provinces and historical monuments, allowing regional identity to be embedded within the product system. The product becomes a dynamic system in which the user's cultural identity is co-constructed with the designer, through the action of the user selecting and purchasing interchangeable panels.

Instead of looking to architectural design for a style, this system provides a way to interpret the past and present, using a collection of systematic rules to help develop new designs. The application of visual identity theories, the philosophy of symbolism in light, modularity in translation, and identity-based customization add to the theoretical basis of how culture has influenced design and how it can be adapted for manufacturing. This approach helps fill gaps in linking architecture, cultural identity, and modern-day product design, while providing an adaptable system that can be applied to other products in the future.

To enhance procedural clarity, the conceptual framework is structured as a sequence of interrelated working phases rather than as isolated theoretical constructs. Each phase represents a specific stage in the design-

based research process, translating abstract cultural and architectural concepts into concrete design decisions. This phased structure clarifies how theoretical inputs systematically guide the design development, prototyping, and evaluation of the Noor-Avan lamp. Accordingly, the framework consists of five sequential phases:

1. Cultural and architectural analysis
2. Formulation of design criteria
3. Architectural-to-product translation
4. Identity-based customization
5. Industrial design and validation

These phases form a continuous workflow that links theory, design action, and practical implementation. Although the framework is demonstrated through the Noor-Avan case study, its structure is intentionally designed to be adaptable to other culturally grounded product design contexts.

Figure 2 illustrates the proposed conceptual framework as a sequence of five interrelated working phases. The framework visualizes both the conceptual logic and the procedural flow of the design-based research process, demonstrating how cultural theory is progressively transformed into a manufacturable and customizable lighting product.

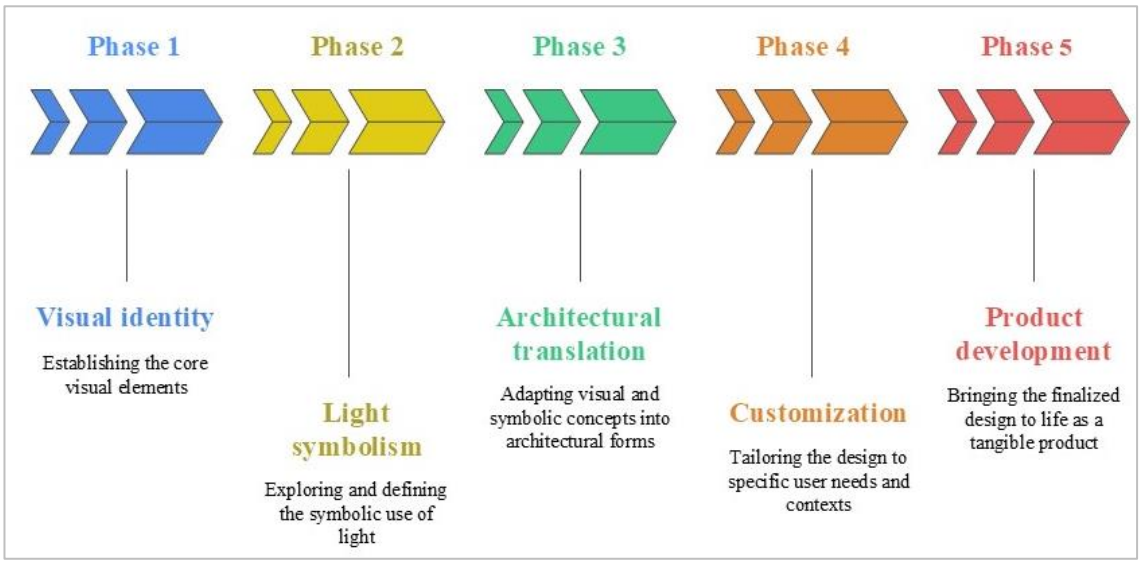

Figure 2: *Conceptual framework.*

Table 1: *Conceptual Framework of the Study.*

Core Dimension	Theoretical Basis (from Literature)	Design Translation Strategy	Application in Nour-Avan
Visual Identity & Cultural Semiotics	Visual identity theory; symbolic meaning-making; modular geometry and muqarnas; cultural semiotics in design (Lo, 2025; Rashdan & Ashour, 2024; Qin & Ng, 2020)	Abstraction of motifs; symbolic interpretation; semantic transfer from architecture to product aesthetics	Use of gereh-chini patterns, geometric framing, and engraved MDF motifs representing regional identity of Iranian cities
Symbolic & Architectural Role of Light	Light as spiritual, philosophical, and cultural signifier in Iranian heritage (Aghapour, 2021; Shariatmadari, 2019; Abarghouei Fard et al., 2025)	Lighting as emotional and symbolic experience; integration of multiple light sources; emphasis on shadow–light dynamics	Dual-lighting system (halogen + tri-color LED strip) to evoke traditional warmth + modern experiential control; illuminated patterns generating symbolic shadow-play

Architectural-to-Product Translation	Cultural element transfer, heritage abstraction, framework for modern reinterpretation (El-Khouly, 2021; Setlhatlhanyo et al., 2019; Zhang & Zhang, 2024)	Converting architectural structures (latticework, jali, carved surfaces) into manufacturable, modular product elements	Scalable PVC body, plexiglass diffusion layer, interchangeable MDF carved plates inspired by traditional architectural systems
Cultural Customization / Mass Personalization	Studies on customization clusters, consumer identity–product match, modularity and configuration (Pallant et al., 2020; Trentin et al., 2025; Pandremenos & Chryssolouris, 2014)	Designing customizable modules; linking product identity to user identity; mass personalization through motif replacement	Province-based customization: users select patterns related to birthplace or cultural affinity; interchangeable side panels enabling personalized identity expression
Industrial Design Feasibility & Contemporary Product Development	Data-driven product development, intelligent design systems, manufacturing practicality (Yixiong et al., 2020; Tao & Hui, 2024)	Balancing cultural depth with manufacturability; scalable production using local materials; modular assembly	PVC molding, layered assembly, standard electronic modules → enabling cost-efficient and scalable industrial production suitable for the Iranian market

Methodology

This study adopts a design-based research (DBR) methodology combined with qualitative–descriptive analysis to systematically translate architectural-cultural principles into an industrially viable product. DBR was selected due to its iterative, practice-led structure, which enables the integration of theory, design experimentation, prototyping, and evaluation within a single coherent process.

The methodological structure directly corresponds to the conceptual framework presented in Figure 2 and is organized into five sequential and interrelated phases:

1. Cultural and architectural analysis
2. Formulation of design criteria
3. Architectural-to-product translation through ideation
4. Industrial design and prototyping
5. User evaluation and industrial validation

Each phase operationalizes specific theoretical constructs introduced in the conceptual framework, ensuring methodological clarity, transparency, and replicability.

Step 1. *Conceptual Analysis and Review of Theoretical Foundations*

This phase corresponds to Phase 1 (Cultural and Architectural Analysis) of the conceptual framework and focuses on identifying culturally embedded architectural principles relevant to product translation. In the initial phase, an in-depth analysis is conducted on Iranian Architectural Identity with an emphasis on historically significant motifs, traditional wood working (specifically the type known as Gereh-Chini), and the significance of Light in Persian Architecture. This analysis was essential for identifying historical and culturally relevant elements and transitioning them from the architectural context to Modern Design. Through the examination of Historical Buildings, Types of Lighting, and Decorative Systems, I determined the foundational concepts for the Noor-Avan lamp. This foundational theoretical framework provided guidance in terms of the design philosophy and direction for conceptualizing and creating the Noor-Avan Lamp. The conceptual foundations derived from architectural analysis are summarized in Figure 3.

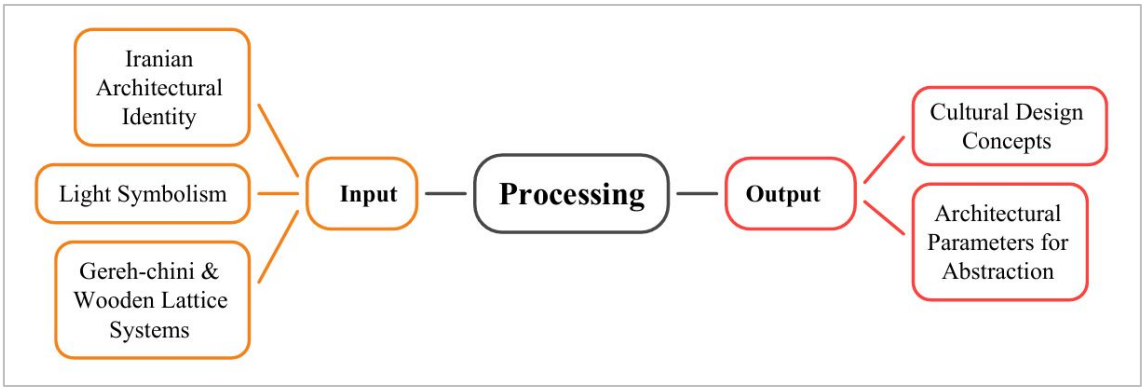

Figure 3: *Conceptual analysis of Iranian architectural principles informing the design foundation of Noor-Avan.*

Step 2. *Formulating Design Criteria Based on Iranian Architectural Principles*

Aligned with Phase 2 (Formulation of Design Criteria) of the conceptual framework, this step translates theoretical insights into explicit and operational design criteria. In this step, the information gained from the theoretical review was changed into concrete criteria. These criteria are grouped into three groups: aesthetic-architectural, functional-sensory, and conceptual-identity. The criteria were determined by how we would be reinterpreting historic shapes of light fixtures, the way that they provide a sense of familiarity and comfort, and how we could create materials that would provide the best balance between cultural authenticity and manufacturability. We also developed the principles of customization by using interchangeable MDF panels to represent Provincial Identity. Figure 4 expresses the extracted concepts which converted into three sets of design criteria.

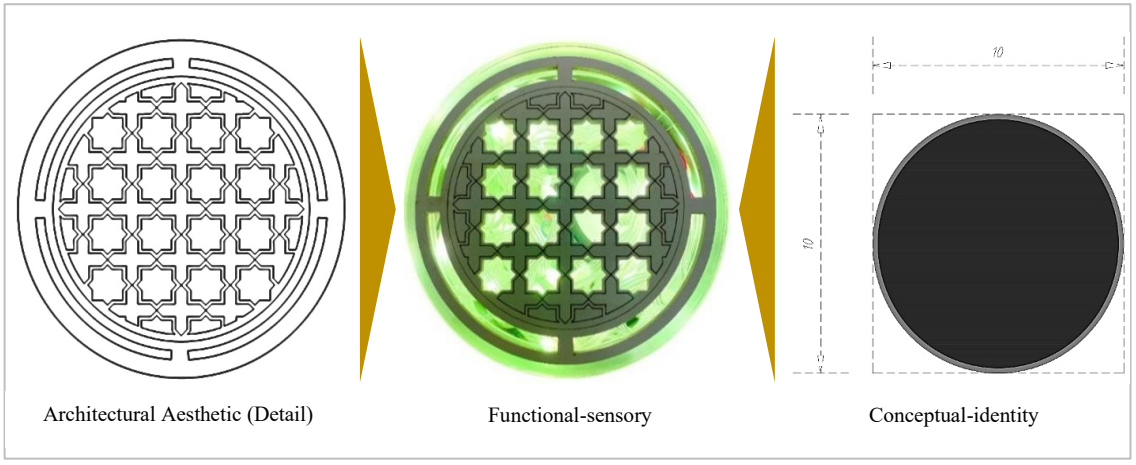

Figure 4: *Translation of architectural concepts into structured design criteria for product development*

Step 3. *Ideation and Concept Development*

This step reflects Phase 3 (Architectural-to-Product Translation) of the conceptual framework, in which architectural principles are abstracted and transformed into preliminary product concepts through iterative ideation. In this step, multiple concepts were generated, which were based on the earlier criteria. To accomplish this, we created conceptual sketches and morphological studies along with early 3D models (of the PVC, plexiglass, and MDF layers) to explore possible forms, lighting techniques, and spatial relationships. The goal of this effort was to create a compact and lightweight structure that was capable of being mass-produced while still maintaining a cohesive cultural narrative. The integration of the internal electronic components (Bluetooth module, speaker, tri-color LED strip) to the overall form and external lighting and pattern design was periodically re-evaluated as we went through the iterative development

process to ensure that the final product was creating a well-balanced output of Cultural Expression, Usability, and Technical Feasibility.

Step 4. *Industrial Design, Prototyping, and Product Development*

Corresponding to Phase 4 (Industrial Design and Prototyping), this stage focuses on material testing, dimensional definition, mechanical detailing, and fabrication feasibility. This phase represents the transition from conceptual design to actual construction in many different ways, with detailed dimensions (for example, height = 10 cm and diameter = 13 cm) and material testing performed for the evaluation of materials (2.5 mm PVC, 2 mm Plexiglass, and engraved MDF) and their behavior. Mechanical design has been focused on developing a mechanism that works to attach components together, the process used for manufacturing assemblies, and where these components (light channels, wiring, rocker switches, and other acoustic components) can be placed. The prototypes of all the variations were built using several iterations, and then subjected to evaluation based on lighting performance, clarity of engraved design, and both structural integrity and visual integrity. The findings of the evaluations have produced recommendations for product improvements based on cultural objectives while maintaining industrial specifications.

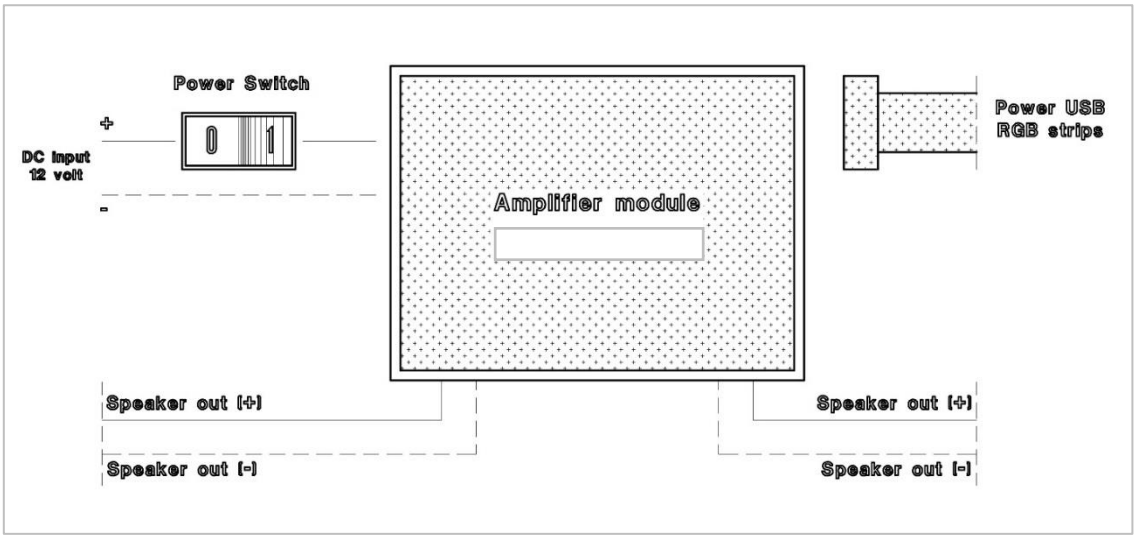

Figure 5: *Circuit detail of the table light*

Based on Figure 6, the assembly of separate sections of the main body is expressed. The first section is the top part of the light body, and the middle detail is the bottom part of the main body. The third detail shows the assembled form of the light body. In Figure 7, the indoor components of the light are presented. At first, the RGB strips are located, then the amplifier is located at the bottom of the light, and in the third detail, the speakers are located to complete the music feature of the table light. As it is shown in Figure 8, the top layer of the light includes PVC, Plexi glass, and MDF. Figure 5 describes the circuit section of the table light, which includes an amplifier as the mainboard, a power switch, a USB connector, which is used for the RGB strips, and the wiring.

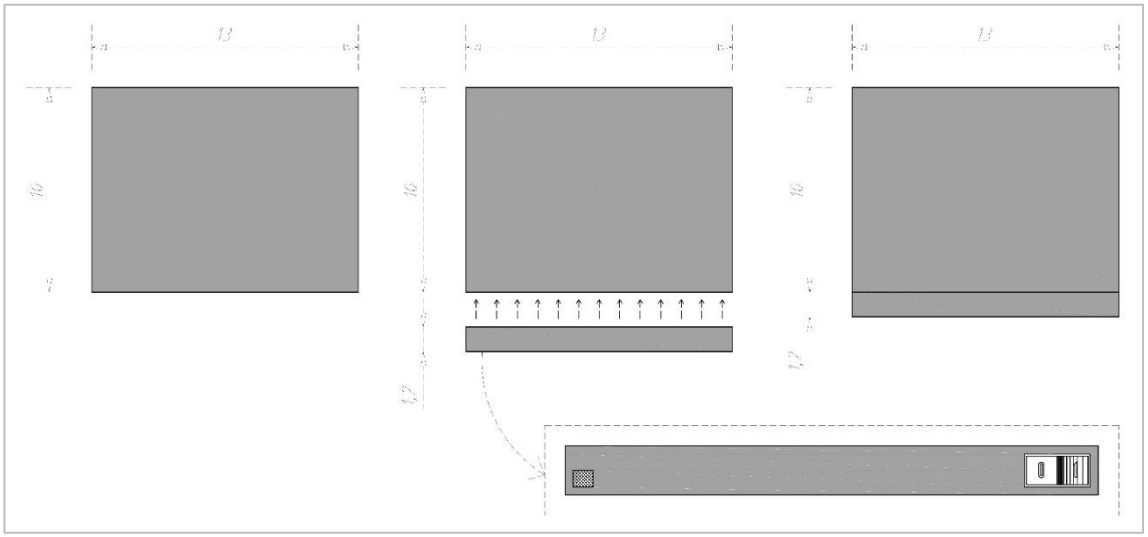

Figure 6: *Main body assembling detail*

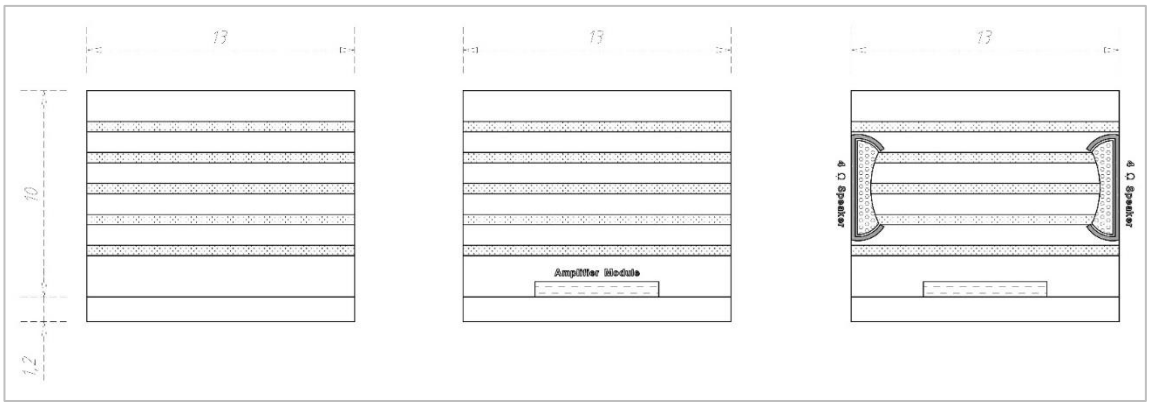

Figure 7: *Inside detail of table light*

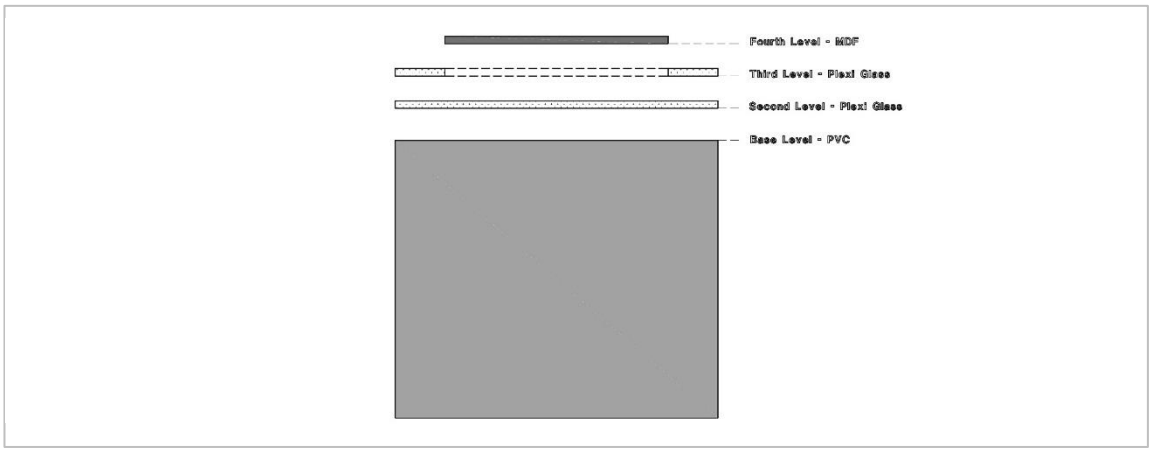

Figure 8: *Top part of the light layering*

Step 5. *Evaluation, User Testing, and Industrial Readiness*

This final step aligns with Phase 5 (Industrial Validation and User Evaluation) of the conceptual framework and evaluates both user perception and manufacturing readiness. In the fifth step of Noor-Avan, testing occurred within the home setting. The user's experience consisted of experiencing Noor-Avan's light, light comfort, the selection of multiple light types, and the overall sensory comparison of each type of light to see if there was a difference in perception. The researchers were also keen to assess the effect of the provincial identity panel on the product, which was expected to evoke an emotional connection and satisfaction for the user. Part of the testing process was to evaluate the feasibility of mass manufacturing,

while other parts focused on the materials available in Iran, the manufacturing methods, and the costs associated with producing Noor-Avan on a large scale. The resulting evaluations indicated that Noor performed satisfactorily in both functional and aesthetic categories.

By combining multiple avenues of research into one cohesive methodology, the design-build-research (DBR) methodology supports the systematic design of a novel product through a thorough exploration of all facets of the conceptual, cultural, and technical aspects of designing an innovative product. In addition, DBR methodology can serve as a source of inspiration for creating innovative contemporary products based on existing traditions - i.e., converting architectural heritage designs from the past into modern-day usable products. DBR enables theoretical and practical limitations to be incorporated during each phase of the process, ensuring that the final product represents Iranian identity, while at the same time satisfying all contemporary user needs.

By explicitly aligning each methodological step with the conceptual framework, the proposed DBR process provides a transferable and replicable model for culturally grounded product design. While demonstrated through the Noor-Avan case study, the methodology can be adapted to other cultural contexts and product typologies by substituting the architectural references and material constraints.

Results

1. *Representing Iranian Identity in a Contemporary Product*

Noor-Avaan provides an authentic reflection of Iranian identity instead of just a surface finish or aesthetic enhancement. Layers of design in Noor-Avan's structure symbolize the richness of the Persian culture. Further analysis of the various design attributes of the Noor-Avaan family of products will show how they relate to both Iranian Architecture & Industrial Design. The use of motifs/type of designs in the product, as well as the possibility of customizing them based on a user's province of origin, allows for an enhanced cultural experience for the user while using Noor-Avaan or incorporating it into his/her environment. The motifs/types of designs are indicative of gereh-chini (geometric lacework), architectural framing for structure, design structure for significant architectural monuments, and design for architectural lighting. The various regions of Iran have unique motifs that signify a "local identity." The user's connection to their culture and emotional state occurs while utilizing Noor-Avaan. Figure 9 and Figure 10 provides a visual representation of Noor-Avaan's collection and show various examples of the unique colorings that may be created.

Figure 9: *General view of Noor-Avan table light.*
Figure 10: *General view of Noor-Avan table light.*

Figure 11: *Artistic patterns of Noor-Avan table light)*

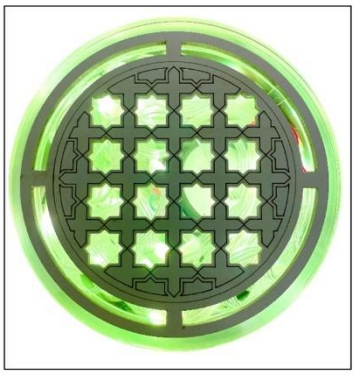

Figure 12: *Artistic patterns of Noor-Avan table light*

Figure 13: *Artistic patterns of Noor-Avan table light*

Figure 14: *Architecture patterns of Noor-Avan table light (Kashan)*

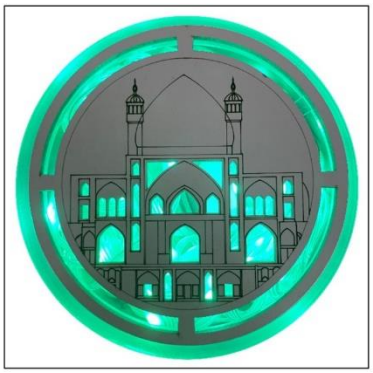

Figure 15: *Architecture patterns of Noor-Avan table light (Kashan)*

Figure 16: *Architecture patterns of Noor-Avan table light (Shahyad tower)*

Figure 17: *Technical drawing of Noor-Avan architecture patterns*

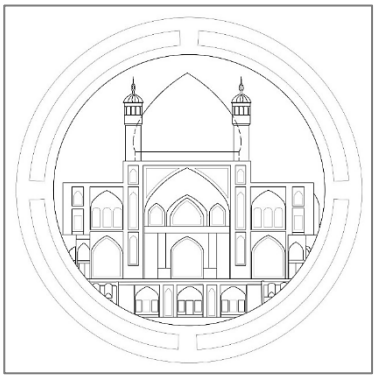

Figure 18: *Technical drawing of Noor-Avan architecture patterns*

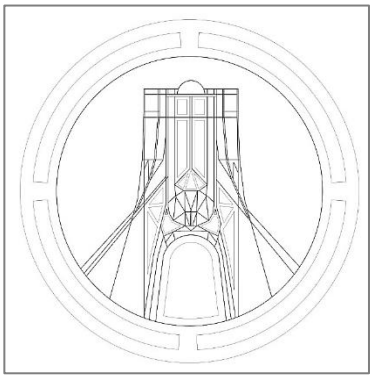

Figure 19: *Technical drawing of Noor-Avan architecture patterns*

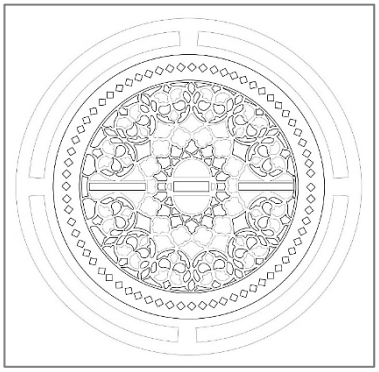

Figure 20: *Technical drawing of Noor-Avan artistic patterns*

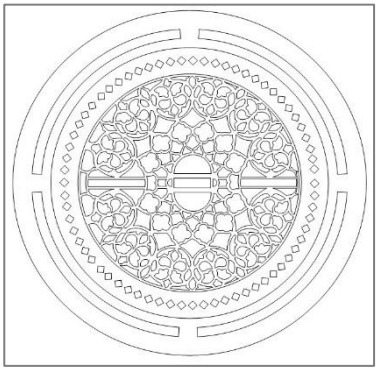

Figure 21: *Technical drawing of Noor-Avan artistic patterns*

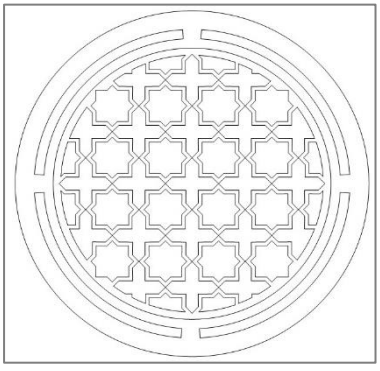

Figure 22: *Technical drawing of Noor-Avan artistic patterns*

Noor-Avan Lighting has been defined by various architectural patterns. As it is shown in Fig 11-16, there are different types of lighting design in accordance with cultural heritage buildings of Iran, and as they are illustrated in Fig 17-22, the drawings present the design process.

2. *Enhancing Lighting Quality and User Perception*

In addition to providing technical information about the combination of three-color LED strips, the Halogen lamp creates two types of lighting. The Halogen lamp creates a warm glow similar to that of the traditional light bulb, while the LED allows for more color options. Noor-Avan can therefore enhance the quality of lighting in addition to being a functional lighting source. It also has the ability to create an aesthetic experience for the user through its potential use as a 'perceptual medium' in the user's home or office. Through the adjustment of the color and brightness of the light, the user can control how they feel, empowering them to create their own unique visual experiences within the room with illuminated patterns displayed on the MDF panels.

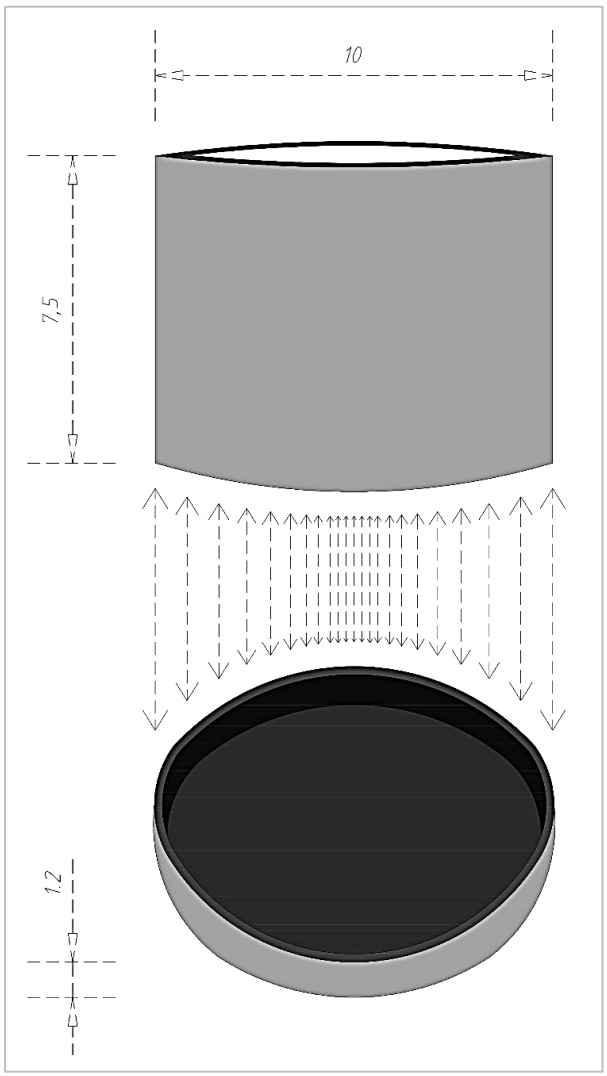

Figure 23: *Exploded drawing of Noor-Avan table light*

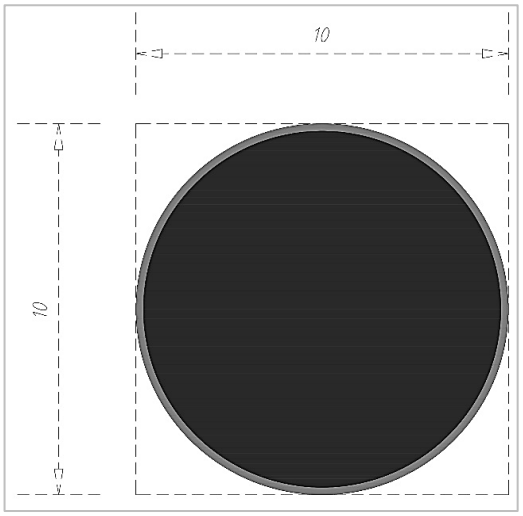

Figure 24: *Top view technical drawing*

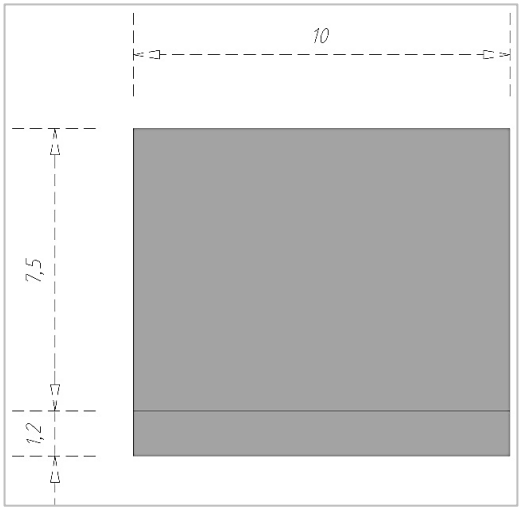

Figure 25: *Front view technical drawing*

3. *Evaluating Product Structure from an Industrial Design Perspective*

The outcome of the analysis of the design process showcased by this study highlighted that when combining both PVC and acrylic glass together with engraved MDF panels, this represents an optimal combination of industrial durability, manufacturability, and attractiveness through aesthetic aspects. The size of Noor-Avan

is designed compact enough to be able to easily fit into a multitude of different locations that may not have as much room available. In addition, the modularity of the wood section, as well as interchangeable panels demonstrate that this item can be manufactured on a mass scale while offering opportunities for future growth with new motif sets being introduced. All of these characteristics will allow Noor-Avan to evolve from being just another standard table lamp, becoming an extensive cultural product with the ability to expand over time. The technical drawings created for the Noor-Avan table light are shown in Figures 23 – 25.

4. *Technical Structure and Component Integration*

The Noor-Avan light fixture provides a system for its components (both Electrical and Material) to work as one cohesive unit and meet the product's cultural, aesthetic, and functional goals through an integrated technical structure. The primary structure of the fixture is a cylindrical PVC outer shell that is lightweight, easy to manufacture, and creates a Thermal barrier for the fixtures' internal components housed inside. The exterior panels are made from cellulose fiber (MDF) and are engraved with regional geometric motifs. Additionally, these panels serve as interchangeable identity panels; therefore, complementing the RGB Light that supports cultural stories. The tricolor scenario-based LED Strip is mounted to the circumference of the outer shell and provides even light distribution while also allowing for creating dynamic illuminated scenes. To help distribute the light created by the LEDs to help with the diffusion of the light through the engraved pattern on the MDF panels, an inner layer of plexiglass was used between the outer shell and the Interior Module.

The power for the entire setup of the lamp comes from a 5V source with the help of a direct connection to the initial stage of Bluetooth audio control: the Bluetooth audio hub (BAH). Specifically, the BAH has three main functions: it will wirelessly stream audio to the speakers; it will provide power for the RGB light strip by way of the USB port; and it will connect and control the Internal speaker and light strip. The internal speaker is rated at 4 watts with simultaneous stereo output and features a simple ON/OFF toggle switch. All these elements of the lamp create a comprehensive, fully integrated electronics network that combines to provide multiple functions in one compact area. All of these features enhance the user's experience, as it provides one device for both controlled lighting and audio through one control device. Table 2 presents the component list, materials, and functions related to each lighting section.

Table 2: *Technical structure and component list*

Component	Material / Type	Function	Integration Role
Main body	PVC	Provides structural enclosure	Houses all electronic and lighting elements
Decorative panels	2.5 mm MDF	Display engraved regional motifs	Interchangeable identity customization layer
Inner diffuser layer	2 mm Plexiglass	Softens and homogenizes light	Enhances clarity of motif illumination
RGB lighting strip	3-color, scenario-based LED	Provides dynamic illumination	Connected to the USB output of the Bluetooth module
Lighting remote control	Infrared remote	Controls RGB colors and lighting scenarios	Interfaces with the RGB strip
Bluetooth audio module	5V module with USB	Enables Bluetooth playback; supplies USB power to the lighting	Central hub for power + audio + lighting
USB output port	Built into the module	Supplies electricity to the RGB strip	Facilitates stable power distribution
Internal speaker	4-Watt driver	Produces audio output	Wired directly to the Bluetooth module
Rocker switch (0/1)	Mechanical on/off	System power control	Positioned on a PVC body for user access
Power adapter	5V external adapter	Supplies the main power to the system	Feeds the Bluetooth module and lighting

4. *Customization as a Cultural Design Strategy*

The research revealed that provincial-style customization was a major advantage for the product as it created a strong connection between the product and the users represented by their city or place of origin motif choice. The majority of the participants stated that they preferred to choose provincial-style motifs because of the ability to customize the motifs or design based on their geographic location and/or cultural values. By allowing users to customize the product(s) with geographic-based decorative elements, users can view their product as a cultural symbol, which raises the perceived value of the product. Additionally, the customization option can be utilized to create new design collections based on future customization options.

5. *Enhancing Multisensory Experience through Light and Sound*

Researchers have discovered that the simultaneous use of light and sound in a single product provides an enhanced user experience over what would have been achieved by using either light or sound alone. Because this product integrates both types of input (Bluetooth lighting and audio), it impacts visual and auditory sensory layers at the same time. As a result, this product's ability to create an emotional/sensory experience aligns with the principles of User Experience Design (UED), which aims to design a product for its physical functionality as well as the emotional/sensory interaction it generates for the user. Noor-Avan exemplifies Tangible Interactivity (TI) and is an example of how technology and traditional artistic methods can collaborate to create products that are both technologically advanced and artistically meaningful.

6. *Industrial Feasibility and Product Line Development*

An engineering study of the product indicates that by using the resources available in Iran (PVC, MDF, Plexiglass, standard led strips, pre-assembled electronics), it is possible to produce this product at a low cost and with little dependence on foreign resources. By creating a product with a layered design that is easy to construct and uses standard PVC molds, the cost of producing the product will be significantly lower, and high quantities of the product can be produced. The analysis also suggests that there is potential for the creation of a national line of this product to be manufactured in different regions across Iran, which will create access to jobs in the creative industries in every corner of the country.

Discussion

1. *Interpretation of Findings*

This study's results highlight that, through systematic transformation, architectural heritage can be effectively translated into modern, industrially designed items that maintain their traditional cultural Identity, rather than being relegated to decorative details. The development and assessment processes used to create Noor-Avan illustrate the significance of having a well-defined approach to architectural identity based on the intersection of the geometric structure, philosophy of light, logic of materials, and symbolism of space, which have a major effect on how the designer creates a new product. Additionally, the findings suggest that cultural identity can and should be a driving force in design, rather than being an afterthought.

Another major conclusion obtained from the current study was that it is possible to use both functional and symbolic characteristics of light as a tool, using both halogen and Tri-Color LED within the design of a dual lighting strategy to illustrate how shadows and light react in relation to each other in the context of traditional Iranian architecture. The evaluation of the dual lighting strategy approach by users shows that the layering of lighting creates a level of comfort, adds depth, and evokes feelings of intimacy in addition to creating an environment similar to the interiors of Iranian architectural styles. The design team has shown how the principles of lighting, as symbolic of traditional architectural design, can also be applied to smaller-scale new consumer products.

Research has shown that modularizing architectural style and process into product form allows the product to be made through the use of interchangeable components. In our work, we explored how the traditional construct of Gereh-chini and carved surfaces may inform interchangeable MDF components through our design process. The examples of technical drawings and prototypes illustrate how it is possible to create decorative pieces that can both exist in parallel as functional items created through an industrial manufacturing environment and be produced using modular design logic, material constraints, and iterative research in the design process. In this respect, the research supports that the designs for culturally rich products do not preclude the product's ability to be manufactured and therefore may coexist in design environments that are both structured and methodical in their approach to product design and manufacture.

In addition, integrating multisensory interactions such as synchronized audio and visuals extended the functionality of the lamp while allowing an experience unique to the lamp itself. Adding a Bluetooth speaker created an emotional bond between the user and the product. Placing the Noor-Avan lamp in the context of contemporary experience-based design confirms how modern design is becoming more and more about emotions, perception, and function working together.

2. *Comparison with Existing Design Approaches*

The early 20th-century modernist movement's school of thought on how architecture and the application of that philosophy into furniture, product, and consumer goods is an integration of the concepts of architecture into the methods, techniques, materials, and production processes of those products. Designers who took from this philosophy to develop their own work instruments included Marcel Breuer, Ludwig Mies van der Rohe, and Peter Behrens. Architects used these references to derive morphological information from the manner in which buildings are manufactured and built. They then created low-cost, accessible products that visually resemble architectural forms.

However, in contrast to these modernist approaches, Noor-Avan departs from the architectural notion of using architecture as an aesthetic reference or ingredient and instead approaches architecture as a vehicle to represent contemporary culture as a cultural narrative. This new approach will provide context-specific insight into the culturally rich process of designing and making architectural space through different semiotic constructs. Noor-Avan has drawn upon the specific regionalized semiotic understanding of the built environment in Iran and uses this to express the same meaning through the designs of its architecture as other regionalized influences did.

An Architecture with an architectural motif, we will abstract and modularize this motif into several components, which are then functionally aligned to create new architectural components that will then become an architectural theme. By using this approach, this research avoids creating simply a collection of architectural motifs, which is what many articles discussing reinterpreting cultural heritage vs. mimicking do. Noor-Avan is distinct among other products that reflect various cultural influences as it does not tell the story of a cultural heritage, but rather it tells every individual's story through the identity and interactions of the users. By allowing the user to help define the cultural expression of their design, it is transforming from a static piece of hardware into an interactive cultural interface.

3. *Novel Theoretical Contribution of the Study*

As incorporated in this study's theoretical framework, is new to the literature. The research provides (1) architectural heritage, (2) symbolic light theory, and (3) identity-based customization to the design of industrial products based on the structured methodology of the cultural heritage of the design process. In previous research and standard historical knowledge of architecture related to the design of products, the methods of incorporating the architecture of different cultures into products have been established; however, the current research takes a more definitive approach to defining the method and methodology for transforming architectural elements into user-centric stocks of manufacturable product designs.

This paper also provides an example of a scalable model that can be used for the transformation of product design based on architectural design elements into scaled product design parameters using geometry, ornamentation, hardware, and spatial hierarchy. The central focus of the discussion is to provide a methodological framework for producing the product design of Noor-Avan rather than providing aesthetic conception alone.

Secondly, this study introduces the theoretical concept of identity-powered customization as a process for bridging cultural legacies and modern user involvement. Whereas mass customization has traditionally been investigated from a functional/stylistic point of view, the research seeks to provide an interpretation of customization as a mechanism through which users identify with their place-based cultural heritage and express their identity. This new understanding of personalization will move away from being regarded as a marketable characteristic of product design towards a cultural design methodology that employs emotional and symbolic elements.

The third element of this study's contribution is that the lighting symbolism theory has been incorporated into the process of designing industrial products. Although light has received much attention in both architecture and environmental psychology, it has rarely been considered as an integral part of the design process of small-scale consumer commodities that use systematic approaches for creating the symbolic and metaphysical elements of their designs. Noor-Avan demonstrated how the use of light creates a dual role of providing light and telling stories through its connection to the user's cultural memory.

By fusing these three contributions to expand the current range of design thinking to provide an industrially-ready, experience-focused, culturally-focused, and thoughtful approach to the development of products, the study has created a unique and innovative cultural identity design model for the industrial design and manufacturing processes.

In contrast to earlier examples like the Bauhaus or architect-led design of products, which relied mainly on architectural thought expressed through innovative materials and structure of the product, this research presents a new framework for translating cultural context into an applied design-based research framework, linking architectural meaning to a user-centered customization approach within the context of architectural design methodology. While the novelty of this research does not derive from the use of architecture as an inspirational source in general, it rather formalizes how to translate the power of architectural identity into scalable, customizable, multisensory industrial products via a design-based research approach.

By framing customization as a cultural interface rather than a purely functional feature, the study extends existing design thinking literature and proposes a new interpretive role for product personalization in culturally grounded design. Figure 26 synthesizes the relationship between the identified research gaps, the conceptual framework, and the study's novel theoretical contributions.

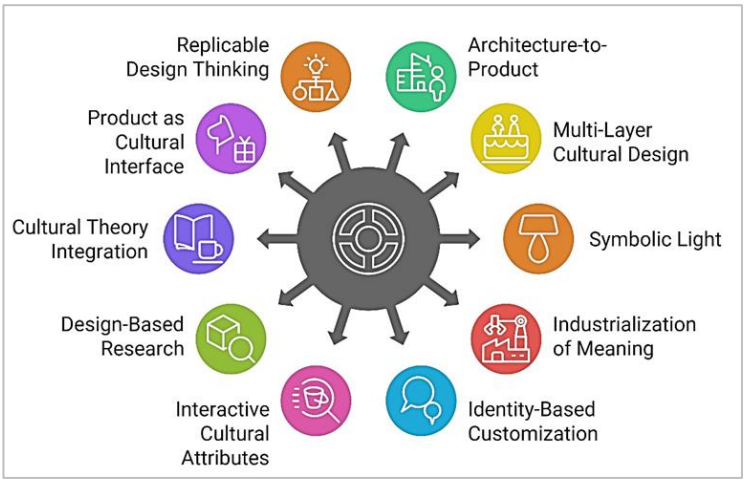

Figure 26: *Novel theoretical contributions*

Conclusion

The research was done to fill a current gap in the area of product design, namely, the lack of a systematic and theoretically based method to create industrially viable and user-centered products that reflect Iranian architecture as an architectural identity. There have been examples of how architectural thought has been incorporated into product design; this has typically happened through means of copied or stylistically imitative methods. In contrast, this research has developed a methodical design-based approach that allows for the interpretative application of different aspects of architectural heritage to the design of everyday commercial products, thus demonstrating the need for the cultural and emotional meaning of place to be included in the concept of design.

The methodology adopted for this research was through design-based research (DBR), which resulted in a progression from understanding the culture and theory of Iranian architecture, to developing the design criteria, iteratively generating and prototyping product ideas (table lamps), and allowing for users in a real-context to evaluate the designs. The Noor-Avan table lamp developed through this process is used as a case study to demonstrate how architectural concepts including Gereh-Chini (geometric patterns), symbolic use of light and shadow, and regional place markers can be incorporated into modern industrial design, and the results of this research confirmed that the cultural meaning associated with the product does not only rest in the shape or ornamental details, but also in how the product can be modular in construction, its use of light and shadow, and the multisensory experience that the product provides.

An important aspect of this study is that it addresses an established gap in the research literature, i.e., the absence of an established repeatable process for translating architecture's role as a key factor for product development, across categories of products, into actual products. A conceptual framework is introduced to establish a process for such a translation using visual identity theories, cultural semiotics, and the translation of architectural style and identity-based customization to product development. The research also demonstrates how regions can adapt customization to their regional identity and move away from a static model of cultural identity that is strictly represented through symbols to a model where the cultural identity becomes an interactive element of how users experience a product.

This demonstrates a shift in how users perceive products and create experiences with those products, which is supported by the use of locally sourced materials, modular component design, and standardized electronic systems to facilitate the production of design products architecturally influenced by cultural heritage.

Furthermore, the incorporation of light and sound into Noor-Avan's designs clearly places it within the current framework of experience-led design and underscores the critical role of engaging multiple senses in products designed for daily use.

Future studies can build on this framework by broadening to additional product categories and developing parametric and AI-assisted customization frameworks, and adding lifecycle/sustainability evaluations to improve environmental performance. Studies comparing different cultural contexts to the architectural identity model would also assist in determining the flexibility of the model beyond Iranian architectural heritage.

This research shows that the Architectural Identity is not just a formal inspiration but also a potential generative design system. By bringing together theory, design practice, and the ability to produce a replicable model for culturally grounded products, the research positions design as more than an aesthetic function but rather as a central component in creating dialogue among heritage, technology, and the way we live.

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