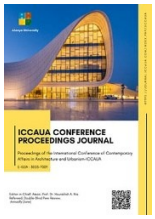

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The Impact of Historic Building Illumination on Urban Landscape: A Case Study of the Galata District

[1] **İrem Ayan**, [2] Prof. Dr. **Leyla Dokuzer Öztürk**
Yildiz Technical University, Faculty of Architecture, Department of Architecture, Istanbul, Türkiye [1]
Yildiz Technical University, Faculty of Architecture, Department of Architecture, Istanbul, Türkiye [2]
E-mail [1]*: iiremayan@hotmail.com, E-mail* [2]*: dokuzer@yildiz.edu.tr*

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Abstract

Illuminating architectural, artistic, and urban features in outdoor spaces forms the core of urban lighting practices. Among these elements, buildings hold a prominent role. The primary objective of façade lighting should surpass merely rendering structures visible at night; it should aim to enhance architectural narratives and evoke aesthetic appreciation. In this context, the illumination of historic and iconic contemporary structures, along with their surroundings, plays a pivotal role in promoting the associated urban areas and reinforcing the city's identity. This research, centered on the Galata District, was carried out in two stages. In the first stage, a detailed analysis was conducted on the existing façade lighting of the emblematic Galata Kulesi and seven other historic buildings in its vicinity, alongside the lighting conditions of nearby pedestrian pathways. The study area, including its buildings, pathways, and existing lighting systems, was digitally modeled in three dimensions. In the second stage, proposals were developed to enhance the existing lighting conditions. These design solutions were visualized using three-dimensional models. This comprehensive study of the Galata District's lighting environment offers targeted recommendations to highlight its historical fabric, providing a valuable resource for urban beautification initiatives.

Keywords: Urban lighting; Galata District; Historic buildings; Façade lighting.

1. Introduction

Urban lighting encompasses the illumination of urban, artistic, and architectural elements in outdoor spaces. Cities establish their identities through their historic districts and significant structures, which are fundamental to their cultural and architectural heritage. Accordingly, the appropriate illumination of landmark buildings and their surroundings reinforces urban identity, enhances architectural expression, and fosters aesthetic appreciation.

Various façade lighting techniques can be implemented, including floodlighting, accent lighting, wall grazing, contour lighting, transmitted luminance, silhouette lighting, and media façade (CIE, 1993; Philips, 2010). The selection of an appropriate lighting technique primarily depends on the building's function, architectural characteristics, and the potential placement of luminaires (Salata et al., 2015). The positioning of these luminaires is equally critical in preventing unintended light spills beyond target surfaces, thereby mitigating light pollution (Czarnecka et al., 2021; Kyba et al., 2018; CIE, 1997). Light spilling beyond the intended surfaces may adversely affect luminance levels and distribution on the façade of the illuminated building (Saraiji, 2009). Moreover, light intrusion into interior spaces through windows may cause physiological and psychological discomfort for occupants. Studies have shown that exposure to outdoor electric lighting at night is associated with an increased risk of mortality from coronary heart disease among elderly individuals (Münzel et al., 2021; Sun et al., 2021). Light pollution also disrupts animal behavior, sometimes with fatal consequences (Rodríguez et al., 2017; Firebaugh & Haynes, 2016; Boyes et al., 2021). Additionally, electric nighttime lighting has been found to have detrimental effects on plant growth (Czaja & Kołton, 2022) and freshwater ecosystems (Hölker et al., 2023).

The approach to illuminating a significant historical or contemporary landmark should be determined based on its location within the urban fabric. If the structure is situated in a prominent urban area, the lighting scheme should consider the district as a cohesive whole. In this context, developing an urban lighting master plan for key districts is of great significance (Şerefhanoğlu Sözen, Ünver, & Dokuzer Öztürk, 1995; Şerefhanoğlu Sözen et al., 1999). While making an urban district and its key buildings visible through lighting is essential for ensuring the safety of residents and visitors, this alone is insufficient. Beyond fulfilling these fundamental requirements, enhancing the aesthetic appeal of the urban environment is equally important.

In Istanbul, urban districts of historical, commercial, or entertainment significance include the Tarihi Yarımada, Galata-Pera, Levent-Ayazağa, Boğaziçi, and Kadıköy (CIE 234, 2019). This study focuses on the Galata district, where previous research has primarily aimed to identify the area's urban values and analyze existing lighting arrangements (Arifoğlu, 1999). Additionally, studies have specifically examined the lighting scheme of Galata Tower, the district's most iconic landmark (Demiröz & Acarkan, 2016). This study examines the existing lighting conditions of the façades of Galata Tower -one of Istanbul's most emblematic structures- along with seven historic buildings in its vicinity and the pedestrian pathways surrounding them. Furthermore, it aims to develop proposals for improving these lighting conditions.

2. Methodology

The research methodology of this study involves examining the lighting scheme of Galata Tower and its surrounding area, analyzing the existing lighting conditions, and proposing enhancements through alternative lighting designs.
The study was conducted in the following stages:

- Identification of the study area
- Modeling of the study area
- Examination of the current lighting arrangement of Galata Tower and its surroundings
- Evaluation of the current lighting scheme of Galata Tower and its surroundings
- Development of a lighting design proposal for Galata Tower and its surroundings

This methodology aims to improve the existing lighting conditions while formulating a comprehensive lighting strategy for the region by exploring diverse design approaches.

3. Identification of the Study Area

The Galata district is geographically located to the north of Istanbul's historic peninsula, within the boundaries of the Beyoğlu district. With its unique architectural and social structure, Galata serves as a small reflection of the capital cities of Europe. Throughout history, the region has been home to various ethnic groups, cultures, and religions. As a result, the area is also known as the Levantine District (Okyay & Binan, 2017). The coexistence of these diverse cultures has enriched the variety of architectural styles in the area. This study, which aims to examine the lighting arrangements in the Galata district, focuses on a specific study area due to the expansive nature of the region. The boundaries of this area were determined based on streets and routes most frequently used by residents and visitors. The starting point of the study area was selected as Galata Tower, and the endpoint was Bankalar Street. Galata Tower Street, Bereketzade Madresah Street, and Camekan Street, which are frequently visited by both locals and tourists, were considered key transition points between the selected historical structures. Notable historical buildings along this route include Galata Tower, Bereketzade Ali Efendi Mosque, British Post Office, British Hospital, Austrian Hospital, Türkiye İşbank, Salt Galata & Central Bank, and Sen Piyer Church. In addition to these significant landmarks, which add value to the area, the study area also includes the current lighting arrangements along the pedestrian paths extending from Galata Tower and passing through these historical structures.

4. Modeling of the Study Area

The three-dimensional model of the designated project area was developed based on on-site observations and photographs of the buildings and streets within the area. In this regard, detailed documentation efforts were carried out for the area, and the collected data were processed using SketchUp, Archicad, and Enscape software during the 3D modeling process. Photographs taken during the daytime of the relevant buildings, streets, and squares are presented in Figure 1. The Enscape visualizations corresponding to these views are shown in Figure 2.


Galata Tower


British Post Office


Bereketzade Ali Efendi Mosque


British Hospital


Austrian Hospital


Türkiye İşbank

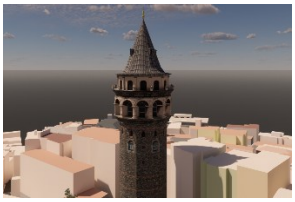

Salt Galata & Central Bank

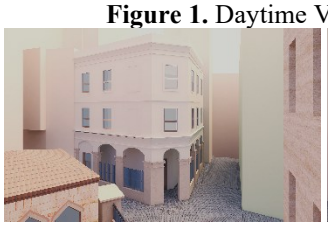

Sen Piyer Church


Camekan Street


Galata Tower Square

Figure 1. Daytime View of the Project Area


Galata Tower


British Post Office


Bereketzade Ali Efendi Mosque


British Hospital


Austrian Hospital


Türkiye İşbank


Salt Galata & Central Bank


Sen Piyer Church


Camekan Street


Galata Tower Square

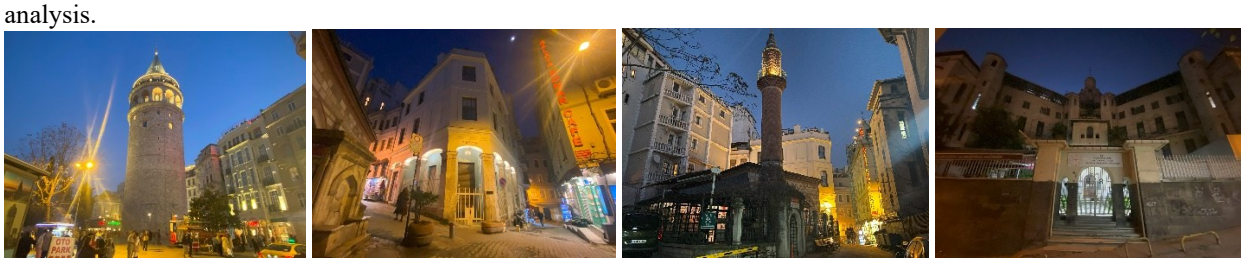
Figure 2. Daytime Enscape Visuals of the Project Area

5. Analysis of the Current Lighting Arrangement of the Galata Tower and Its Surroundings

The current lighting arrangement of the area surrounding the Galata Tower was analyzed through on-site observations, daytime and nighttime photographs, and the generated 3D model. During the daytime fieldwork, the types and locations of luminaires on the façades of eight selected buildings were identified. Photographs of these luminaires were captured for documentation purposes. Additionally, the types and positions of road lighting luminaires affecting the building façades were also recorded. To further evaluate the characteristics of the luminaires and their environmental effects, additional fieldwork was conducted in the evening. During this phase, the condition of the lighting arrangements was observed and documented through photographs. These on-site observations enabled the determination of the functionality of the luminaires and whether they were operational.

Following the investigations conducted at the Galata Tower, the starting point of the route, it was determined that not all of the luminaires on the tower's façade were operational. Some of the linear luminaires in front of the arched windows were found to be non-functional. However, it was observed that all of the pole luminaires surrounding the tower were

functional. Further along the route, Camekan Street, which is solely used as a pedestrian pathway, is illuminated by luminaires mounted on the façades of the buildings. Additionally, the luminaires on the shop façades and the intense light emanating from the interior of the shops contribute to the overall lighting of the street. All luminaires at the Bereketzade Ali Efendi Mosque, situated along the route, were found to be functional. At British Post Office, the pendant luminaire above the entrance door was observed to be non-operational. On Bereketzade Madresah Street, the only luminaire on the façade of the British Hospital, an applique above the interior entrance door, was non-functional. For garden lighting, luminaires are located behind the exterior entrance door. Across from this building, at the Austrian Hospital, only the linear luminaire used to highlight the signboard was operational. No functional luminaire were found at the emergency entrance. The pole luminaires and catenary lighting elements on Bereketzade Madresah Street were observed to be operational. Some of the luminaires on the façade of the İşbank building, located at the end of the stairs, were found to be non-functional. A similar issue was observed at the Salt Galata building, located on the same street. While the Salt Galata building, part of the same complex, has a façade lighting scheme, it was noted that the Central Bank building, further along the structure, lacked any lighting design. On Galata Tower Street, which leads back to the Galata Tower, it was observed that some of the road lighting luminaires were non-functional. Additionally, it was found that Sen Piyer Church, located along the street, only had luminaires at its entrance door. Upon determining the functionality of the luminaires within the project area, the existing lighting arrangement was digitally replicated. The study area, initially modeled in SketchUp, was then enhanced with luminaires using Enscape software. To accurately replicate the lighting arrangement, IES files corresponding to the specifications of the existing luminaires were imported into Enscape. During this process, various light sources were tested through a trial-and-error method, and the resulting visualizations were compared with nighttime photographs. The visualizations of the existing lighting arrangement, created in Enscape, are presented in Figures 3 and 4, alongside the corresponding nighttime photographs for comparative analysis.



Galata Tower | British Post Office | Bereketzade Ali Efendi Mosque | British Hospital

Austrian Hospital | Türkiye İşbank | Salt Galata & Central Bank | Sen Piyer Church

Camekan Street | Galata Tower Square

Figure 3. Nighttime View of the Project Area

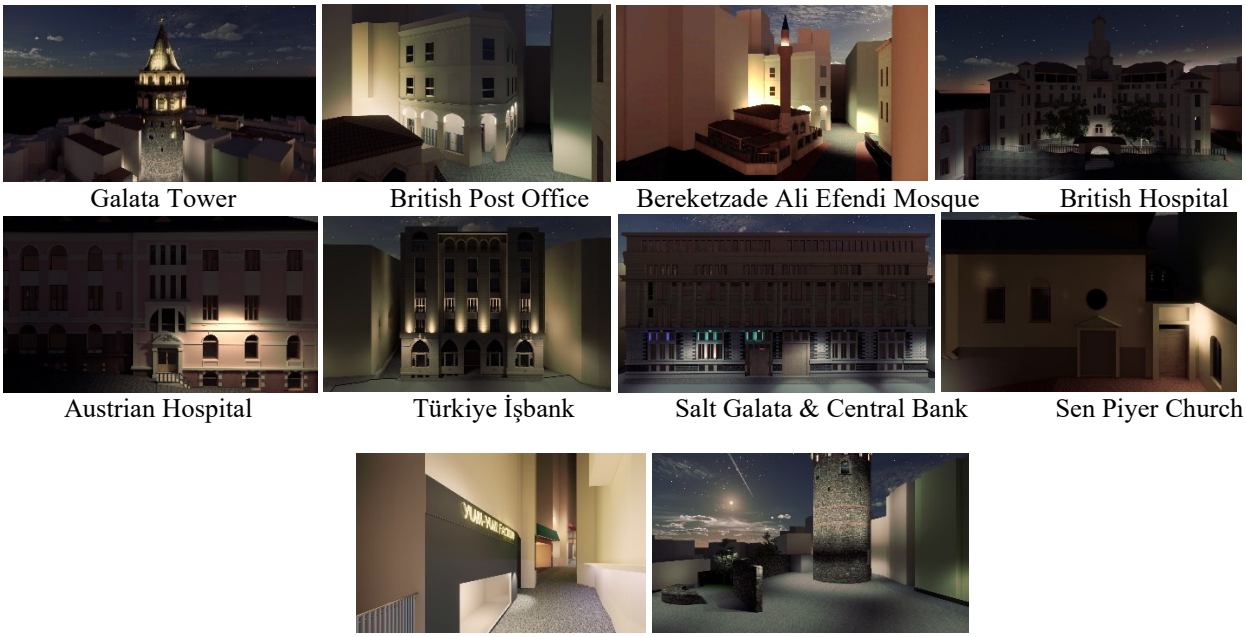


Figure 4. Nighttime Enscape Visuals of the Project Area

6. Evaluation of the Existing Lighting Scheme of the Galata Tower and Its Surroundings

The evaluation of the existing lighting arrangement began at the building scale and was followed by a comprehensive analysis of the surrounding streets. The assessment started at the Galata Tower, the beginning point of the route.

- **Galata Tower:** It was determined that some linear luminaires in front of the arched windows on the Galata Tower's facade were non-operational, while the remaining luminaires were functional. However, the non-operational elements negatively affect the overall integrity of the structure, creating an undesirable irregularity in the tower's nighttime appearance. Projectors, positioned on poles at the base of the tower, left the lowest part in darkness, with illumination beginning approximately three meters above the ground. Linear luminaires installed within the lower and upper windows successfully highlight the windows. Appliques mounted on the terrace railings create a uniformly lit surface when viewed from the outside, offering an aesthetically pleasing appearance. However, the four linear luminaires placed behind the terrace railings, while effective in illuminating the terrace walls, may cause direct glare for people on the terrace. The linear lighting installed along the terrace ceiling negatively impacts the aesthetic integrity of the structure. The conical section at the top of the tower is emphasized with spotlights; however, aerial photographs reveal that the interrupted lighting around the small windows on the cone disrupts the design's cohesion. The spotlights placed inside the upper cone windows failed to create a noticeable effect from the outside. It was also noted that all luminaires on the tower allow for dynamic lighting with coloured light. Additionally, the projectors mounted on poles can perform various light shows. These features contribute to the dynamic and captivating character of the Galata Tower's lighting.
- **Bereketzade Ali Efendi Mosque:** An examination of the lighting elements on the facade of the Bereketzade Ali Efendi Mosque revealed that linear lighting was used exclusively in the minaret balcony section. The illumination of the minaret has positively enhanced the visual perception of the space and highlighted the building's architectural details. However, the absence of lighting in the mosque's garden and the lack of illumination to accentuate the entrance door have negatively affected both the spatial experience and the security of users.
- **British Post Office:** Illumination to highlight arches at the British Post Office have been found to positively contribute to the spatial perception. However, the significant luminance contrasts in this area negatively impact visual comfort. The luminaires placed on the columns, some of which are directed towards the ceiling, have ensured uniform illumination of the space. On the other hand, the excessively homogeneous lighting on the rear surfaces of the arches has diminished their visual emphasis. This indicates a balance issue that should be addressed in the lighting design. Additionally, a pendant luminaire located above the entrance door was found to be non-functional.
- **British Hospital:** It was determined that there were no lighting elements on the facade of the British Hospital, except for an applique placed above the entrance door. However, this applique was found to be non-functional and has lost its effectiveness. The absence of luminaires on the facade is considered a deliberate design choice, in line with the hospital's intended function. In this context, the decision not to incorporate additional lighting elements on the facade aligns with the architectural and functional identity of the building. The hospital's garden is uniformly illuminated by luminaires located behind the exterior entrance door. However, the lack of a lighting arrangement for wayfinding, both inside and outside, as well as the overall homogeneous lighting of architectural elements without any emphasis, has been identified as an unfavorable design aspect. This issue is considered to warrant reconsideration from both a user experience and spatial perception perspective.
- **Austrian Hospital:** The lighting design of the facade of Austrian Hospital aligns with the hospital's functional requirements and, similar to British Hospital, does not incorporate any prominent design features. The nameplate of the hospital is illuminated by a linear luminaire positioned beneath it. However, this luminaire creates significant

luminance contrasts on the sign, negatively impacting the legibility of the hospital's name. It was observed that there are no lighting elements at the main entrance. Currently, the entrance is uniformly illuminated by road luminaires intended to light the path, which is insufficient to visually emphasize the entrance. Additionally, the low illumination levels along the emergency entrance, the connecting path, the ramp, and the stairs present a significant safety risk for users.

- **Türkiye İşbank:** The Türkiye İşbank building features a lighting design distinct from other structures. The building employs a wall grazing technique, with luminaires selected for this purpose being operational on the front facade, while some on the side facades are non-functional. This inconsistency negatively impacts the visual integrity of the facade, creating a sense of incompleteness. Another notable feature of the lighting design is the linear luminaires placed in front of the windows. However, it was observed that only some of these luminaires are functional, posing another challenge to achieving coherence on the facade. Linear luminaires positioned behind the decorative elements at the facade's corners create a lightbox effect in these areas. While this design accentuates the corners visually, it does not contribute to highlighting the building's architectural details. Additionally, it was noted that lighting is present only in the upper portion of the building, while the applique and linear luminaires around the entrance door in the lower section are non-functional. The insufficient lighting of the entrance door detrimentally affects both the user experience and the visibility of the building's entrance. Addressing these lighting deficiencies is crucial for maintaining visual integrity and ensuring user comfort.
- **Salt Galata & Central Bank:** The facade of the Salt Galata building exhibits a partially implemented lighting design; however, numerous elements are non-functional. This condition negatively affects the facade's perception and compromises its visual integrity. The overall design approach adopts a vertical emphasis, accentuating the columns on the facade with spotlights positioned in front of them. Additionally, linear luminaires are installed in front of some windows, similar to the design at the İşbank building. However, excessive light spilling from road lighting onto the facade has introduced an undesirable uniformity in the illumination, detracting from the originality of the design. Moreover, the presence of lighting elements is limited to the lower section of the facade, leaving the upper parts in darkness. This results in the design being perceived as incomplete, diminishing the overall aesthetic impact of the building. In contrast, the facade of Central Bank, which forms the other half of the building, lacks a distinct lighting design, unlike the Salt Galata facade. In general, coloured lighting is employed in the facade design, with occasional use of varying light colours. However, the use of coloured light on historic facades is not considered a preferred design approach (Gün and Dokuzer Öztürk, 2015). Overall, it can be concluded that while a design concept was applied to the Salt Galata facade, this concept has not evolved into a cohesive design identity due to functional shortcomings and incompatibilities with the rest of the building. The complete absence of a lighting design on the Merkez Bankası side negatively affects the architectural coherence of the structure. These facts are significant factors that directly influence the building's aesthetic integrity and user experience.
- **Sen Piyer Church:** It has been observed that the facade of Sen Piyer Church does not feature any lighting design when viewed from the street. The only lighting element present is situated above the main entrance door; however, the significant luminance contrasts produced by this device on the door surface adversely affect visual comfort and hinder the legibility of the sign. This condition complicates the ability of passersby to notice the building and obstructs their perception of the church's presence. Upon entering the church courtyard, three doors are visible. A spotlight is positioned above the door used for entry, enhancing its visibility.The remaining two doors, which are not accessible to visitors, are illuminated by appliques. Furthermore, the area adjacent to the entrance door, which provides information about the church, remains in darkness. The courtyard, as a whole, is inadequately illuminated, resulting in a negative impact on user safety and wayfinding. A comprehensive lighting design is necessary to improve both the visibility of the church from the street and within the courtyard, as well as to enhance the overall user experience.
- **Pedestrian Pathways and Galata Tower Square:** The lighting design of pedestrian pathways was initially examined through Camekân Street, a thoroughfare exclusively designated for pedestrians. This street, flanked by shops on both sides, serves as a frequently used route to access Galata Tower. It was observed that the overall lighting of the street is provided by road luminaires installed on the facades. These luminaires deliver relatively uniform illumination along the pedestrian pathway; however, the luminance on the facades where these luminaires are mounted, particularly near the light sources, becomes excessively high, which negatively affects visual comfort. Furthermore, the variation in colour temperature of light on the shop facades along the street generates visual dissonance and contributes to light pollution. The lighting configurations, reflecting the individual preferences of the shop owners, hinder the formation of a unified visual identity for the street.
  In another key pedestrian space, Galata Tower Square, it was found that there is a lack of a distinct lighting design. To achieve the required illumination levels, pole-mounted luminaires, similar to those used on the street, have been employed. In contrast to the tailored lighting design applied to Galata Tower itself, the indiscriminate approach to illuminating the square adversely affects both the readability of the space and its aesthetic appeal. It is considered imperative to implement a lighting design that accentuates the iconic structure of Galata Tower and improves the aesthetic perception of the square. This would be essential not only for enhancing the user experience but also for elevating the overall quality of the urban space.

7. Development of a Lighting Design Proposal for Galata Tower and Its Surroundings

Based on the evaluations conducted, a proposal for a new lighting scheme was developed to address the identified deficiencies and shortcomings in the current lighting arrangement of the area. Before presenting this new design, the potential impacts of reactivating the unused luminaires within the existing system were assessed. This evaluation aimed

to analyze how the area could be transformed in terms of aesthetics, functionality, and visual comfort, assuming the existing potential is effectively utilized.

7.1 Reactivation of Non-functional Luminaires in the Existing Arrangement

The process of reactivating non-functional luminaires was examined on a building-specific basis using the Enscape software. The evaluations revealed that no non-functional luminaires were found in buildings such as Galata Tower, Bereketzade Ali Efendi mosque, Austrian Hospital, British Hospital, and Sen Piyer Church. Therefore, no improvements were deemed necessary for the existing lighting arrangements in these structures. In the case of British Post Office, reactivating the pendant luminaire above the door visually emphasized the entrance, partially enhancing its visibility. However, as the rear area was already adequately illuminated by the existing lighting on the columns, the emphasis on the entrance was achieved primarily through visual impact. Reactivating the non-functional linear lighting elements on the facade of İşbank contributed to the visual integrity of the facade and facilitated a clearer perception of the design by users. Additionally, activating the linear luminaires behind the window railings resulted in a noticeable increase in the overall luminance of the facade. Regarding the Salt Galata facade, reactivating the non-functional linear and spot light sources partially improved visual integrity. However, these adjustments did not fully resolve the lighting design deficiencies. Some elements of the facade remained in darkness, negatively impacting the building's perception and giving the impression that the design lacked cohesion. These evaluations demonstrate that reactivating non-functional luminaires has yielded positive visual and functional effects in certain buildings. However, it is also clear that some areas require more comprehensive attention. This underscores the importance of lighting design is not only technically functional but also optimized to address aesthetics and user experience holistically.

7.2 Developed Lighting Schemes

Similar to the process of improving the existing lighting arrangement, the development of alternative lighting designs was also addressed on a building-by-building basis within a digital environment. In this process, design proposals were created with careful consideration of each building's architectural features, historical and cultural significance, environmental context, and functional requirements. The primary objectives of the developed proposals were to enhance the perception of spaces at night, emphasize architectural details, improve user safety and comfort, and preserve the cultural heritage of historic structures. For some buildings, a single alternative proposal was presented, while for others, multiple design alternatives were developed. In addition to the buildings, alternative lighting designs were proposed for Camekan Street, a pedestrian pathway, and the square surrounding Galata Tower. Camekan Street was identified as a crucial connection point for users accessing Galata Tower, and alternative solutions were proposed to address both the aesthetic and functional aspects of street lighting. Particular attention was given to reducing the visual confusion caused by the existing lighting arrangement and improving the user experience. For Galata Tower Square, a dynamic lighting approach was adopted to enhance both the aesthetic and functional value of the square. In this context, a flexible lighting arrangement was proposed, which could be activated during specific periods and deactivated when necessary. The proposed design aims to increase the square's visual appeal while also enriching spatial perception and user experience. The presented alternatives were designed to ensure the perceptual integrity of the spaces, elevate their aesthetic value, and enhance the user experience, offering a practical perspective for implementation. Among the broad spectrum sources, many astronomers recommend using light sources with a colour temperature of approximately 3000 K (CIE, 2014). Accordingly, warm light of nearly 3000 K was chosen in all design alternatives developed. Furthermore, care was taken to ensure that the light did not spill over beyond the targeted building facades, thus avoiding light pollution.

- **Galata Tower:** The facade lighting design of Galata Tower has been revised to address the deficiencies identified in the current arrangement, resulting in a comprehensive and balanced lighting scheme. Initially, a luminaire with wide beam light distribution was employed to prevent the lower portion of the tower from remaining in darkness. In addition to the linear lighting placed in a staggered manner in front of the windows, linear luminairs were integrated into the arch details to minimize shadowing and enhance the visibility of the arches. To avoid possible direct glare from the existing linear luminaires mounted on the balcony railing and to ensure uniform illuminance distribution, additional linear luminaires were incorporated to illuminate the wall surface from above using the wall grazing technique. Furthermore, spotlights were strategically positioned on the ground plane to highlight the columns on the balcony facade, accentuating the architectural details. Upon critical assessment of the current design, it was observed that the absence of luminaires in areas corresponding to the upper windows of the tower created a lack of visual continuity. This issue was addressed by adding light sources in these areas, achieving a more cohesive and harmonious design. A visual representation of the alternative facade lighting design is presented in Figure 5.
- **Bereketzade Ali Efendi Mosque:** The existing lighting design of Bereketzade Ali Efendi Mosque revealed that only the upper section of the minaret was illuminated, while no luminaires were installed on other parts of the mosque. In this context, the accentuation of the minaret was considered a successful design element, and efforts were made to enhance this effect. Initially, the impact of the linear luminaires positioned solely on the balcony section was intensified, and additional linear luminaires were installed on the lower part of the minaret to ensure a more comprehensive perception of the structure. As a result, the minaret became more prominent within its surrounding context. To emphasize the mosque's entrance, it was proposed to position luminaires at ground level, utilizing the wall grazing technique to accentuate the arched entrance. Additionally, spotlights were installed above the interior door canopy to improve the legibility of the entrance. For the facade lighting design, linear luminaires were integrated in front of the mosque's arched windows. This arrangement not only highlights the architectural aesthetics of the window details but also increases the overall luminance of the facade, improving the building's

nighttime visibility. Consequently, the mosque's architectural character was made more distinct, and a holistic approach was adopted in the lighting design (Figure 5).

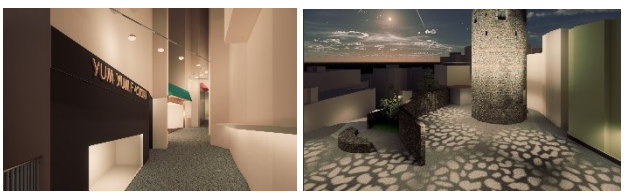
- **British Post Office:** Two distinct facade lighting designs were developed for the British Post Office. In the first design, the existing linear luminaires mounted on the columns were retained, with adjustments made to the luminous flux output and positioning of the luminaires to prevent significant luminance discrepancies. The existing linear luminaires directed at the ceiling in the rear area were deemed unnecessary to enhance the arches. This adjustment resulted in a more accurate emphasis on the building's architectural elements. Additionally, the absence of lighting in the upper sections of the building, which left these areas in darkness, was addressed by adding linear luminaires along the front of the terrace parapet wall, thereby defining the structure's boundaries with light. In the second alternative design, the linear luminaires on the columns were reconfigured not only to accentuate the arches but also to highlight the upper portions of the columns. This approach aimed to make the building's vertical elements more prominent, establishing a distinct visual hierarchy on the facade. Both design proposals seek to reinforce the building's architectural identity and enhance its visibility at night (Figure 5).
- **British Hospital:** The lighting design for British Hospital was developed with a focus on the building's function, prioritizing the comfort and safety of users during evening hours. The primary objectives were to enhance the visibility of the entrances and illuminate the garden. To achieve these goals, appliques were installed along the sections of the garden wall facing the stairs, emphasizing the main entrance and providing illumination for the stairway. The trees within the hospital garden were highlighted using spotlights, accentuating the natural elements visually. Instead of uniformly illuminating the garden, bollard-type luminaires were placed amidst the plants, also serving as path lighting. This design, with light directed from above onto the plants, allows their shadows to be cast on the ground, creating an aesthetically pleasing atmosphere. No additional luminaires were incorporated into the facade of the hospital, except in the entrance area. Spotlights were placed within the niches formed by the arches at the entrance to emphasize the entryway and highlight architectural details. Linear luminaires were integrated into the lower part of the same area to illuminate the stairs, thereby increasing the building's nighttime visibility. This approach aims to meet both visual integrity and user safety requirements while fulfilling the functional and aesthetic needs of the hospital during evening hours (Figure 5).
- **Austrian Hospital:** The lighting design for Austrian Hospital was developed similarly to that of British Hospital, with careful consideration of the hospital's functional requirements. The hospital features two distinct entry points: the main entrance and the emergency entrance. Consequently, the design focused on highlighting both entrances. Architectural elements such as columns, arches, and decorative features at the main entrance were accentuated with luminaires, creating visual focal points. This approach enhanced the entrance's prominence and provided clear directional guidance for users. At the emergency entrance, spotlights were strategically placed beneath the building's overhang to achieve a more uniform illuminance distribution. As a result, the lighting in this area was more uniformly spread, improving safety for users. Furthermore, high luminance contrasts in the existing signage lighting were reduced, leading to a more homogeneous luminance distribution. This design approach reinforced both the functional and aesthetic aspects of the hospital's entry points, enhancing user safety and providing visual guidance during nighttime use (Figure 5).
- **Türkiye İşbank:** Two alternative facade lighting designs were developed for Türkiye İş Bankası. In the first design, the non-functional linear luminaires located in front of the windows were restored to working condition, while the linear luminaires on the walls were removed. To prevent the lower section of the facade from remaining in darkness, a similar lighting arrangement was applied to the windows on the lower part of the facade. Additionally, the appliques and linear luminaires at the entrance were activated to enhance the prominence of these areas. In the second alternative, luminaires optimized for wall grazing technique were placed closer to the wall surfaces, replacing the existing luminaires on the walls. This adjustment improved the overall lighting arrangement. Furthermore, the strategy of illuminating vertical surfaces was extended to the lower part of the facade, with spotlights accentuating the columns in front of the windows. The entrance lighting was designed similarly to the first alternative. The overall goal of the second design was to achieve a more balanced and aesthetically harmonious light distribution, enhancing both the visual coherence of the facade and the quality of the lighting (Figure 5).
- **Salt Galata & Central Bank:** The facade lighting design for the Salt Galata and Central Bank buildings adopts a holistic approach, distinct from the existing lighting condition. This design philosophy emphasizes the building's architectural elements, improving its visibility at night. The lighting focuses on both horizontal and vertical architectural lines, highlighting the windows and columns. Horizontal elements, such as the sills, are accentuated by placing linear luminaires in front of the windows, while the vertical columns are illuminated with spotlights positioned in front of them. This arrangement ensures a balanced illuminance distribution across the facade, enhancing the visibility of architectural details. Additionally, linear luminaires integrated into the horizontal cornice detail above the upper section of the building highlights the top level and defines the structure's boundaries. In areas around the entrance doors, light with a colour temperature of 2700 K is used to emphasize the warmth of the wooden texture, visually distinguishing these areas from the rest of the facade. For the other sections of the building, a colour temperature of 3000 K is preferred to maintain consistency across the lighting design. This approach enhances the building's visual integrity at night, improving both user orientation and aesthetic perception (Figure 5).
- **Sen Piyer Church:** The lighting design for Sen Piyer Church was developed with a focus on improving the visibility and recognition of the church, as well as enhancing the comfort and safety of the surrounding spaces. Linear luminaires were strategically incorporated to illuminate the sign displaying the church's name, making the entrance area more visible from the street. Given the inadequate illumination of the church's courtyard, small

luminaires were installed on the parapet wall of the upper terrace. This not only illuminated the terrace but also improved the overall lighting of the courtyard, enhancing the usability of these spaces during the evening. To highlight the main entrance of the church, indirect-direct luminaires were introduced, creating a welcoming atmosphere. For the other doors, appliques were selected to provide a more homogenous illuminance distribution, ensuring the differentiation of entrances serving different functions. The facade lighting design focused on the upper section of the church, where textural variations were more prominent. Linear luminaires was integrated into this area to accentuate these textural differences, allowing the architectural details to be more visible from the exterior. The overall lighting scheme was designed to establish a balance between aesthetic enhancement and functional coherence, ensuring both visual appeal and comfort for visitors (Figure 5).

- **Pedestrian Paths and Galata Tower Square:** The lighting design for the pedestrian pathways of Camekân Street focuses on elevating the aesthetic quality of street lighting while minimizing light reflections onto the facades. A catenary lighting system has been proposed, with luminaires designed to enhance the overall visual appeal of the street. This approach aims to create a distinct identity for Camekân Street, enhancing the user experience by offering both functionality and visual appeal. Additionally, the system's design allows for the easy integration of decorative elements during special occasions, providing flexibility to adapt the lighting to various events and themes. One of the key issues with the existing lighting arrangement on Camekân Street is the light pollution caused by the varying colour temperatures of the light sources used on the facades of different shops. To address this problem, the design proposes a uniform colour temperature across all shop facades, ensuring consistency throughout the street. In addition, to reduce high luminances, the luminous flux output of the luminaires has been carefully controlled, with specific attention to illuminance and its distribution. This meticulous control improves visual comfort and enhances nighttime visibility while maintaining the aesthetic quality of the street. As a result, the proposed lighting design creates a cohesive, balanced, and high-quality lighting environment, enhancing the overall atmosphere and user experience on Camekân Street (Figure 5).
  The lighting design for the square surrounding Galata Tower takes into account the scale of the area and the presence of numerous historical buildings, necessitating a solution that enhances the space while respecting its historical context. Traditional road lighting methods are not suitable for the square's scale and character, so an alternative approach was developed using projectors integrated into existing lighting poles to create a gobo lighting effect. The gobo system employs specially designed light templates to project various patterns onto the ground, adding visual dynamism and highlighting specific areas within the square. These projectors are programmable, allowing the lighting scheme to be customized for different uses. On special occasions and events, more striking patterns can be projected, while simpler, more subtle patterns can be used during regular hours, creating a light composition that complements the square's overall ambiance. This design provides both aesthetic and functional benefits, supporting the square’s nighttime use and adding a contemporary lighting feature that blends with the historical surroundings. The Gobo projectors also allow for flexibility, enabling the creation of different atmospheres at various times, thus enhancing the pedestrian experience and elevating the square's visual identity. In this way, lighting becomes an integral design element that reinforces the space's spatial and historical character, offering diversity and spatial flexibility throughout the day and night (Figure 5).

Galata Tower | British Post Office | Bereketzade Ali Efendi Mosque | British Hospital

Austrian Hospital | Türkiye İşbank | Salt Galata & Central Bank | Sen Piyer Church



Camekan Street | Galata Tower Square

Figure 5. Examples of the Developed Lighting Designs

8. Conclusion

The lighting of historical environments plays a pivotal role in enhancing the urban fabric and ensuring the visibility of urban identity, even during nighttime. Lighting design goes beyond its functional requirements, becoming a key element in highlighting cultural heritage, strengthening spatial perception, and allowing for the exploration of historical sites after dark. However, lighting such areas requires careful consideration of the architectural, historical, and cultural attributes of the region. Instead of conceptualizing lighting solely for individual structures, it should address the squares, streets, and buildings as an integrated whole. This approach is crucial for achieving spatial cohesion and balanced visual harmony. This study focuses on one of Türkiye's most iconic cultural landmarks, Galata Tower, and its surrounding area. It aims to comprehensively analyze the current lighting arrangement, evaluate it using three-dimensional computer modeling, and propose recommendations for enhancing the lighting design of the area. The primary goal is to develop a sustainable lighting solution that accentuates the historical identity of the region while improving user comfort and spatial perception.

In this context, the proposed lighting design decisions are outlined under the following categories:

- In planning the facade lighting of a historical building, consideration should be given to its architectural style, form, material texture, and decorative elements to create an appropriate lighting arrangement.
- In historical areas that require preservation, the lighting design should be approached in a way that maintains spatial integrity, ensuring that no urban element is evaluated in isolation. The lighting interventions in such areas must align with the historical and cultural context, which is important both aesthetically and functionally. Therefore, it is essential to use lighting elements that integrate with the historical fabric of streets, squares, and buildings.
- When illuminating historical buildings, warm or neutral light colour should be chosen to preserve the ambiance of the space and best highlight the building's texture. The use of multiple light colours within the visual field should be avoided, as this can disrupt spatial perception. This approach ensures consistency in the nighttime perception of the historical environment, thus improving visual comfort.
- The lighting of historical areas is significant not only for the residents but also for the overall appearance and identity of the city. Lighting design can directly impact the urban silhouette by shaping the nighttime perception of surrounding buildings. Consequently, when planning the lighting of historical areas, both the visual contribution to the city as a whole and the needs of local users must be considered.

The design proposals developed in this study aim to provide lighting solutions that are both aesthetically harmonious and functionally suitable, aligned with the architectural characteristics and functions of the buildings. The improvement proposals implemented in the Galata District serve as a practical guide for urban beautification processes, offering design principles and approaches that can be applied to similar historical areas. In this way, effective lighting solutions have been developed to enhance the visibility and promotion of historical sites.

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