

Research on The Emotional Experience of Architectural Apace For Users: A Case Study of Cologne Cathedral

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Abstract. With the continuous development of the construction industry and the increasing demand for quality of life, architectural design needs to consider not only functionality and aesthetics, but also the emotional experience of users. This study aims to explore how architectural space design affects users' emotional experience, and propose corresponding design strategies to enhance the quality of user experience. This article mainly uses literature review and case analysis to select the Cologne Cathedral as a representative, and sorts out the specific manifestations of its architectural space design that affect the emotional experience of users, including color matching and material selection, spatial layout and structural arrangement, design and cultural elements, etc. Based on the above findings, this study proposes a series of strategies to optimize the design of architectural space. The research is structured as follows: First, we review relevant literature to clarify the basic concepts and theoretical foundations of architectural space and emotional experience; Secondly, through case analysis, explore the impact of the architectural space of Cologne Cathedral on users' emotional experience; Thirdly, it proposes strategies and suggestions for architectural space design based on emotional experience. This helps to promote the development of architectural design towards a more humanized and emotional direction. In the future, we will continue to explore more design elements that affect users' emotional experience, and combine emerging technological means to further enhance the emotional value of architectural space.

Keywords: Emotional Experience; Architectural Space; Cologne Cathedral.

1. Introduction

At the intersection of modern architecture and environmental psychology, architectural space is more than just physical structures; it carries emotions, memories, and experiences. Current research has made progress in understanding how architectural space impacts user emotional experience from various angles, including psychology, sociology, and aesthetics. The design, layout, and utilization of architectural space directly affect people's emotions and psychological states.

As a prime example of European Gothic architecture, Cologne Cathedral symbolizes religion and offers spiritual sustenance and emotional resonance for many. Its grand form and detailed decorations create an extraordinary atmosphere, providing a profound emotional experience for visitors. By analyzing Cologne Cathedral, we aim to uncover the connection between architectural space design and human emotions, offering theoretical foundations and practical guidance for creating emotionally rich spaces.

This research focuses on: the following aspects: firstly, analyzing the influence of architectural spatial form and layout on individual emotions; secondly, exploring the role of materials and colors in emotional experiences; thirdly, examining how the overall atmosphere of architecture regulates the impact of the above factors on emotions in the context of social and cultural background.

Through literature review and case analysis, this study constructs a theoretical framework centered on Cologne Cathedral through literature review and case analysis. Our goal is to deepen the understanding of the interaction mechanism between architectural space and human emotions, promoting more humane and emotional architectural design. This exploration not only enriches the theoretical system of architectural design but also provides targeted guidance for architects to meet growing spiritual needs.



2. Basic Concepts

2.1. Architectural Space

Architectural space encompasses both the internal and external areas formed by various architectural elements, designed to meet production or living needs.

Internal spaces are typically enclosed by walls, floors, roofs, doors, and windows, creating an environment for human use. External spaces highlight the relationship between buildings and their surroundings, often emphasizing harmony with nature. Based on use, spaces can be categorized into public, semi-public, semi-private, and private. Churches, for instance, are public spaces open to all. By boundary type, they range from enclosed (warehouses) to semi-enclosed (Savoy villas), semi-open (balconies), and open (squares). Structurally, there are single and composite spaces. Spatially, dynamic spaces guide movement, while static spaces facilitate display and observation.

Styles vary widely—Gothic, Baroque, Rococo, Renaissance, modernist, postmodern—each reflecting historical periods and cultural aesthetics. Gothic architecture, emerging in France during the 12th to 15th centuries, is known for its tall spires, monumental scale, intricate decorations, cross arches, slender columns, and innovative frame structures that allow soaring roofs and majestic appearances.

The Cologne Cathedral epitomizes these features with its Gothic style, spatial ingenuity, and rich decorative arts, becoming a global landmark and a testament to human architectural achievement, enriching emotional experiences for visitors. This exploration holds significant implications for enhancing the emotional impact of architectural spaces in contemporary design.

2.2. Emotional Experience of Users

Marc Hassenzahl's concept of user emotional experience is rooted in emotional evaluation theory, suggesting that emotions arise from the satisfaction or fulfillment of users' psychological needs or goals, leading to positive or negative feelings. In architectural spaces, this specifically refers to the emotional and psychological responses elicited during user interaction with these spaces.

Architecture, as a tangible manifestation of human creativity and cultural expression, plays a pivotal role in inspiring emotional experiences that resonate with individuals at sound levels [1].

Firstly, design elements like color, material, and lighting can evoke emotional resonance; for instance, warm tones and soft materials create a cozy atmosphere, inducing relaxation and happiness. For example, public parks, as oases in the concrete desert of urban environments, evoke a wide range of emotional responses from their visitors, highlighting the emotional interplay between people and place [2]. Secondly, architectural designs can express personal or political viewpoints through deconstruction or radicalization techniques, directing users' emotional responses. Rem Koolhaas' exploration of territorial boundaries and ideological themes in his graduation project exemplifies this approach. Lastly, unique sensory experiences crafted through architecture—visual, auditory, and tactile—facilitate profound emotional memories, which deepen over time, becoming distinctive experiences associated with the space.

Assessing these emotional experiences involves physiological signal detection, subjective questionnaires, behavioral observation, and virtual reality technology. Analyzing exemplary architectural works globally allows exploration of the relationship between spatial form and emotional experience, enabling the distillation of universal design principles and methods applicable in practice.

2.3. Connection between Architectural Space and Users' Emotional Experience

Architectural space serves both material and spiritual functions, addressing cultural, psychological, and emotional needs by creating suitable indoor environments that provide aesthetic enjoyment and satisfy spiritual pursuits. A key aspect is offering a positive emotional experience through sensory

and spiritual stimulation, fostering memorable interactions. Technological advancements have enhanced the interactivity between spaces and users.

Conversely, user emotions significantly impact architectural design, prompting a "people-oriented" approach that focuses on fulfilling psychological and physiological needs to evoke emotional responses. This interaction involves people, emotions, and space. Designers must deeply understand spatial concepts and exhibit boundless creativity to create not only functional but also artistically and culturally rich spaces. Through comprehensive research and user engagement—surveys, interviews, or workshops—designers can craft architecture that meets practical needs and resonates emotionally with users, reflecting their input in the final outcomes.

3. Elements Affecting Users' Emotional Experience in Cologne Cathedral

3.1. Materials and Colors

Color, lighting, spatial arrangement, and material selection are key elements in interior design that can evoke specific emotions and moods, ranging from calmness and relaxation to stimulation and energy [3]. Cologne Cathedral's main structure is built from polished stones, with over 400,000 tons used, meticulously selected and processed to ensure stability and aesthetics. The gray stone color conveys calmness and solemnity, aligning with the church's religious atmosphere and enhancing its Gothic architectural style. Rich textures and color variations are achieved through different materials and shadow play on the exterior walls. The interplay between form, space, and light in architecture creates environments that can evoke a range of emotional responses from tension to excitement [4].



Figure 1. The glass windows. Ludwig fan (2024) Xiaohongshu [5]

The cathedral's stained glass windows like being shown in Figure 1, themed around biblical stories and known as "Gothic glass window treasures", utilize bright colors and intricate patterns to create unique light effects, enhancing spatial dimensions and vividness. Interior lighting is designed to vary with sunlight angles, casting colorful shadows that intensify the sacred atmosphere of the dimly lit Gothic interiors, immersing visitors in a profound emotional experience.

3.2. Form and Layout

Cologne Cathedral, a quintessential Gothic structure with soaring spires, pointed arches, flying buttresses, and slender columns, integrates unique German elements. Its symmetrical design—evident in both facade and floor plan—aligns with Gothic aesthetics and religious ideals of perfection and sanctity. The "basilica" layout, featuring a central nave flanked by side chapels and an altar-facing three-aisle scheme, enhances spatial hierarchy and fluidity, fostering a solemn yet vibrant atmosphere for worshippers. The cathedral's upward extension strategy, highlighted by its nearly identical 157-meter spires, amplifies its visual grandeur and spiritual aspiration. These towering elements evoke a sense of reaching towards the divine, offering visitors a transcendent emotional

journey, which can be seen in Figure 2. With a nave height of 48 meters, the interior exudes an imposing verticality, instilling awe and sacredness.



Figure 2. The exterior of Cologne Cathedral. Yingzhixingyu (2018) [6]

3.3. Elements and Atmosphere

The emotional significance of architectural spaces is often rooted in cultural narratives and symbolic meanings, which can deepen the emotional connections people have with their surroundings [7]. Rich in decorative arts—sculptures, murals, stained glass—Cologne Cathedral elevates its artistic and visual appeal. Flying buttresses not only support its massive walls and roof but also embellish the building's exterior. Inside, intricately carved capitals, arches, and reliefs demonstrate medieval craftsmanship, while numerous sculptures and murals, particularly at the entrance, convey deep religious sentiment (Figure 3).

These cultural narratives and symbols deepen emotional connections to the space. Stained glass windows illustrating biblical tales enrich the church's aesthetics and impart Christian teachings, resonating emotionally with visitors and reflecting European cultural identity.

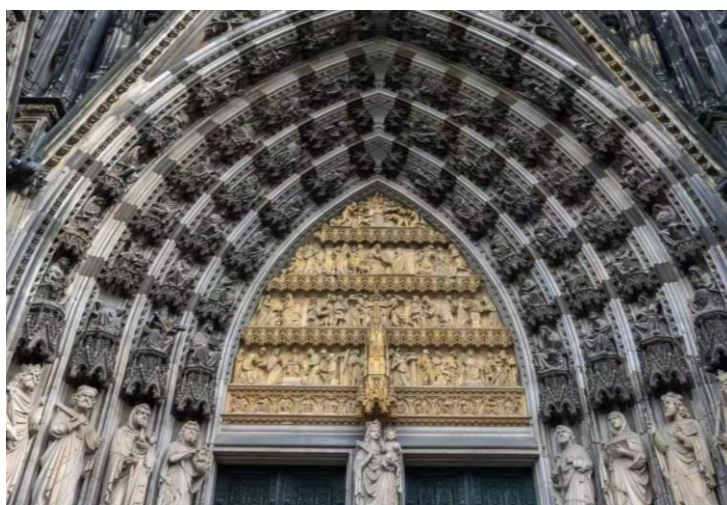


Figure 3. The exterior of Cologne Cathedral. Yingzhixingyu (2018) [8]

The overall design cultivates a sacred ambiance; the tranquil, holy interior bathed in soft, colored light induces feelings of peace and spiritual cleansing. This profound emotional impact underscores the enduring significance of religious architecture and sentiment in contemporary design.

4. Inspiration for Architectural Space Design Based on Enhancing User's Emotional Experience

4.1. Promoting the Development of Interactive Behavior

Color and material are important factors in shaping spatial atmosphere. On the one hand, by selecting appropriate colors and materials, different spatial atmospheres can be created, which directly affect people's emotional states and form unique emotional memories of the space.

There is also the sound environment. Environmental soundscapes within architectural spaces significantly influencing emotional responses, with natural and ambient sounds often evoking a sense of calm and relaxation [9]. For example, using warm tones can create a comfortable and cozy atmosphere; while cool tones may bring a refreshing and serene ambiance.

The tactile sensation of various materials can also offer users distinct experiences. Material choices in architecture can converge cultural values and identities, influence social cohesion and the sense of belonging among community members [10]. For example, wood gives a warm and welcoming feeling, while metal appears modern and cold.

On the other hand, light and shadow are important means of shaping spatial emotions. Through clever lighting design and layout, rich light and shadow effects can be created, enhancing the sense of hierarchy and three dimensionality of the space. At the same time, changes in light and shadow can also affect people's emotional states, such as soft lighting that can make people feel relaxed and comfortable, while strong lighting may make people feel nervous and uneasy. Therefore, in architectural space design, the creation of light and shadow effects should be fully considered to shape unique emotional memories. The design of elements such as color changes, spatial structure, and material texture can attract people's attention.

In addition, in modern architectural space design, modern and diverse interactive methods can be realized to fully mobilize people's sensory experience. With the development of technology, the application of virtual reality (VR) and augmented reality (AR) technology enables users to have deeper interactions with buildings, increasing their sense of participation and fun in the space. Intelligent systems and technological means, such as human-computer interaction interfaces, can enhance the interactivity of building spaces. These technologies can guide users according to their needs, allowing them to operate more conveniently and quickly.

4.2. Emphasize the Expression of Theme Intention

At the beginning of the design, architects need to establish a clear and unique theme based on the characteristics and needs of the project. This theme should run through the entire design process and become the core guiding all subsequent design decisions, in order to form a unique and distinctive architectural style, become the tone of the entire architectural design, and bring users a unique visual experience.

By carefully planning the spatial layout, the theme is integrated into every corner of the space. For example, in the design of a library, the theme of knowledge dissemination can be reflected through the arrangement of bookshelves and the setting of reading areas. While emphasizing the theme, the basic functional requirements of the space cannot be ignored.

Designers need to cleverly integrate themes while meeting the actual usage needs of users. Spatial arrangement and the organization of space are crucial for emotional experiences, with open layouts promoting freedom and flexibility, where enclosed spaces may enhance focus and imagination [11]. Reasonable spatial layout can guide people's vision and action paths, making them feel comfortable and smooth in space.

For example, by setting spacious passages, reasonable functional zoning, and comfortable rest areas, people can feel convenient and comfortable during use. With the development of the times, innovative design techniques are used to present architectural styles in novel ways, which not only meet

functional needs but also bring unexpected surprises and experiences to users. Unique architectural forms and structural designs can attract people's attention, stimulate their imagination and curiosity. This visual impact often leaves a deep impression on users.

In summary, architectural space design enhances user experience by clearly expressing architectural style. Architects need to constantly explore and innovate in the design process, closely integrating style with space, function, sensory experience, and sustainable development, to create architectural spaces that are both profound and characteristic of the times.

4.3. Promote the Formation of Emotional Memory

Cologne Cathedral serves as a prime example of how historical and cultural context shapes architectural experiences, influencing visitor emotions and behaviors [12]. The design of architectural spaces increasingly emphasizes emotionalization, aiming to create human emotions through space. This design philosophy holds that architecture is not only a display of technology and aesthetics, but also a reflection of culture and national spirit, which can evoke emotional resonance among users. Detail decoration is the key to improving the quality of space.

Through exquisite decorative elements such as carvings, murals, artworks, etc., the artistic and ornamental value of the space can be increased. These detailed decorations not only enrich the visual effect of the space, but also subtly trigger emotional resonance in people's details, thereby deepening tourists' subconscious emotional memory of the space. Endowing architectural cultural connotations is also an important means of stimulating users' emotions.

Each architectural space has its unique historical and cultural background, and the overall cultural atmosphere of the building often contains rich cultural connotations and historical backgrounds. By telling the stories behind it, people can increase their memory, emotional investment, and sense of identity towards the space. Understanding the interplay between environment, self, and action necessitates a holistic approach that takes into account both objective environmental features and subject experiences [13].

By delving deeper and expressing, designers can touch users' emotions, resonate with them in the space, and enhance the overall quality of the experience. For example, places like churches can introduce people to the historical evolution and cultural connotations of buildings through setting up explanatory signs, holding exhibitions, and other methods, so that they can develop emotional memories of the space during their visit.

5. Conclusion

Studies have shown that factors such as the openness and enclosure of space, the cool and warm tones of colors, the brightness and darkness of lighting, and the texture of materials have a significant impact on users' emotional experience.

Gothic architecture, represented by Cologne Cathedral, offers visitors a multi-layered emotional experience, ranging from nobility and sacredness to shock and power, to emotional resonance and spiritual inspiration, and ultimately to exploration of history and culture. These attributes make Gothic architecture not only an architectural style, but also an art form capable of touching people's hearts and inspiring thought, thus providing fresh insights into the relationship between architectural space and user emotional experience.

Architectural designers can begin by fostering interactive behavior, emphasizing the expression of thematic intentions, and facilitating the formation of emotional memories. By carefully planning the spatial layout to balance openness and privacy, utilizing color psychology principles for color matching, adopting multi-level lighting design to cater to various scene needs, and opting for environmentally friendly and sustainable materials, among other meticulous designs, they can create more humanized and emotionally resonant architectural spaces and enhance user emotional experiences.

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