



The Impact of Moroccan Architectural Elements on Hotel Guest Satisfaction: A Sentiment Analysis of *Tripadvisor* Reviews in Marrakesh

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Abstract. Traditional Moroccan architectural elements are extensively incorporated into the design of hotels in Marrakesh, yet their aesthetic impact within modern tourist accommodations remains largely unquantified in a systematic manner. This investigation examines the influence of Moroccan architectural elements on the emotional responses of tourists, specifically analyzing hotel reviews in Marrakesh. By utilizing text mining and econometric regression methodologies on a dataset of 8,689 *Tripadvisor* reviews, this study investigates the correlation between architectural aesthetics and tourists' emotional experiences. The research encompasses keyword identification and sentiment analysis, employing VADER tools to quantify emotional tendencies in user reviews. It further quantifies the relationship between architectural features and sentiment scores through Ordinary Least Squares Regression. Findings reveal that reviews containing key Moroccan architectural terms such as “riad,” “arch,” and “courtyard” are associated with significantly higher emotional scores than those without such references, suggesting that Moroccan architectural elements considerably evoke positive emotional responses. Even after accounting for confounding variables such as service quality and cleanliness, cultural keywords maintain a significant positive impact on emotional scores, indicating that cultural elements enhance overall evaluations via emotional pathways. This study broadens the comprehension of the interplay between architectural space and emotional experience, elucidating how cultural design influences tourist evaluation behavior through emotional mechanisms. The results not only furnish empirical insights for culturally-driven hotel space design but also contribute theoretically to the domains of cross-cultural design, emotional space, and tourism perception research.

Keywords: Moroccan Architecture, Tourist Emotion, Sentiment Analysis, Cultural Elements, Hotel Design.

1 Introduction

As a fundamental pillar of Morocco's economy, the tourism sector has exhibited a robust recovery following the COVID-19 pandemic. According to data disseminated by the *Moroccan National Tourism Office* in December 2024, the tourism industry has

achieved unprecedented revenue levels, amounting to 9.2 billion euros in 2024, indicative of a strong developmental trajectory [1]. This resurgence has been propelled by supportive policies and strategic initiatives, positioning Morocco as an increasingly attractive destination for international tourists. Within the tourism value chain, the hotel industry serves as a pivotal component, offering accommodations, dining, and cultural entertainment, thereby playing a crucial role in shaping the tourist experience. The hotel sector in Morocco is experiencing dynamic growth. Based on statistics from the Tourism Office, as of July 2024, there are 4,742 classified hotels nationwide, with 471 new establishments added over a four-year period, reflecting an 8% growth [2]. From unique and popular homestays to economical chain hotels, and prestigious international brands such as Royal Mansur, Four Seasons, and Marriott, hotels in Morocco widely incorporate Islamic architectural styles and Berber cultural elements in their design, creating a distinct and identifiable aesthetic system. The cultural significance and aesthetic value of these elements render them ideal subjects for examining the influence of architectural space on tourists' emotional experiences and cognitive appraisals.

Although existing literature has extensively examined the historical evolution and cultural symbolism of traditional Moroccan architectural styles, and tourism research has addressed cultural tourism and urban image construction, three research gaps persist: firstly, an empirical analysis of the impact mechanism of architectural aesthetics on tourists' emotional expression in textual form is lacking; secondly, the integration of natural language processing techniques with architectural feature analysis remains underexplored; thirdly, the aesthetic impact of traditional Moroccan architectural elements in contemporary tourist hotels has not been systematically quantified. In the context of the growing emphasis on "sense of place" and "cultural embedding" in global tourism, investigating how these architectural symbols, imbued with cultural memories, influence tourists' emotional perception and evaluative behavior in modern hotel environments holds significant theoretical and practical value.

This study selects hotels in Marrakesh, one of Morocco's four major imperial cities, as its focus, owing to its well-established tourism infrastructure and rich cultural resources. An analytical model is proposed to leverage online review texts, and systematically explore the influence of traditional Moroccan architectural elements on tourists' emotional responses within hotel spaces in Marrakesh. Utilizing the *Tripadvisor* online platform, this research encompasses 8,689 English-language reviews from the past five years, sampled from three hotels categorized by star ratings: 3-star, 4-star, and 5-star. By employing keyword identification to detect manifestations of Moroccan architectural elements, in conjunction with VADER sentiment analysis, and Ordinary Least Squares (OLS) Regression, the study quantifies the relationship between architectural features and tourist emotions and evaluations. The research empirically substantiates the positive impact of Moroccan architectural aesthetics on enhancing hotel guests' emotional experiences, while also extending the theoretical connections among tourism space, emotional experience, and cultural identity. The findings provide empirical evidence and policy insights pertinent to cross-cultural hotel design practices.

2 Literature Review

2.1 Architectural Aesthetics and Tourist Experience

The theory of Sensory Experience postulates that architecture should engage multiple senses, facilitating emotional responses through the strategic use of materials, manipulation of light and shadow, and thoughtful spatial arrangement [3]. For instance, biophilic architectural elements can induce aesthetic pleasure and relaxation by incorporating direct features such as water elements or natural motifs like foliage and floral patterns, or by designing spaces that symbolically evoke natural environments [4]. The integration of fractal geometry within architectural design can augment spatial complexity and perceived order [5]. Empirical research indicates that spatial geometric characteristics—including prominence, curvature, proportion, and scale—exercise considerable influence over the emotional states of individuals. Expansive, symmetrical spaces are generally associated with positive emotional responses, whereas confined or disproportionately designed spaces may provoke negative reactions [6]. A study examining the impact of “narrative interior design” on the occupancy rates of low-star heritage hotels in the historic district of Amman, Jordan, surveyed 280 tourists, revealing that 34.6% declined to stay due to “inadequate internal design of the hotel” [7]. These findings underscore the substantial impact of architectural design on the emotional responses and experiences of tourists.

2.2 Cultural Characteristics of Moroccan Architecture

Moroccan architecture embodies a confluence of diverse cultural influences, including Arabic, Berber, and Islamic elements, reflecting the unique architectural artistry of both Africa and the Arab world, and is imbued with profound symbolic and aesthetic significance. The Berber architectural style predominantly utilizes natural materials such as stone and mud bricks, emphasizing harmony with the natural environment, and is frequently observed in Morocco’s rural and mountainous regions [8]. The Islamic architectural style is distinguished by the use of geometric patterns, Arabic calligraphy, and botanical motifs, and is predominantly featured in mosques, palaces, and courtyards [9]. The Spanish Moorish style, which has its origins in the Andalusian region, is noted for its horseshoe arches, intricately carved wooden ceilings, and Zellige ceramic tiles [10]. Table 1 provides a synthesis of the five most prevalent literary elements that are likely to evoke tourist perceptions or emotional responses.

Table 1. Five types of architectural elements and their possible emotional effects.

Architectural elements	Feature description	Tourist perception keywords
Zellige	Composed of manually cut small colored ceramic tiles pieced together to form complex geometric patterns, commonly found in wall, floor, and fountain decorations.	exquisite, traditional, cultural, visually pleasing

Architectural elements	Feature description	Tourist perception keywords
Riad	A four enclosed residential building with a fountain and plants in the center, emphasizing symmetry and introversion, commonly used in the renovation of boutique hotels.	private, quiet, natural, healing, relaxing
Mashrabiya	Hollow carved wooden lattice windows provide both shade and ventilation, with a strong sense of visual rhythm, often found in window and corridor areas.	elegant, exquisite, mysterious, and exotic
Horseshoe arch	Arches that are wide at the top and narrow at the bottom, with full curves, create a sense of spatial extension and ceremony, commonly used in doorways and corridors.	smooth, open, sacred, culturally embedded
Dome and hollow decoration	Mostly used for the ceilings of mosques or palaces, paired with intricate carvings and geometric patterns, emphasizing a sense of vertical space.	solemn, grand, awe inspiring, meticulously crafted

It is important to acknowledge that existing research on traditional Moroccan architectural elements predominantly focuses on historical, architectural, and cultural heritage perspectives, exploring their historical origins, the evolution of architectural styles, and their cultural symbolic significance. These studies largely emphasize the formal characteristics, functional significance, and links to Islamic art within traditional Moroccan architecture. However, there is a discernible paucity of quantitative analysis centered on tourist experiences, particularly concerning the quantitative investigation of the emotional dimensions of architectural elements in the context of contemporary hotel design.

2.3 Online Comments and Sentiment Analysis

In recent years, natural language processing techniques such as sentiment analysis and keyword extraction have gained prominence in tourism research. These methodologies enable the automatic identification of positive or negative sentiments expressed in tourist reviews and facilitate the discovery of key determinants influencing tourist satisfaction [11]. By applying sentiment analysis to online comment data, researchers can distill the core factors impacting tourists’ overall evaluations through their emotional responses.

However, the extant body of research on online hotel reviews predominantly concentrates on aspects such as service quality and customer service, with limited examination of the direct relationship between architectural aesthetics and review sentiments. Despite the significance of architectural design in shaping the tourism experience, its potential influence on tourists’ emotions and satisfaction has not been thoroughly investigated. This study seeks to address this gap by employing data-driven sentiment analysis and regression models to extract emotional responses from tourist evaluations and to quantify the impact of Moroccan architectural elements on tourists’ emotional dispositions.

3 Research Methodology

The investigation employs a tripartite methodological framework, integrating keyword recognition, sentiment analysis, and statistical modeling, to develop an analytical construct termed “architectural features - emotional perception - tourist experience.” This framework seeks to quantitatively assess the influence of Moroccan architectural elements on the emotional responses of tourists.

3.1 Data Acquisition

The *Tripadvisor* online platform has greatly facilitated the digital transformation of tourism, as evidenced by the pivotal role that online reviews play in hotel digital marketing, the comprehension of tourist behavior, and the shaping of travel decisions [12]. For the purposes of this study, a dataset of 8,689 English-language user reviews from the Marrakesh region was extracted from *Tripadvisor*, spanning a five-year period, via Python-based web scraping techniques. The dataset encompasses reviews from nine hotels. Among these, three hotels representing Moroccan architectural elements from each star category (3-star, 4-star, 5-star) were randomly selected based on visual analysis of real-life hotel imagery available on the platform. This selection ensures a diverse representation in terms of pricing and service quality. Each review includes an overall user rating (ranging from 1 to 5 stars), optional six-dimensional ratings (covering aspects such as location, cost-effectiveness, cleanliness, service, sleep quality, and room), along with user-generated free text content.

3.2 Keyword Identification

To investigate the emotional and aesthetic impacts of Moroccan architectural motifs in hotel design, this study initially categorizes and summarizes prevalent design elements typical of traditional Moroccan architecture that are commonly featured in hotel designs. Drawing from an on-site examination of images and reviews pertaining to local hotels in Marrakesh, four quintessential architectural elements are selected as keywords, forming an inaugural keyword library. These elements encapsulate the artistic allure and cultural symbolism inherent in Moroccan architecture and potentially influence tourists’ visual enjoyment, spatial perception, and cultural immersion. Table 2 provides an overview of the initial keyword library, which comprises four categories of vocabulary associated with Moroccan architectural characteristics.

Table 2. Descriptive statistical results.

Category	Keywords
Structural	riad, riads, courtyard, courtyards
Decoration	mosaic, tiles, arch, arches, handiwork, decorated
Ambiance	tranquility, peaceful, intimate, authentic
Cultural/Traditional	Moroccan, Arabic, artisanal, traditional

Each review is systematically scanned to determine the presence of the identified keywords. A binary variable is subsequently generated for each review (i.e., a value of 1 is assigned if the keyword is present, otherwise 0). Furthermore, the frequency of each keyword’s occurrence is meticulously documented for subsequent analytical processes. Figure 1 illustrates the occurrence frequency and ranking of these keywords across all reviews, with the term “riad” emerging as the most frequently mentioned, noted nearly one thousand times.

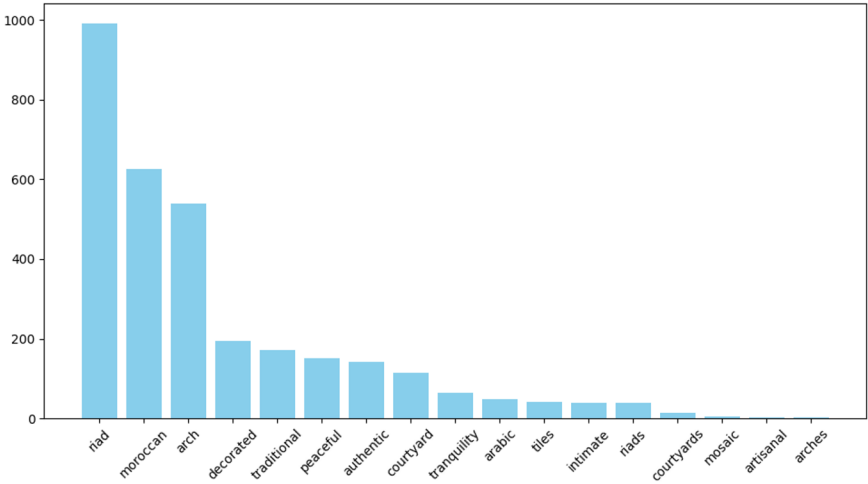


Fig. 1. Frequency statistics of Moroccan architectural elements keywords in hotel reviews.

3.3 Sentiment Analysis

In the realm of natural language processing (NLP), sentiment analysis can be implemented using various methodologies, including rule-based approaches relying on dictionaries (such as VADER), pre-trained language models (such as BERT), and commercial Application Programming Interfaces (APIs) like Google Cloud NLP [13].

This study employs the VADER sentiment analysis tool provided by the NLTK toolkit in Python to quantify emotional tendencies in user-generated comments. VADER is particularly adept at detecting sentiment in English, especially within the context of social media and online comments. The analysis yields a composite sentiment score for each comment, ranging from -1 (indicative of extreme negativity) to +1 (indicative of extreme positivity), thus serving as a metric for emotional inclination [14]. The advantages of utilizing this method include: (1) the absence of a requirement for training data, allowing for immediate deployment; (2) a robust capability to handle non-standard texts, such as emoticons, abbreviations, and emphasized words; (3) effectiveness in processing negations and modifiers (e.g., “not good” and “very happy”), with the emotional scores being adjusted through explicit rules. Empirical evidence suggests that VADER surpasses manual annotation in the accuracy of analyzing short texts, such as those found on *Twitter* and in product reviews, while incurring significantly lower expenses (Ibid).

3.4 Statistical Modeling

To investigate the relationship between keywords related to Moroccan architecture and positive sentiment expressed in reviews, this research employs Ordinary Least Squares (OLS) Regression, using sentiment scores as the dependent variable. This approach enables an analysis of the impact of keyword frequency and six-dimensional scores on sentiment disposition, and examines whether architectural keywords correlate with elevated sentiment scores. OLS regression is extensively utilized to scrutinize linear relationships between variables. Through this methodological framework, the study quantifies the effect of architectural elements on sentiment scores, thereby elucidating their relationship with tourist satisfaction [15].

4 Research Results and Analysis

4.1 Descriptive Analysis

In order to conduct an initial investigation into the influence of Moroccan architectural terminology on the emotional tone of user comments, this study divides the data into two categories based on the binary variable of whether keywords were included: reviews containing specific architectural keywords (26.14%) and those without such keywords (73.86%). The mean sentiment scores for these two categories were computed, revealing that comments group with keywords (N=2271) has an average sentiment score of 0.9122, whereas those without keywords (N=6418) averages 0.8494.

This preliminary analysis suggests that, in the absence of other controlling variables, the mention of Moroccan architectural terms within user comments is associated with a more positive emotional inclination. These findings provide foundational insights for subsequent regression analyses and tentatively affirm the positive role of architectural keywords in sentiment expression.

4.2 OLS Regression Analysis

Building upon the descriptive statistical analysis, this study employs the OLS Regression method, analyzing sentiment scores as the dependent variable while treating the number of keywords and service dimension scores as independent variables. The aim is to elucidate the isolated impact of architectural keywords on sentiment. The regression outcomes are presented in Table 3, where the coefficient for the number of keywords ("Keywords_Count") is 0.008, with a p-value of 0.077, indicating statistical significance at the 10% level. This suggests that the inclusion of architectural keywords tends to enhance emotional positivity. Specifically, the detailed ornamentation inherent in Moroccan architecture, with its rich decorative elements, demonstrates high artistic value and exquisite craftsmanship. Such features enable customers to appreciate the unique charm and cultural heritage embodied in the architecture, eliciting admiration and favorable commentary, which is reflected in the comments through more positive keywords and elevated sentiment scores. In contemporary society, there is an increasing inclination towards personalized and unique experiences. The distinctive style and

uniqueness of Moroccan architectural elements cater to this demand, allowing customers to feel individualistic and special during their experience, thereby generating positive emotional responses and comprehensive expression in their comments. Additional significant positive factors include location score (“Location”), cost-effectiveness score (“Value”), cleanliness score (“Cleanliness”), and service score (“Service”), whereas bedroom score (“Rooms”) and sleep quality score (“Sleep_Quality”) do not exhibit a statistically significant effect on sentiment scores.

Table 3. OLS regression results.

Variable	Coefficient	P> t
Keywords_Count	0.008	0.077
Location	0.066	0.000
Value	0.071	0.000
Cleanliness	0.025	0.005
Service	0.176	0.000
Rooms	-0.003	0.718
Sleep_Quality	0.002	0.785

5 Conclusion

This study investigates the influence of Moroccan architectural elements on tourists’ emotional responses by analyzing user reviews of Moroccan hotels, employing text mining and econometric regression methodologies. An examination of 8,689 hotel reviews yields the following key findings: (1) Cultural keywords are associated with significantly enhanced emotional scores. Reviews that feature Moroccan architectural keywords exhibit an average emotional score of 0.912, notably higher than the score of 0.849 for reviews lacking such keywords. This indicates that Moroccan architectural elements elicit a substantial positive emotional response in tourist reviews. (2) OLS regression analysis reveals that, even after controlling for variables such as service quality and cleanliness, cultural keywords still exert a significant positive impact on emotional scores (coefficient=0.008, marginal significance). This finding suggests that cultural elements may enhance overall evaluations via emotional pathways. In sum, Moroccan architectural style, as a cultural-spatial construct, not only augments tourists’ aesthetic satisfaction but also stimulates emotional responses, ultimately leading to positive word-of-mouth endorsements.

The research provides actionable insights for design and communication strategies in Morocco and similar cultural tourism destinations. The concept of “culture-driven emotions” is shown to play a pivotal role in tourism marketing, offering valuable implications for brand strategies within the hotel industry. For instance, hoteliers may consider integrating cultural elements more deeply into their design ethos, encourage tourists to incorporate these cultural elements in their reviews by utilizing specific keywords on online travel agency platforms and social media, thereby fostering “user collaborative marketing.”

However, it must be acknowledged that this study presents preliminary model with certain limitations. For instance, the reliance on text sentiment analysis tools introduces potential inaccuracies. Additionally, the static definition of keywords necessitates future research employing dynamic cultural content identification via deep learning techniques. Future investigations could also extend to comparative studies of varied cultural styles or further examine the impact of “cultural emotions” on long-term loyalty and brand preference.

References

1. *The Maghreb Times*: Morocco Sets Tourism Attendance Records in 2024. <https://themaghrebtimes.com/morocco-sets-tourism-attendance-records-in-2024/> (2024).
2. Froyd, J. N.: Hotel Investment in Morocco Increases. *Tourism Review News*. <https://www.tourism-review.com/morocco-expects-increased-hotel-investment-news14552> (2024).
3. Delaqua, V.: Sensory Design: Architecture for a Full Spectrum of Senses. *ArchDaily*. <https://www.archdaily.com/969493/sensory-design-architecture-for-a-full-spectrum-of-senses> (2023).
4. Joye, Y.: Architectural Lessons From Environmental Psychology: The Case of Biophilic Architecture. *Review of General Psychology* 11(4), 305-328 (2007).
5. Kaur, M. D.: The Art and Science of Fractal Geometry in Architecture. *Cindrebay*. <https://blog.cindrebay.com/the-art-and-science-of-fractal-geometry-in-architecture/> (2024).
6. Shemesh, A., Leisman, G., Bar, M., Grobman, Y. J.: The emotional influence of different geometries in virtual spaces: A neurocognitive examination. *Journal of Environmental Psychology* 81, 101802 (2022).
7. Fahmawee, E., Jawabreh, O. A. A.: Narrative architectural interior design as a new trend to enhance the occupancy rate of low-class heritage hotels. *New Design Ideas* 6(2), 207-228 (2022).
8. Bernasek, L.: *Artistry of the everyday: beauty and craftsmanship in Berber art*. Cambridge, Massachusetts, Peabody Museum Press (2008).
9. Mona, M.: Islamic Style Interior Design: Embracing Tradition and Modernity. *INJ Architects*. <https://injarch.com/islamic-style-interior-design/> (2024).
10. Rosser-Owen, M.: Andalusí spolia in Medieval Morocco: “architectural politics, political architecture”. *Medieval Encounters* 20(2), 152-198 (2014).
11. Mehraliyev, F., Chan, I. C. C., Kirilenko, A. P.: Sentiment analysis in hospitality and tourism: a thematic and methodological review. *International Journal of Contemporary Hospitality Management* 34(1), 46-77 (2022).
12. Dimitrios, B., Ioannis, R., Angelos, N., Nikolaos, T.: Digital marketing: The case of digital marketing strategies on luxurious hotels. *Procedia Computer Science* 219(4), 688-696 (2023).
13. Song, P.: Sentiment Analysis: A General Comparison. *Medium*. <https://medium.com/@patapon.son/sentiment-analysis-a-general-comparison-11903e62b25f> (2024).
14. Youvan, D. C.: Understanding Sentiment Analysis with VADER: A Comprehensive Overview and Application. *ResearchGate*. DOI: 10.13140/RG.2.2.33567.98726 (2024).
15. Zdaniuk, B.: Ordinary Least-Squares (OLS) Model. *Springer, Cham.*, 4867-4869 (2024).

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