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Neuro hospitality leveraging neuroscience to redefine guest experience in hotels and tourism

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Abstract

This research delves into the nascent notion of neuroscience Hospitality, which leverages insights from neuroscience to redefine guest experience in hotels and tourism. Using a structured questionnaire, data were collected from hotel guests to examine the role of sensory, emotional, cognitive, technological, and cultural stimuli in shaping hospitality experiences. Factor analysis was utilized to discern the fundamental characteristics of visitor perception. The Kaiser-Meyer-Olkin (KMO) score of 0.740 with Bartlett's Test for Sphere ($\chi^2 = 8845.119, p < 0.001$) validated the appropriateness of the data using factor analysis. Principal Component Analysis utilizing Varimax rotation identified five variables that account for 85.56% of the total variation. The identified factors were: Sensory & Emotional Immersion, Surprise & Digital Engagement, Smart Comfort, Experiential Novelty & Memory, and Cultural & Emotional Triggers. These factors collectively reflect how neuro-cognitive stimuli drive satisfaction, memory formation, and loyalty in hospitality contexts. The results underscore the significance of incorporating neurological ideas into hotel design, service personalization, and technological adoption. This paper contributes to hospitality research by offering an evidence-based framework for enhancing guest satisfaction and loyalty through neuro hospitality strategies.

Keywords: Neuro hospitality, guest experience, sensory immersion, emotional engagement, smart hospitality technology, customer satisfaction, customer loyalty

Introduction

The hospitality industry has always sought to enhance guest experiences, moving beyond functional service delivery toward emotional engagement and memory creation. With the increasing influence of neuroscience in consumer behavior research, the concept of *Neuro Hospitality* has emerged as a powerful paradigm that explains how sensory stimuli, emotional cues, and cognitive triggers shape customer perceptions and decision-making.

In hospitality, guest satisfaction is not solely determined by physical amenities but by how experiences are *felt, processed, and remembered*. Neuroscience suggests that sensory immersion (sight, sound, touch, smell, taste), emotional empathy, novelty, and cultural engagement influence memory formation and loyalty behaviors. Hotels that leverage these insights can craft experiences that meet urgent needs and build long-term emotional bonds with guests.

This study aims to identify the key neuro-cognitive dimensions that influence hotel guest experiences. Specifically, it applies factor analysis to uncover the latent constructs underlying sensory, emotional, cognitive, technological, and cultural variables. By doing so, the study provides an evidence-based framework for integrating neuroscience into hospitality service design.

Literature Review

Jiang, J., & You, L. (2025) ^[1] in their study on "*TourismNeuro xLSTM: neuro-inspired xLSTM for rural tourism planning and innovation*" found that the NeuroTourism xLSTM significantly outperformed traditional time-series models on accuracy metrics across multiple datasets. The neuro-inspired memory and attention modules improved the model's ability to capture rural tourist data's long-term interdependence and irregular patterns. The model optimized multi-objectively robustly capability (e.g., balancing revenue, sustainability). Suggested to Integrate neuro-inspired ML approaches into destination planning tools to improve forecasting and resource allocation. Cardoso, L., et al. (2024) ^[2] in their study on "*New clues to smart tourism research from a neuroscience perspective*" found that Neuroscientific methods (eye-tracking, EEG, GSR, immersive tech) are increasingly

integrated into smart tourism research and reveal five behavioral/cognitive elements central to visitor responses: attention, preference, arousal, involvement, and valence (emotions). It is suggested that destination managers should adopt mixed-method evaluations combining behavioral (clickstream, bookings), physiological (eye-tracking, GSR), and self-report measures to design more engaging smart experiences.

Al-Nafjan, A., Aldayel, M., & Kharrat, A. (2023) ^[3] in their study on “*Systematic Review and Future Direction of Neuro-Tourism Research*” noted that Neuro-tourism is a growing but still nascent field; existing studies are uneven in methodological rigor and often small-scale. The most common neuro tools are eye-tracking and GSR; EEG studies are fewer but offer deeper insights into affective processing. Neuro methods reveal unconscious emotional responses that differ from self-reports, demonstrating the added value of physiological measures for tourism and experience design. Suggested that future research should combine neurophysiological data with longitudinal behavioral outcomes (e.g., revisit intention, WOM) to establish causal links between in-experience neural signals and long-term loyalty.

Objectives of the study

1. To identify the key factors that shape guest experiences in hotels through the lens of neuroscience.
2. To examine the role of sensory, emotional, technological, and cultural triggers in enhancing guest satisfaction and loyalty.
3. To validate the neuro-hospitality model using factor analysis.

Methodology

Research Design

This study adopts a quantitative research design to examine the underlying neuro-cognitive dimensions influencing guest experiences in hotels and tourism. A structured survey instrument was developed based on neuroscience-driven hospitality constructs including sensory immersion, emotional connection, cognitive enrichment, technological experience, and memory triggers.

Sampling and Data Collection

The study employed a purposive sampling method to collect responses from hotel guests who had stayed in star-category hotels within the past twelve months. A total of 521 respondents participated in the survey. The respondents

represented a diverse demographic profile in terms of age, gender, occupation, and travel purpose, thereby ensuring broader generalizability of the findings.

Data were collected using a structured questionnaire containing 14 items derived from sensory, emotional, cognitive, technological, and memory-related constructs. Each item was rated on a scale of five (1 = Strongly Disagree, 5 = Strongly Agree).

Statistical Tools and Data Analysis

- The gathered data were encoded and examined utilizing SPSS (Statistical Package used in Social Sciences). The subsequent tools were utilized: Kaiser-Meyer-Olkin (KMO) Test along with Bartlett's Test of Sphericity for evaluate sampling adequacy and appropriateness for factor analysis. Utilization of Principal Component Analysis, or PCA, with Varimax Rotation to discern fundamental aspects affecting guest experiences.
- Communality analysis to examine the proportion of variance explained by extracted factors.
- Rotated Component Matrix to interpret the clustering of variables into distinct dimensions.

The factor solution was validated using the eigenvalue criterion (>1) and scree plot analysis. Five factors were extracted, explaining 85.56% of the variance.

Test: “Factor Analysis”

Factor analysis was used to identify key dimensions of teacher expectations, job satisfaction, and retention. The KMO value exceeded 0.9, and Bartlett's Test was significant ($p = 0.000$), confirming data suitability for factor analysis.

Table 1: KMO and Bartlett's Test

“KMO and Bartlett's Test”		
“Kaiser-Meyer-Olkin Measure of Sampling Adequacy”		.792
“Bartlett's Test of Sphericity”	“Approx. Chi-Square”	8845.119
	“df”	91
	“Sig.”	.000

“Source: SPSS output based on author's analysis of survey data.”

The “KMO” value for 0.740 indicates a strong relationship among variables, and “Bartlett's test” ($p = 0.000$) disallows the null hypothesis, confirming that factor analysis is appropriate.

Table 2: Communalities: Initial Vs Extraction”

“Communalities”	“Initial”	“Extraction”
The hotel's lighting positively influenced my mood.	1.000	.721
Pleasant fragrances in public areas improved my overall impression.	1.000	.984
Visual aesthetics (design, plants, art) made my stay more enjoyable.	1.000	.968
Staff showed genuine empathy and concern for my needs.	1.000	.977
Service personalization made me feel valued.	1.000	.974
Surprise gestures (welcome treats, upgrades) made me feel special.	1.000	.964
The hotel provided opportunities to learn about local culture.	1.000	.766
Informational materials were mentally stimulating and informative.	1.000	.761
The stay provided novelty that broadened my perspectives.	1.000	.695
Digital interfaces (apps, kiosks) made navigation easy.	1.000	.957
Smart-room technology (controls, personalization) improved comfort.	1.000	.742
The stay created lasting positive memories.	1.000	.765
I am likely to recommend the hotel based on unique experiences.	1.000	.954
The combination of sensory and emotional cues made the experience unforgettable.	1.000	.749
Extraction Method: Principal Component Analysis.		

“Source: SPSS output based on author's analysis of survey data.”

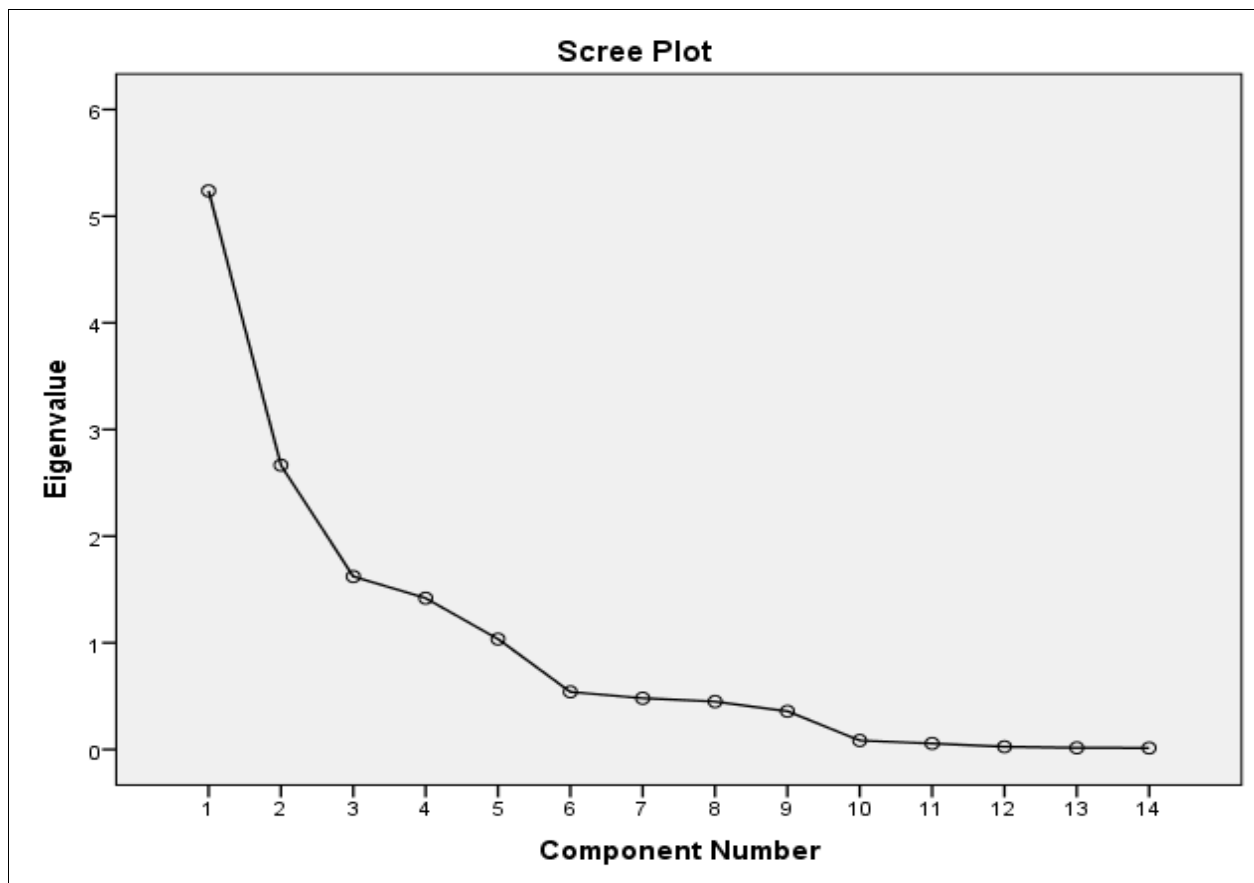
Extraction: In contrast, extraction communalities produce final communalities that are usually lower than 1.0. This shows the proportion of variable variance elucidated by

variables having Eigen values greater than 1.0. Exclusion from component analysis is recommended if extraction communalities are below .40. No element needs removal.

Table 3: Total Variance

"Component"	"Initial Eigenvalues"			"Extraction Sums of Squared Loadings"			"Rotation Sums of Squared Loadings"		
	"Total"	"% of Variance"	"Cumulative %"	"Total"	"% of Variance"	"Cumulative %"	"Total"	"% of Variance"	"Cumulative %"
1	5.238	37.411	37.411	5.238	37.411	37.411	3.954	28.244	28.244
2	2.666	19.039	56.450	2.666	19.039	56.450	2.938	20.989	49.233
3	1.622	11.583	68.033	1.622	11.583	68.033	1.926	13.757	62.989
4	1.418	10.132	78.165	1.418	10.132	78.165	1.803	12.879	75.868
5	1.035	7.395	85.560	1.035	7.395	85.560	1.357	9.692	85.560
6	.540	3.856	89.416						
7	.480	3.430	92.846						
8	.449	3.208	96.053						
9	.358	2.560	98.614						
10	.084	.598	99.212						
11	.056	.399	99.611						
12	.026	.184	99.796						
13	.015	.109	99.905						
14	.013	.095	100.000						
"Source: Survey Data" "Extraction Method: Principal Component Analysis"									

"Source: SPSS output based on author's analysis of survey data."



"Source: Survey Data. Figure created by the authors."

Fig 1: The Scree test

The scree plot indicated a three-factor solution, and factor rotation was applied to simplify interpretation by aligning

variables more closely with a single factor.

Table 4: Rotated Component Matrix

"Rotated Component Matrix"	1	2	3	4	5
Pleasant fragrances in public areas improved my overall impression.	.966				
Visual aesthetics (design, plants, art) made my stay more enjoyable.	.962				
Staff showed genuine empathy and concern for my needs.	.966				
Service personalization made me feel valued.	.964				
Surprise gestures (welcome treats, upgrades) made me feel special.		.949			
The hotel provided opportunities to learn about local culture.					.798
The stay provided novelty that broadened my perspectives.				.784	
Digital interfaces (apps, kiosks) made navigation easy.		.942			
Smart-room technology (controls, personalization) improved comfort.			.855		
The stay created lasting positive memories.				.819	
I am likely to recommend the hotel based on unique experiences.		.940			
The combination of sensory and emotional cues made the experience unforgettable.					.800

"Source: SPSS output based on author's analysis of survey data."

Varimax rotation was used to clarify factor loadings, revealing four key dimensions influencing customer satisfaction based on variables with high correlations.

Factors influencing staff attraction and retention

Factors	Variables	Factor Loading
Factor1 "Sensory & Emotional Immersion"	Pleasant fragrances in public areas improved my overall impression.	.966
	Visual aesthetics (design, plants, art) made my stay more enjoyable.	.962
	Staff showed genuine empathy and concern for my needs.	.966
	Service personalization made me feel valued.	.964
Factor2 "Surprise & Digital Engagement "	Surprise gestures (welcome treats, upgrades) made me feel special.	.949
	Digital interfaces (apps, kiosks) made navigation easy.	.942
	I am likely to recommend the hotel based on unique experiences.	.940
Factor3 "Smart Comfort"	Smart-room technology (controls, personalization) improved comfort.	.855
Factor4 "Experiential Novelty & Memory"	The stay provided novelty that broadened my perspectives.	.819
	The stay created lasting positive memories.	.784
Factor5 "Cultural & Emotional Triggers"	The hotel provided opportunities to learn about local culture	.800
	The combination of sensory and emotional cues made the experience unforgettable.	.798

"Source: SPSS output based on author's analysis of survey data."

The KMO value of 0.740 indicated sampling adequacy, while Bartlett's Test ($\chi^2 = 8845.119$, $p < 0.000$) confirmed the suitability of the dataset for factor analysis. Communalities after extraction ranged from 0.695 to 0.984, confirming that all items contributed meaningfully to the factor structure. The total variance explained was 85.56%, demonstrating that the extracted five factors provide a robust summary of the dataset. The Scree Plot further supported a five-factor solution. The rotated component matrix revealed clear groupings of variables, simplifying interpretation. Each factor corresponds to a distinct neuro-hospitality dimension.

Factor 1: Sensory & Emotional Immersion (Loadings:.962-.966)

This factor groups together sensory and emotional cues such as *fragrances, aesthetics, empathy, and personalization*. It suggests that guest experiences are strongly shaped by *multi-sensory immersion combined with emotional attentiveness*.

Factor 2: Surprise & Digital Engagement (Loadings:.940-.949)

This factor combines *surprise gestures, digital ease of navigation, and recommendation intent*. It indicates that both *unexpected emotional touches and seamless digital experiences* foster guest advocacy and recommendation.

Factor 3: Smart Comfort (Loading:.855)

This standalone factor emphasizes the role of *smart-room*

technology in personalizing comfort. It highlights how *automation, personalization, and ease of control* significantly enhance satisfaction.

Factor 4: Experiential Novelty & Memory (Loadings:.784-.819)

This factor reflects how *novelty and memory formation* enhance guest perspectives. New experiences that broaden horizons contribute to *lasting positive impressions*.

Factor 5: Cultural & Emotional Triggers (Loadings:.798-.800)

This factor emphasizes the importance of *cultural learning and emotional resonance*. It shows how cultural immersion and the combination of sensory-emotional triggers make experiences *unforgettable*.

Results

The factor analysis identified five dimensions that collectively explain how neuroscience-based stimuli shape guest experiences in hospitality:

1. Sensory & Emotional Immersion (fragrances, aesthetics, empathy, personalization)
2. Surprise & Digital Engagement (surprises, digital ease, advocacy)
3. Smart Comfort (smart-room technology personalization)
4. Experiential Novelty & Memory (novelty and lasting memories)
5. Cultural & Emotional Triggers (local culture, sensory-

emotional resonance)

Together, these dimensions explain 85.56% of total variance, confirming their strong explanatory power.

Discussion

The findings validate the concept of Neuro Hospitality as a multi-dimensional construct. Guests interpret and evaluate their hotel experiences not only on tangible service quality but also on neuro-cognitive triggers. Sensory immersion builds immediate impressions, emotional connection drives personalization, and novelty fuels curiosity and memory. Meanwhile, technology enhances convenience, while cultural elements enrich authenticity.

This aligns with neuroscience research, which emphasizes that emotions and sensory stimuli influence memory encoding and retrieval. Hotels that consciously integrate these triggers can create differentiated experiences leading to stronger guest satisfaction and loyalty. Importantly, the factor structure shows that digital engagement and emotional surprise are closely linked, suggesting that hotels must integrate technology with human warmth for maximum impact.

Conclusion

The study concludes that five key neuro-hospitality factors—Sensory & Emotional Immersion, Surprise & Digital Engagement, Smart Comfort, Experiential Novelty & Memory, and Cultural & Emotional Triggers—are central to redefining guest experiences in hotels and tourism. These factors not only explain a significant portion of guest perceptions but also provide actionable insights for hotel managers.

By adopting a neuro-hospitality approach, hotels can design experiences that are not only functional but also emotionally resonant, culturally engaging, and technologically seamless. Such integration ensures higher satisfaction, stronger loyalty, and long-lasting memories, ultimately redefining the future of hospitality service delivery.

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