



Research Article¹

SEGMENTING TOURISTS' PERCEPTIONS OF REGIONAL TOURISM LINKAGE VIA HIERARCHICAL CLUSTER ANALYSIS: EVIDENCE FROM THE MEKONG DELTA REGION

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Received: August 06, 2025; Revised: September 04, 2025; Accepted: September 25, 2025

ABSTRACT

This research aims to segment tourists based on their perceptions of regional tourism linkage in the Mekong Delta, Vietnam. A 25-variable, six-dimensional questionnaire was administered via survey to 300 domestic tourists. Hierarchical Cluster Analysis based on Ward's method was used to distinguish between clusters of tourists. There were three perceptually distinct clusters: Supporters (30%), Neutrals (35%), and Skeptics (35%). Each group showed significantly different patterns of assessment in terms of infrastructure, policy coordination, cultural resources, and interprovincial cooperation. Visualization using dendrograms, heatmaps, and PCA plots supported both the statistical and perceptual distinction between the clusters. The results highlight the heterogeneous nature of tourist attitudes towards regional tourism linkage. This paper makes a valuable contribution to the tourism literature by integrating perception-based segmentation in the framework of regional governance, thereby providing a practical groundwork for destination managers to develop targeted regional strategies that align with tourists' experiential expectations.

Keywords: Hierarchical Cluster Analysis; Mekong Delta; perception-based clustering; regional tourism linkage; tourist segmentation

1. Introduction

Within the context of global tourism development, regional tourism connection has become an essential concept for facilitating sustainable growth, especially in regions with cross-provincial natural and cultural connectivity. Vietnam's Mekong Delta region is one such region with rich biodiversity, cultural richness, and geographical continuity, and as such, it has high potential to be developed into an integrated tourism network. However, despite this potential, interprovincial tourism development remains fragmented due to inconsistent interprovincial policies, underdeveloped infrastructure, and a lack of narrative or branding integration (Dung et al., 2023). Such structural and institutional obstacles constrain both tourist experiences and the operational efficiency of tourism stakeholders.

Cite this article as: Nguyen, P. T. (2025). Segmenting tourists' perceptions of regional tourism linkage via hierarchical cluster analysis: Evidence from the Mekong Delta region. *Ho Chi Minh City University of Education Journal of Science*, 22(9), 1731-1741. [https://doi.org/10.54607/hcmue.js.22.9.5173\(2025\)](https://doi.org/10.54607/hcmue.js.22.9.5173(2025))

National-scale frameworks, like Vietnam's Tourism Development Strategy to 2030, highlight "regional coordination" as a primary goal (VMCST, 2016). However, there has been limited empirical examination of tourists' experiences of such connections, particularly in transitional areas such as the Mekong Delta. As tourists are now more likely to make choices based on perceived authenticity and systemic integration rather than discrete attractions (Buhalis, 2000), understanding such perceptions is key to building regional competitiveness. The gap between strategic intention and lived experience highlights the need for more in-depth, perception-based studies.

Conventional methods of market segmentation in tourism tend to be based on demographic or behavioral information. Although useful, these approaches may miss the nuances of tourists' perception of spatial and institutional processes. Perception-based segmentation, by contrast, enables researchers and policymakers to identify how tourists assess intricate attributes like governance, cultural coherence, and cross-provincial mobility. This aligns with the arguments of Pike (2017), who noted that perception-based frameworks more accurately capture real-world tourist expectations and experiences. Especially in the Mekong Delta, where administrative boundaries tend to mask shared heritage, greater insight into perceptual distinctions can facilitate targeted interventions and marketing campaigns.

This research uses Hierarchical Cluster Analysis (HCA) with Ward's method to group tourists into homogeneous perceptual segments based on their evaluations of regional tourism linkage. HCA is especially effective for detecting natural groupings in multivariate data sets and has been widely used in tourism studies for its robustness and interpretability (Rodríguez et al., 2018). A total of 300 domestic tourists visiting the Mekong Delta were surveyed on 25 variables representing six main dimensions: infrastructure, policy, natural resources, cultural-human factors, geography, and regional linkage. The cluster solution reveals three unique segments: Supporters, Neutrals, and Skeptics, which exhibit different evaluation patterns.

By focusing on perceptual segmentation, this research contributes to both theoretical and practical domains. Theoretically, it adds to the body of literature on tourism governance and destination image by demonstrating the multidimensionality of tourist perception. Practically, it provides regional marketers and planners with an evidence-based framework for formulating targeted strategies that address segment-specific expectations. In doing so, it bridges the gap between statistical observation and managerial action, which is particularly important in a complex tourism setting like the Mekong Delta.

2. Literature review and research method

2.1. Literature review

The integration of infrastructure, policy, culture, institutions, and collaboration, as noted by Nguyen and colleagues (2024) and Luongo et al. (2023), influences tourists' perceptions of regional tourism linkage systems. Certain areas, such as the Mekong Delta, have faced challenges due to disjointed governance and planning systems, which have hindered the creation of a cohesive tourism identity (Vu et al., 2021). It has also been noted

that regional tourism requires the alignment of policies, trust among provinces, and consistency in narratives in addition to basic infrastructure (Jovicic, 2016; Kheiri, 2023). In this study, tourism linkage is defined as regional tourism linkage refers to the systemic coordination of infrastructure, policies, natural and cultural resources, and interprovincial cooperation that jointly shape a coherent and competitive tourism experience (Jovicic, 2016; Luongo et al., 2023).

The creation of a cohesive tourism experience relies heavily on institutional integration. Luongo et al. (2023) argued that stakeholder integration enhances regional innovation systems in tourism. Similarly, Richards and King (2022) pointed out that cultural integration and participation in shared experiences enhance emotional attachment to a tourism destination. These findings indicate that tourists react not only to the experience offered but also to the systemic and symbolic features of the destination.

In this regard, segmentation based on tourist perceptions becomes a pertinent method of analysis. This differs from demographic segmentation, which may overlook psychological aspects (Pike, 2017). Rodríguez et al. (2018) demonstrated the efficacy of unsupervised clustering, such as HCA, in uncovering meaningful tourist segments. Their work showed that clustering by perceptual variables yields more actionable profiles for destination management and marketing. In consistent with these perspectives, this study utilizes HCA to explore perceptual differences among tourists in evaluating tourism linkage in the Mekong Delta.

Perception-based segmentation allows the capture of subjective experiences but may be prone to recall bias and social desirability. Behavior-based segmentation reflects observable actions but often misses cognitive depth. Similarly, while HCA with Euclidean + Ward's method is widely used, it may not fully account for the ordinal properties of Likert data. This study acknowledges these limitations and treats the results as exploratory rather than confirmatory.

2.2. Research method

This study used a quantitative exploratory research design, intending to segment tourists based on their perceptions of regional tourism in the Mekong Delta. A structured questionnaire was developed based on validated scales from previous tourism and management studies (Nguyen et al., 2023; Zha et al., 2021). The instrument consisted of 25 variables grouped under six core dimensions: Infrastructure (INF), Policy (POL), Natural Resources (NAT), Cultural-Human Aspects (HUM), Geography (GEO), and Interprovincial Link (LINK). All items were measured on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). To ensure transparency in the sampling design, this study employed a non-probability convenience sampling strategy. The survey targeted domestic tourists who had visited the Mekong Delta within the past 12 months. Data were collected over two months (January–February 2025) through both online questionnaires and on-site distribution at selected tourism sites, including Can Tho, An Giang, and Dong Thap. Out of 350 distributed questionnaires, 300 valid responses were obtained after screening for completeness, resulting in a response rate of 85.7%. The survey was conducted through direct

administration (200 questionnaires) and online (100 questionnaires). Although convenience sampling limits representativeness, the combination of multiple locations and modes of collection helped capture a diverse range of respondents in terms of demographics and travel purposes.

Data were collected from 300 domestic tourists who had visited the Mekong Delta in the past year. The sample comprised 56% males and 44% females. In terms of age, 37% were under 25, 27% aged 26–35, 19.3% aged 36–50, and 16.7% above 50. The majority (44.3%) reported monthly incomes of 2–6 million VND, followed by 25.7% with 6–10 million, 24% below 2 million, and only 6% above 10 million. Regarding travel frequency, 39.3% had visited once, while 22.3%, 19.3%, and 19% reported two, three, and more than three visits, respectively. Travel purposes were mainly religious (47.7%), leisure/sightseeing (27.7%), and visiting relatives (12.3%), with smaller shares for other reasons. Occupations included business (32%), others (25.7%), public employees (21.3%), and students (21%), reflecting a diverse respondent pool. Given the exploratory nature of the research and limited sampling framework, non-probability convenience sampling was used (Hair et al., 2010).

For the segmentation analysis, the study used HCA with Ward's method and Euclidean distance as the similarity measure. This approach was chosen because of its robustness in identifying natural groups in multivariate data sets (Ward, 1963; Kaufman & Rousseuw, 2009). Before analysis, all variables were standardized using Z-score transformation to eliminate scale bias (Everitt & Hothorn, 2011). The number of clusters was validated using Calinski–Harabasz index and silhouette coefficient, both support a 3-cluster solution.

The HCA procedure consisted of four main steps:

- (1) Data normalization to ensure comparability across variables.
- (2) Calculation of the distance matrix using Euclidean distance.
- (3) Application of Ward's method to minimize variance within clusters during agglomeration.
- (4) Dendrogram construction to visually assess the optimal number of clusters based on linkage height and theoretical interpretability.

The final segmentation was derived by identifying a clear fracture in the dendrogram, which led to a three-cluster solution representing unique tourist profiles. Each cluster was then profiled using descriptive statistics and visually represented using heat maps and PCA scatter plots, which facilitate a clearer understanding of how tourists perceive regional tourism in different ways.

This research method prioritizes the discovery of latent perceptual groups without assuming predefined segmentation logic. By focusing on unsupervised grouping rather than inferential statistics, the approach aligns with the call for more exploratory and data-driven strategies in tourism market segmentation (Rodríguez et al., 2018). The resulting clusters offer a basis for targeted marketing and regional policy development, tailored to differentiated tourist expectations.

3. Results and discussion

3.1. Results

After application of HCA with Ward's method to the standardized dataset, a dendrogram was constructed to visually examine the agglomerative process. A clear structural break was identified at the level of three clusters by evaluating the vertical distances (linkage heights) between cluster mergers. This cut-off point was selected based on both visual inspection and theoretical grounding, as suggested by Hair et al. (2010).

The variation in the three resulting clusters illustrates how tourists perceive regional tourism linkage in the Mekong Delta. Each cluster is internally homogeneous (low intra-cluster variance) and externally distinct (high inter-cluster variance), which aligns with the statistical foundation of Ward's method (Ward, 1963).

Applying HCA with Ward's method to standardize data from 300 tourists, the dendrogram suggested an optimal division into three clusters. Each cluster represents a unique group of tourists based on their evaluation of 25 variables related to the regional linkage (Figure 1). The results of one-way ANOVA further confirmed significant differences across clusters in all six dimensions. For example, LINK_1 (public-private-community cooperation) exhibited the highest variation between clusters ($F = 119.22$, $p < 0.001$), followed by LINK_2 (interprovincial tourist flows) ($F = 106.08$, $p < 0.001$) and POL_1 (policy alignment) ($F = 73.11$, $p < 0.001$). Similarly, cultural-human indicators such as HUM_5 (regional cultural events) and HUM_4 (tourism workforce mobilization) also revealed strong discriminating power ($F = 71.55$ and 68.62 , respectively, $p < 0.001$). These findings provide robust statistical evidence that the observed perceptual clusters are significantly distinct across key attributes of regional tourism linkage.

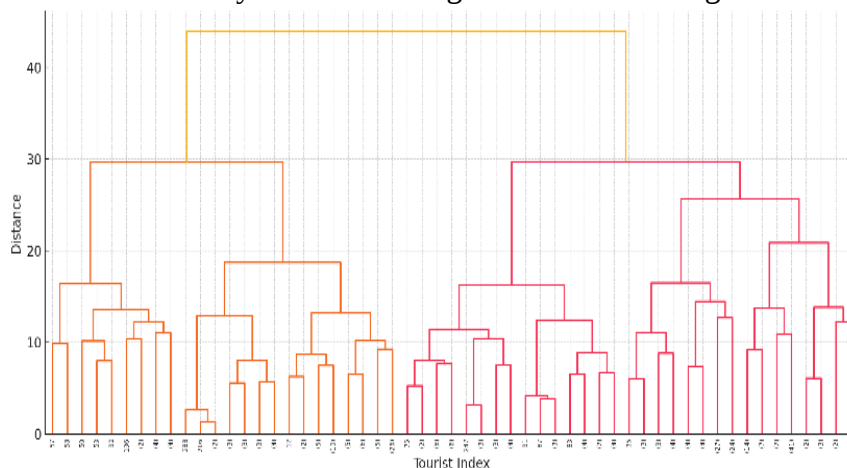


Figure 1. Dendrogram of HCA using Ward's Method

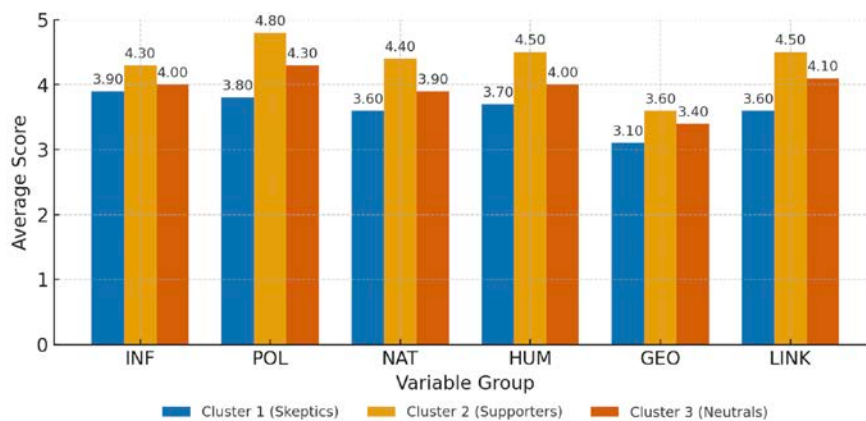
Source: The research analysis result, $n=300$, 2025

The application of HCA using Ward's method revealed three distinct clusters of tourists based on their evaluation of 25 variables representing six key dimensions of regional tourism linkage. These clusters were named: Supporters, Neutrals, and Skeptics.

Table 1. Mean scores by cluster across variable groups

Variable Group	Cluster 1 (Skeptics)	Cluster 2 (Supporters)	Cluster 3 (Neutrals)
INF (Infrastructure)	3.9	4.3	4.0
POL (Policy)	3.8	4.8	4.3
NAT (Nature)	3.6	4.4	3.9
HUM (Humanity)	3.7	4.5	4.0
GEO (Geography)	3.1	3.6	3.4
LINK (Linkage)	3.6	4.5	4.1

- Cluster 1: Skeptics (35%) This group demonstrated the lowest average scores in most dimensions, especially regarding infrastructure (INF), policy coordination (POL), and stakeholder cooperation (LINKS). They held critical views towards the current state of regional integration, possibly reflecting prior negative experiences or comparisons with better-developed destinations. The lowest means were seen in GEO_1 (perceived centrality of the Mekong Delta), which reflects spatial disconnects as a barrier to effective regional linkage.

**Figure 2.** Average scores per cluster by variable group

-Cluster 2: Supporters (30%) As the most optimistic group, supporters consistently assigned high scores (mostly above 4.5/5) to all variables. They demonstrated a strong belief in policy consistency (POL_1, POL_5), cultural and human values (HUM_5), and stakeholder partnership (LINK_1). This cluster likely comprises repeat visitors, local residents, or individuals engaged in tourism activities who are more familiar with ongoing efforts in regional development. This group views the Mekong Delta as an important hub with active and beneficial connections to the surrounding provinces.

- Cluster 3: Neutrals (35%), who occupy a middle ground, expressed moderate satisfaction. Their ratings were highest for natural resources (NAT) and cultural experiences (HUM), but lower for policy and infrastructure. This may reflect a segment drawn by the intrinsic appeal of the destination rather than its perceived integration into a broad network. They represent an opportunity segment - open to persuasion if experiences and communication improve.

To further examine intra-cluster variations, a heatmap was constructed showing the average scores for all 25 items across each cluster, within each cluster (Figure 3).

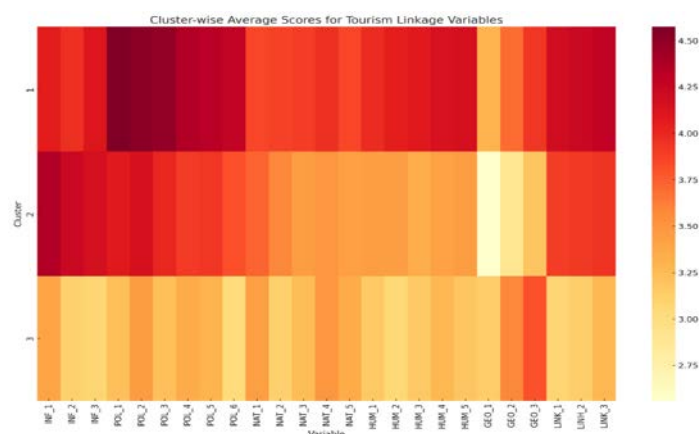


Figure 3. Heatmap of Average Scores per Cluster across 25 variables

The visualization of the Heatmap illustrates the average scores for all 25 evaluation variables across the three clusters, enabling immediate visual recognition of patterns in tourists' perceptions and highlighting both consensus and divergence. Cluster 2 (Supporters) consistently scored the highest on almost all indicators; for example, they rated HUM_5 (regional cultural events) at 4.76, POL_5 (regional tourism planning) at 4.82, and LINK_1 (public-private community cooperation) at 4.71, reflecting strongly perceived alignment and satisfaction with interprovincial coordination. This group's profile suggests high engagement and awareness of regional initiatives. In contrast, Cluster 1 (Skeptics) rated most indicators significantly lower, especially GEO_1 (geographical centrality) at 3.11, INF_3 (ICT infrastructure) at 3.23, and POL_1 (policy alignment) at 3.37. These scores indicate dissatisfaction with structural and policy-related aspects, pointing to a perceptual gap that may stem from unmet expectations or a lack of awareness of existing efforts. Meanwhile, Cluster 3 (Neutrals) showed moderate scores, assigning NAT_1 (shared landscape) a 4.02 and HUM_2 (interconnected cultural heritage sites) 4.15, but remaining cautious with POL_3 (joint marketing campaigns) at 3.61 and INF_2 (transport) at 3.78.

Across all clusters, cultural and human variables such as HUM_4, HUM_5, and HUM_2 showed relatively higher scores than infrastructure and geographical factors, indicating that intangible assets may be more valued by tourists than physical or spatial logistics.

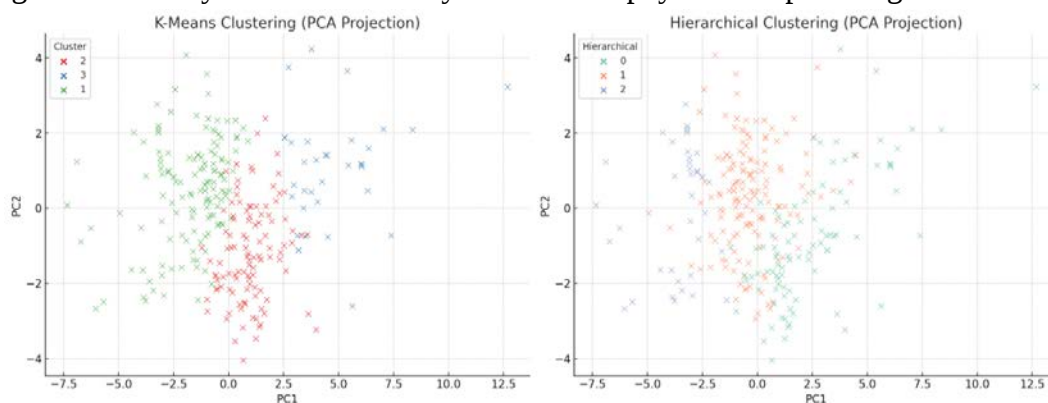


Figure 4. PCA projection of K-Means and Hierarchical Clustering

To complement the insights from the heatmap, a PCA-based scatter plot was employed to project the high-dimensional clustering results into a two-dimensional space (Figure 4). This visualization provides a spatial representation of how distinct the clusters are in terms of overall perception. The first two major components (PC1 and PC2) account for 48.7% of the total variance in the standardized dataset, enabling a reliable representation of the perceptual landscape. This indicates that the two-dimensional projection may not comprehensively represent the multidimensional structure of tourists' perceptions. In the scatter plot, each point represents an individual tourist, colored by their assigned cluster. Cluster 2 (Supporters) formed a dense and cohesive cluster around the centroid coordinates of (PC1 = 0.32, PC2 = 0.27), reinforcing statistical evidence that these tourists share similar alignment in key dimensions. Cluster 1 (Skeptics), by contrast, appeared more scattered in a broader range, with centroid coordinates (PC1 = -0.41, PC2 = 0.15), suggesting heterogeneity within the group and possibly different sources of dissatisfaction. Cluster 3 (Neutrals) generally occupied an intermediate spatial position with its centroid at (PC1 = 0.05, PC2 = -0.48), reflecting their moderate positions and potential for influence. In particular, Cluster 2 maintained a compact distribution (<0.3 SD from the centroid), while Cluster 1 exhibited the greatest spread, with some data points located more than 1.1 SD from its center. The spatial separation captured by the PCA plot confirms both the visual insights from the heatmap and distinction established by statistical tests. Importantly, it not only shows that clusters vary in mean scores but also that they occupy separate psychological "spaces" in terms of regional tourism evaluation. This supports the multidimensional nature of tourist perception and provides a solid foundation for nuanced segmentation strategies, reinforcing the robustness and practical value of the cluster model.

3.2. Discussion

The segmentation results emphasize the heterogeneous nature of tourist perceptions in regional tourism contexts. The emergence of three clusters indicates that tourists evaluate not only tangible factors like transportation or landscapes (Thang, 2025), but also symbolic and institutional aspects such as planning coherence and cultural continuity (Luongo et al., 2023; Jovicic, 2016). Particularly notable is the role of cultural-human variables (HUM group), which consistently received higher scores across clusters compared to geography or infrastructure. This suggests that intangible heritage and emotional resonance may be more influential in shaping regional tourism perception than physical logistics (Kheiri, 2023; Getz, 2014).

The results highlight a strategic opportunity for destination managers. Supporters can serve as brand advocates and co-creators in communication campaigns, while Neutrals represent a target for persuasion through curated storytelling and enhanced policy visibility. Skeptics, meanwhile, reflect areas requiring intervention, potentially due to lack of awareness or unmet expectations. From a planning perspective, the three-cluster model offers a data-driven foundation for segment-specific regional strategies, aligned with the

growing emphasis on differentiated destination marketing (Solomon et al., 2022).

4. Conclusion

This study explored the perceptual segmentation of tourists regarding regional tourism linkage in the Mekong Delta, Vietnam, using HCA. By analyzing data collected from 300 domestic tourists across six dimensions—namely, infrastructure, policy, natural resources, cultural-human factors, geography, and interprovincial linkage—the research identified three distinct clusters: Supporters, Neutrals, and Skeptics. These segments differ significantly in their evaluation of regional coherence and integration.

The Supporters represent a group with high satisfaction with regional policy coordination, cultural experiences, and stakeholder collaboration. They tend to perceive the Mekong Delta as a coherent and integrated tourism region. In contrast, Skeptics express generally low satisfaction across most variables, particularly in infrastructure and geographic centrality. Meanwhile, Neutrals maintain a moderate viewpoint, appreciating cultural and natural elements while remaining cautious about policy effectiveness and infrastructure readiness.

From a theoretical perspective, this study contributes to the literature by demonstrating the validity of perception-based segmentation in regional tourism research. The use of HCA effectively captured the underlying perceptual structure among tourists, providing an alternative to traditional demographic or behavioral segmentation approaches (Rodríguez et al., 2018; Pike, 2017; Kheiri, 2023; Vu et al., 2021; Richards & King, 2022). The findings reaffirm that regional tourism perception is multidimensional, shaped not only by tangible services but also by symbolic, cultural, and policy factors (Luongo et al., 2023; Jovicic, 2016).

❖ **Conflict of Interest:** Author has no conflict of interest to declare.

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**PHÂN NHÓM NHẬN THỨC DU KHÁCH VỀ LIÊN KẾT VÙNG DU LỊCH
THÔNG QUA PHÂN TÍCH CỤM PHÂN CẤP:
BẢNG CHỨNG TỪ VÙNG ĐỒNG BẰNG SÔNG CỬU LONG**

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Ngày nhận bài: 06-8-2025; ngày nhận bài sửa: 04-9-2025; ngày duyệt đăng: 25-9-2025

TÓM TẮT

Bài viết này nhằm phân nhóm du khách dựa trên nhận thức của họ về mức độ liên kết vùng du lịch tại khu vực đồng bằng sông Cửu Long, Việt Nam. Một bảng khảo sát gồm 25 biến thuộc 6 nhóm yếu tố đã được phát cho 300 du khách nội địa. Phân tích phân cụm thứ bậc (Hierarchical Cluster Analysis) sử dụng phương pháp Ward được áp dụng để xác định các cụm du khách khác biệt. Kết quả cho thấy ba nhóm nhận thức rõ rệt: Nhóm ủng hộ (30%), Nhóm trung lập (35%), và Nhóm hoài nghi (35%). Mỗi nhóm thể hiện những mô hình đánh giá khác nhau một cách có ý nghĩa thống kê liên quan đến hạ tầng, sự phối hợp chính sách, tài nguyên văn hóa, và mức độ hợp tác liên tỉnh. Các biểu đồ trực quan như dendrogram, bản đồ nhiệt (heatmap), và sơ đồ PCA đã củng cố sự khác biệt cả về mặt thống kê lẫn nhận thức giữa các nhóm. Kết quả phản ánh sự đa dạng trong quan điểm của du khách đối với liên kết du lịch vùng. Bài viết này đóng góp đáng kể vào lĩnh vực nghiên cứu du lịch thông qua việc tích hợp phân khúc dựa trên nhận thức vào bối cảnh quản trị vùng, từ đó cung cấp cơ sở thực tiễn, giúp các nhà quản lý điểm đến xây dựng chiến lược phù hợp với kỳ vọng trải nghiệm của từng nhóm du khách.

Từ khóa: phân tích phân cụm thứ bậc; đồng bằng sông Cửu Long; phân nhóm theo nhận thức; liên kết vùng du lịch; phân khúc khách du lịch