



Research article

Research on rural tourism environment perception based on grounded theory A case study of Beishan Village, Zhuhai City, Guangdong Province, China

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ABSTRACT

Drawing upon its regional culture, natural landscapes, and architectural features, Beishan Village in Zhuhai City, Guangdong Province, has forged a distinctive rural development model that combines an industrial park with tourism. While this approach has catalyzed rural progress, it also encounters numerous complex practical challenges. Utilizing the grounded theory method, this study employs participatory observation, in-depth interviews, and network data analysis to investigate the perspectives of three key stakeholder groups: villagers, tourists, and resident merchants. A model is constructed to capture their environmental perceptions of rural tourism. Based on an analysis of network and interview textual data, as well as the influencing factors identified through the theoretical model, this study proposes several optimization strategies. These include enhancing infrastructure development, cultivating a regional brand culture, strengthening the institutional management framework, establishing a rural sharing economy platform, and introducing digital tours. These strategies are designed to refine and enhance Beishan Village's development model, offering insights for similar villages and advancing the integration of beautiful China initiatives with urban and rural development efforts.

1. Introduction

The countryside, with its abundant historical culture and breathtaking natural landscapes, possesses a distinctive allure and significant value for rural tourism. In recent years, the accelerated urbanization in China has triggered a substantial migration of the rural populace to cities, giving rise to challenges such as population aging and the hollowing out of villages [1]. This migration has amplified the differentiation among villages, resulting in various categories, including decaying and vanishing villages, decaying yet resilient villages, market-driven suburban villages, resource-specific remote villages, and urban villages [2]. The evolution of rural environmental space and its perception evaluation has emerged as a pivotal topic of deliberation among academics. It is noteworthy that the Chinese government has formulated a series of policies aimed at safeguarding, rejuvenating, and advancing villages. For instance, in

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October 2017, the Communist Party of China introduced the Rural Vitalization Strategy in the report of the 19th National Congress, advocating for the construction of beautiful villages [3]. Subsequently, in October 2022, the report of the 20th National Congress emphasized the primacy of rural development, adhering to urban-rural integration, and fostering the revitalization of rural industries, talents, ecology, organizations, and culture [4]. In this context, the implementation and advancement of policies concerning rural protection and development persistently stimulate the progress and rejuvenation of the rural environment. An increasing number of architects and artists are redirecting their creative focus from urban areas to villages. Nevertheless, because of the top-down execution of rural renewal policies, the intricacy of the rural environmental system, and the limited personal cognitive experience of certain architects and artists, it unavoidably disrupts the natural growth system of villages, thereby amplifying the conflict between protection and development in villages [5]. Unless the interplay between the various components of the rural development system is adeptly managed, rural endeavors will encounter challenges.

In this context, various economically driven rural development projects, such as sustainable traditional agriculture [6], resorts, pastoral complexes, food towns, and health centers, have emerged as attractive investments through tourism [7], thereby propelling the transformation and economic growth of rural industries. The distinctive historical culture, folklore traits, cultural heritage, and natural ecological landscapes inherent to villages have evolved into valuable tourism assets [8]. As fresh vitality is steadily infused into rural environments and industries, the influx of tourists and returning residents is on the rise, exemplified by Beishan Village in Zhuhai City. Consequently, gaining insights into the perception, evaluation, and emotional experiences of the rural environment by villagers, tourists, and resident merchants holds paramount importance for villagers, businesses, and governments, ultimately fostering future sustainable rural progress and intelligent rural construction [9].

In recent years, scholarly investigations into rural tourism perception have predominantly focused on environmental space renewal strategies, sustainable rural advancement, tourist satisfaction surveys, user experiences, and consumer behaviors [10–17]. For instance, certain scholars have employed questionnaire surveys to explore potential micro-revival tactics grounded in the assessment of rural residents' cognition and preferences. Their findings reveal that tourism is widely recognized and preferred as a method of industrial development [18]. Other scholars have delved into the impact of consumer behavior on economic development within the tourism sphere through field surveys, interviews, content analysis, and structural equation modeling [17]. Notably, research on environmental perception evaluation constitutes a significant portion of these studies. Specifically, investigations have explored factors influencing tourists' revisit rates and loyalty towards rural tourism experiences [19], analyzed the quality of rural tourism services from the tourist's perspective, and examined the cognition of tourist cultural villages through the lens of residents [20]. These studies utilize a range of methodologies, including interviews, questionnaire surveys, structural equation modeling, content analysis, and network data analysis. Nonetheless, there is a certain uniformity in the data sources and research content across these studies. Rural tourism development constitutes a comprehensive undertaking, primarily led by governments and enterprises, with residents and tourists serving dual roles as resource providers and participants [21]. Hence, examining the perception and evaluation of the rural environment solely from one group's perspective would yield incomplete results.

Based on this premise, our research adopts an exploratory analysis grounded in theory, with the researcher serving as an integral tool. Through a combination of participatory observation, in-depth interviews, and network data analysis, we examine the perception of the rural environment from three primary stakeholders: villagers, tourists, and resident merchants. Grounded theory offers a critical avenue to explore the experiences, beliefs, and emotions inherent in our subjects. It systematically extracts and interprets the deep cognition and emotional experiences of these stakeholders, constructing a comprehensive framework for understanding rural environmental perception. To ensure authenticity and contextual richness, participatory observation allows researchers to seamlessly integrate into the rural milieu, facilitating real-time observation and documentation of daily behaviors and interaction patterns. This provides a wealth of field data. Complementing this, in-depth interviews enable the direct capture of authentic viewpoints, attitudes, and profound experiences. To further validate and enrich this dataset, we introduce network data analysis as a powerful adjunct. This method precision-extracts valuable data related to rural environmental perception from an expanse of network information, offering a broader, more diverse perspective. The convergence of these methodologies not only facilitates a comprehensive, multi-dimensional analysis of rural environmental perception but also ensures the reliability and validity of our findings. This holistic approach aids in exploring the spatial evolution of the rural environment and the organizational relationships and influencing factors therein, laying a solid theoretical and empirical foundation for proposing scientifically sound optimization strategies.

Our study seeks to answer the following questions: How does the transformation of rural space impact residents' lives? What are the perspectives of resident merchants on this transformation? What are the experiences of tourists during their rural sojourns? To address these, we amalgamate primary and secondary data, leveraging in-depth interviews and network data to amass a substantial corpus of textual information. This data then informs the three-step coding process inherent in grounded theory: generating labels, concepts, and categories, condensing, and identifying core categories, and establishing a theoretical framework. This unique approach not only mitigates the uniformity of data sources but also enables cross-verification of information.

The paper is structured as follows: In the second section, the author zooms in on the research topic, specifically, the spatial perception characteristics and individual behavioral tendencies of rural spaces during tourism, and methodically reviews and explores relevant literature in this domain. The third section presents a detailed overview and discussion of the current development status of Beishan Village in Zhuhai City, alongside an explanation of the research methods and data collection procedures. In the fourth section, the grounded theory approach is employed to conduct an in-depth analysis of the research samples. Through rigorous coding, induction, and verification processes, a theoretically explanatory model of tourism environmental perception in Beishan Village is ultimately developed. In the fifth section, building upon the theoretical model, the author further expounds on the underlying meanings and mechanisms of the four fundamental dimensions comprising environmental perception, laying out a theoretical framework to guide environmental optimization strategies in the sixth section. In the seventh section, the author shifts focus back to the broader

topic of rural spatial transformation and tourism development, initiating further academic discussions centered around stakeholders' spatial perception within this dynamic process. In conclusion, the paper offers a coherent summation of the entire research inquiry, key findings, and theoretical contributions, while honestly acknowledging the limitations encountered during the research and suggesting potential directions for future investigations.

2. Literature review

Rural tourism, as an emerging form of tourism, considers environmental perception as a pivotal factor influencing the visitor experience and behavioral decisions [22]. In recent years, urban-rural interaction and the escalating demand for leisure travel have propelled rural tourism into the limelight, owing to its distinctive natural landscapes, profound cultural heritage, and serene human-land relationships [23]. Consequently, there is an urgent need for an in-depth exploration of how rural tourism environments are perceived. The tourism industry represents one of the fastest-growing economic sectors [24] and comprehending the perception dimensions of tourist groups towards the tourism environment holds paramount importance for fostering healthy and sustainable industry development [25].

The grounded theory perspective, which integrates positivism and constructivism, serves as a potent tool for delving into the intrinsic mechanisms of rural tourism environmental perception and its subsequent impact on individual behavioral tendencies [26]. Illustratively, scholars have harnessed the grounded theory approach to unveil the pivotal role of factors like environmental quality [27], local uniqueness [28], and community participation [29] in shaping the overall rural tourism experience. These factors not only shape tourists' subjective cognition and emotional reactions but also directly influence their satisfaction and loyalty toward rural tourism destinations [30]. Other scholars have tapped into grounded theory to dissect the intricate structure of environmental perception in Chinese rural tourism [31], emphasizing the significant role of unique rural landscapes, profound cultural heritage, and a harmonious community atmosphere in shaping tourist perception [32]. These insights contribute to elucidating the genesis of tourists' willingness to revisit and propagate positive word-of-mouth [33]. Simultaneously, scholars have also delved into residents' cognition towards shifts in the tourism environment and its impact on their psychological dispositions and pragmatic choices about tourism development participation [34]. This provides invaluable empirical references and theoretical backing for the formulation of inclusive and sustainable rural tourism policies [35]. Such research endeavors not only enrich the theoretical underpinnings of rural tourism environmental perception but also furnish a robust theoretical foundation for bolstering destination competitiveness and stabilizing the tourism market by analyzing the formation mechanism of tourists' psychological states.

Despite extensive research, several unresolved issues and potential breakthrough points persist in the study of environmental perception in rural tourism. Firstly, although various aspects such as natural landscapes [36], cultural heritage [37], local characteristics [28], and community interaction [29] have been explored in detail, a refined quantitative analysis examining their inherent meanings and interaction mechanisms remains inadequate. Specifically, constructing a comprehensive and three-dimensional spatial perception model poses a challenge. Future research should focus on effectively integrating diverse perception elements to accurately

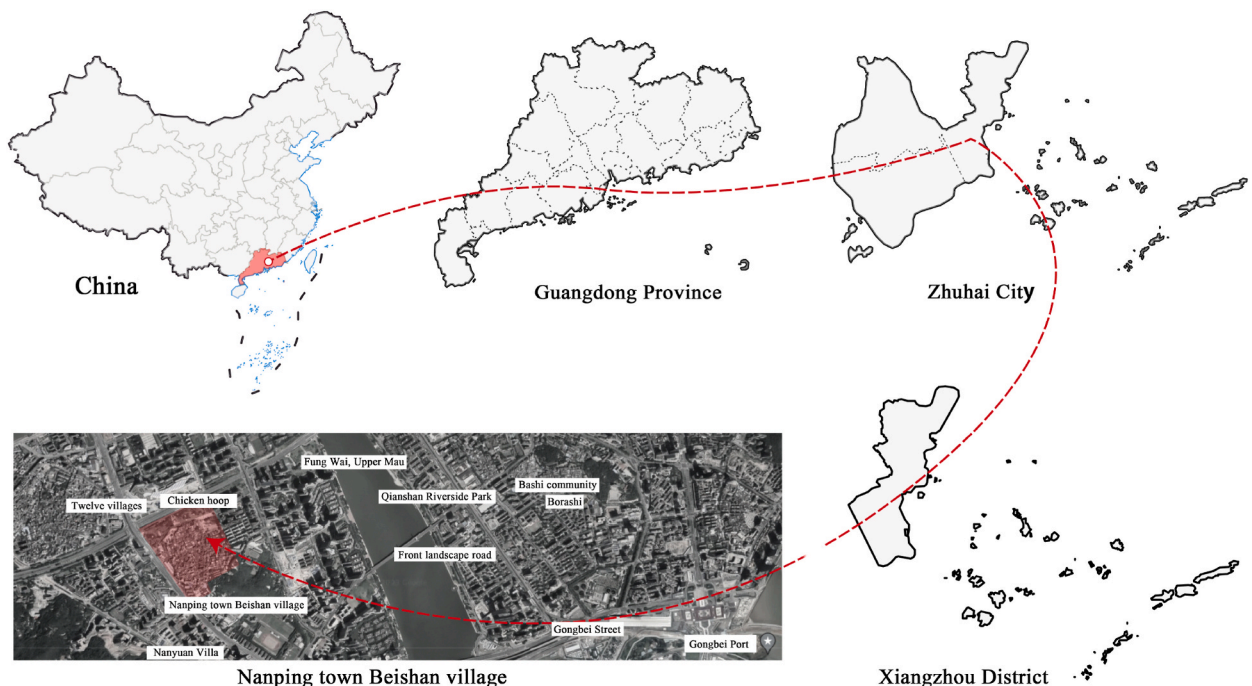


Fig. 1. Geographical location of Beishan Village.

depict the multifaceted experiences of stakeholders in rural tourism. Secondly, current research has overlooked the temporal dynamics involved in the formation, evolution, and stabilization of environmental perception in rural tourism. Stakeholders' perceptions are not static but evolve within different spatio-temporal contexts. Therefore, there is an urgent need to utilize qualitative research methods, such as grounded theory, to explore how this dynamic perception process reciprocally shapes individual behavioral tendencies. This will uncover the micro-dynamic mechanisms and macro-pattern construction laws.

To address these gaps, this paper leverages the strengths of grounded theory in deep exploration and theory construction. Through field research and an extensive review of online resources, we have systematically collected and organized various dimensions of rural tourism environmental perception. Our study focuses not only on the in-depth analysis of stakeholders' multiple perception factors, including the rural physical, cultural, and social environments but also on the complex relationships that emerge among these groups over time and across changing contexts. By employing coding, categorization, theoretical saturation, and other grounded theory methodologies, this paper aims to extract the core components of rural tourism environmental perception and their interaction mechanisms. Furthermore, we endeavor to construct a theoretical model that accurately reflects the diverse subjective experiences of stakeholders. Additionally, this paper incorporates a localized perspective, emphasizing unique perception dimensions within the context of Chinese rural tourism, such as rural heritage protection, community participation, and local cultural inheritance. Ultimately, our goal is to facilitate the seamless integration of theory and practice, proposing targeted and practical strategies for optimizing the rural tourism environment. This will drive sustainable and healthy growth within the rural tourism industry.

3. Research design

3.1. Research object

After identifying the research questions, theoretical sampling was conducted to select representative cases for in-depth analysis [38]. In this study, Beishan Village, Zhuhai City, Guangdong Province, was chosen as the research sample. Beishan Village is situated in the southeast of the intersection of Zhuhai Avenue and Nanwan Avenue, Nanping Town, Zhuhai City [39]. It was established during the Han Dynasty and covers an area of approximately 5 square kilometers (Fig. 1). Located just 2 km south of Macau, the village features nearly 90 well-preserved historical residential buildings and 11 existing ancestral halls [40]. Most of the historical buildings date back to the territory expansion during the Qianlong period [41]. The overall architectural layout is relatively concentrated, exhibiting a complete and clear form. In 2009, it was designated as a famous historical and cultural village in Guangdong Province (Fig. 2).

The successful hosting of the 2010 Music Festival in Beishan drew artists and tourists from around the globe, attracting an audience of 120,000 in five years [42]. Cultural and creative industries have rapidly converged in Beishan Village. In 2014, the Zhuhai Municipal Government issued the "Concept Planning for Urban Renewal in the Beishan Area of Zhuhai". Under the government's guidance, Beishan Village has gradually undergone renewal and transformation, while prioritizing protection [43]. In 2015, the Ministry of Housing and Urban-Rural Development of Guangdong Province, along with other cultural departments, jointly selected Beishan Village as one of the inaugural provincial traditional villages. Beishan Village is considered an exemplary model for the transformation of rural areas into tourism spaces. However, due to the renewal of the rural spatial environment, there are urgent issues that need to be addressed between villagers, settled businesses, and the government, such as inadequate infrastructure, poor store leasing practices, and management challenges.



Fig. 2. Real environment space photos of Beishan Village.

Hence, the reasons for selecting Beishan Village as the research sample are as follows: 1. Typicality and representativeness. Among the numerous urban villages in Zhuhai undergoing micro-renewals, Beishan Village emerges as one of the most prosperous traditional villages, showcasing a harmonious blend of traditional village aesthetics and creative industrial parks. 2. Availability of research data. Beishan Village offers a diverse range of survey subjects, including villagers, businesses, and tourists, facilitating in-depth interviews. 3. High sample selection compatibility. With its rich historical and cultural heritage, Beishan Village has retained a considerable number of historical buildings and traditional characteristics. It is part of the first cohort of traditional villages in Guangdong Province, holding significant practical importance and value for studying rural environmental perception.

3.2. Research methods

The revitalization of the rural environment and industries has sparked renewed vigor in many rural regions, including Beishan Village in Zhuhai City, manifesting in increased tourist traffic and a growing number of returning residents. A profound comprehension and impartial assessment of rural environmental perception have emerged as a crucial aspect of decision-making for villagers, businesses, and governmental departments, aiming to foster sustained rural prosperity and development. This study focuses on Beishan Village, Zhuhai City, Guangdong Province, China, recognized for its wealth of historical and cultural heritage, distinctive natural resources, and an original model of integrated rural industry development. Utilizing Grounded Theory, we systematically investigate the essence and traits of rural tourism environmental perception. Our objective is to dissect the distinctive manifestations and interactive mechanisms of rural tourism environmental perception in Beishan Village, particularly in the context of the convergence of ecotourism, industrial tourism, and rural tourism. This exploration offers fresh perspectives for theoretical research and provides invaluable strategic direction for stakeholders involved in practical operations and planning management, thereby promoting enduring sustainable growth in rural tourism and beyond.

Grounded Theory, introduced by American scholars Glaser and Strauss in 1967, is a qualitative research method that aims to derive theories from data [44]. Over time, scholars like Strauss and Corbin, Charmaz, and others have evolved the methodology, giving rise to procedural Grounded Theory and constructive Grounded Theory, building upon the classic approach [45]. In this study, we integrate the tenets of all three schools, primarily relying on the data analysis framework of classic Grounded Theory, supplemented by the causal structures of procedural Grounded Theory. Our methodology involves problem emergence (through literature review, field research, and note-taking), data collection (via theoretical sampling and interviews), data processing (incorporating open coding, selective coding, and cognitive mapping), theoretical coding (to achieve theoretical saturation), and ultimately, theoretical testing. This rigorous bottom-up approach allows us to construct a comprehensive theory (Fig. 3).

3.3. Data collection and processing

After identifying the research questions and specific cases, this study employed a combination of primary and secondary data, encompassing in-depth interviews, participatory observation, and network data analysis, to reinforce data triangulation [46]. Through in-depth interviews, we obtained a total of 23,000 words of interview transcripts and 502.43 min of audio recordings. Additionally, eighty-three photographs were captured via participatory observation, and 21,553 words of comments along with 231 photographs were gathered from online textual materials.

Initially, the research team examined historical documents, local chronicles, demographic information, and online reviews about Beishan Village, aiming to grasp the fundamental information about the survey site. Between March 6th and July 25th, 2023, the team conducted six on-site interviews to acquire first-hand data. The primary data were systematically organized, analyzed, annotated, and coded, and conceptual categories were subsequently summarized. For selecting interview subjects, purposive random sampling was utilized to identify villagers, businesses, and tourists who possessed a comprehensive understanding of village development and environmental transformation for in-depth interviews. These subjects were numbered and documented. The final sample size, determined based on the principle of theoretical saturation, consisted of 22 respondents, labeled N.01-22 (Table 1), with interview durations varying from 15 to 40 min.

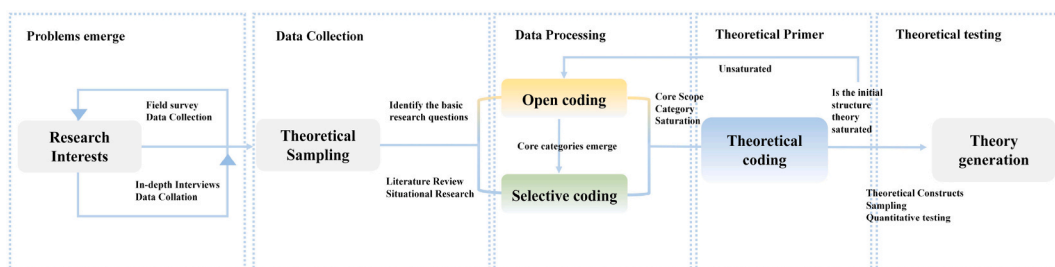


Fig. 3. Flow chart of grounded theory.

Table 1
List of interviewees.

Interviewees	Number	Gender/Age	Occupation	Interviewees	Number	Gender/Age	Occupation	
Residents (Local)	N.01	Female/53	Freelance	Tourists	N.12	Male/32	Company owner	
	N.02	Male/48	Fruit store owner		N.13	Male/23	Company employee	
	N.03	Female/44	Shopkeeper		N.14	Female/19	University students	
	N.04	Female/38	Teahouse owner		N.15	Male/19	University students	
	N.05	Male/33	Teahouse staff		N.16	Female/26	Doctoral student	
	N.06	Male/29	Mahjong restaurant owner		Businesses (Local)	N.17	Female/46	Tea and fruit store owner
	N.07	Female/48	Freelance			N.18	Female/38	Tea and fruit store clerk
Residents (Field)	N.08	Female/42	Tailor store owner	Businesses (Field)	N.19	Male/45	Art curator	
	N.09	Male/28	Part-time worker		N.20	Male/29	Nail salon owner	
	N.10	Female/45	Kiosk owner		N.21	Male/40	Ho Hon Kee salesclerk	
	N.11	Female/38	Kiosk clerk		N.22	Female/32	Tea store owner	

4. Rooted theoretical data analysis

4.1. Open coding

Open coding represents the initial phase of grounded theory coding, encompassing the gathering and systematization of data about the research subject matter. This involves extensive fieldwork and online research to consolidate and harmonize diverse information streams. All pertinent data is documented and coded in alignment with its original context. It is imperative to steer clear of personal biases during this process and strive to accumulate a substantial amount of raw data. Leveraging on-site interview data and online textual information, we conducted in-depth interviews with residents, businesses, and visitors in Beishan Village, prioritizing relevance, and suitability. Furthermore, we scraped pertinent feedback from platforms like Xiaohongshu and Dianping for text data compilation, coding, and conceptual categorization. This undertaking was executed by a team of five coders. In total, we conducted 28 on-site interviews, of which 22 yielded substantial content, resulting in 4268 words of unaltered feedback and 101 preliminary concepts. From Xiaohongshu and Dianping, we amassed 1922 articles, extracting 178 pertinent reviews that generated 21,553 words of original comments and 583 initial concepts. By amalgamating interview and online data, we obtained 25,821 words of unmodified feedback and distilled 684 preliminary concepts. Given the expansive nature of the raw data, [Table 2](#) offers a glimpse into the coding procedure ([Table 2](#)).

4.2. Selective coding

Selective coding constitutes a process of deeper theorization following open coding. Based on the research objectives and inquiries, data undergoes selective screening and summarization for categorization and theorization, aiming to unravel causal relationships and inherent logic among various categories and to forge logical connections between codes. By sorting through the amassed data and textual materials, this study reorganized the 4268 words of unaltered comments and 101 preliminary concepts garnered from open coding of the interview transcripts. This resulted in the derivation of 36 first-level codes and 65 s-level codes ([Table 3](#)). Similarly, from the online texts, the 21,553 words of original feedback and 583 initial concepts obtained via open coding were restructured, yielding 31 first-level codes and 120 s-level codes ([Table 4](#)). Owing to the vast volume of raw data, only a segment of the coding process is exhibited.

4.3. Theoretical coding

Theoretical coding, the culminating step in the coding process, entails a higher level of theoretical generalization and the identification of core categories derived from open and selective coding. This stage constructs a theoretical framework by utilizing all the tags, concepts, and categories extracted from the raw data. Through iterative comparison, induction, and integration, it elucidates the relationships among various categories. By tracing the logical connections between initial concepts, sub-categories, and main categories, the process of environmental perception factors in Beishan Village is articulated in a coherent storyline, thereby formulating the theoretical model of environmental perception in Beishan Village ([Fig. 4](#)).

The narrative of the model's primary categories comprises atmosphere perception, space perception, place perception, and visual perception as the primary elements of the model. Impressionability serves as the pivotal pathway of the model, while experience perception, cultural perception, historical perception, and interactive perception constitute the subsequent elements. The fundamental factors influencing this storyline framework are natural geographical conditions, historical and cultural backgrounds, institutional management practices, and urban development initiatives. This investigation delves into the sub-categories and aligns the main categories to forge a theoretical model of tourism environmental perception specific to Beishan Village.

4.4. Result saturation and test

The theoretical coding phase consists of 32 theoretical codes and 9 logical relationships, achieving saturation. Upon analyzing and

Table 2
Excerpts of open coding of textual material.

Number of people	Coding (concept)	Number	Original Comments
1	Specially come to play; Suitable for children; Convenient transportation; Very good location; Regional characteristics; More interesting than commercial stores; Preserves a lot of historical buildings.	7	This destination is particularly popular for leisure activities, offering a designated play area for children. I discovered this location through social media buzz and online reviews. My family resides in Zhongshan, and we drove over to explore. I believe that the old factory buildings hold significant potential for cultural tourism projects. The location itself is highly appealing, situated in a bustling district, and distinguishes itself through its building renovation and specialized stores. As we embark on renovating industrial plants, we have visited numerous nearby renovation sites. Unlike traditional village renovations, which often have limitations and frequently result in demolitions, this location presents unique opportunities.
2	The hygiene of this area was very poor before the renovation; Now the stores are very distinctive; The overall environment is more comfortable than the commercial plaza; The flow of people is great; The control measures are loose; The stores are all self-employed.	6	We are an international retailer that has been operating in this location for two years. Prior to this, we were based in North Mountain Village. Previously, the environmental hygiene in this area was inadequate, with garbage strewn everywhere. However, this year, garbage cans have been installed, significantly improving the cleanliness of the surroundings. Earlier in the year, before the arrival of other stores, Urban Village exhibited a more distinctive character. Occasionally, visitors would come to experience the novelty of the area, finding the shopping environment here more comfortable compared to that of a typical shopping mall. Currently, the signage for merchants is not sufficiently clear, with many stores lacking proper signage. Only a few well-known stores provide clear directions, making it difficult for many visitors to locate specific stores. Furthermore, this place, which used to be a predominantly rural area, now hosts numerous card game parlors and experiences heavy traffic. However, there are very few community activities organized. The village council's management is lax, as evidenced by the lack of celebration during major holidays such as October 1st, where even the national flag was not displayed. Each merchant operates independently, lacking a unified atmosphere during significant occasions.
3	Sanitary environment is not bad; Attracts many young people; Prices are higher in the renewed area.	3	I have been working in this area for several years and have witnessed significant changes in the local environment and business landscape. The area has become a popular destination for both tourists and investors, attracting a steady stream of visitors during holidays and entrepreneurs seeking business opportunities. However, the consumption prices in this region have escalated significantly, creating a noticeable disparity between the updated and non-updated sections of the area. This dichotomy is reflected in the contrasting business atmospheres within the same vicinity. One notable aspect is the influx of foreign business owners, such as the proprietor of a prominent store who hails from Macau. This diversity in business ownership adds to the unique character of the area. While there are no standout locations that are exceptionally superior or inferior, the area exhibits a degree of uniformity in terms of its commercial offerings and operational models. The demographics of the area have also undergone changes, with a noticeable increase in the young population. This shift is likely attributed to the vibrant social and commercial activities in the region. Additionally, it appears that the management of the area is split between a second-hand contracting company and the local development authority, resulting in a mixed ownership structure. In terms of safety and hygiene, significant improvements have been made in recent years. The security measures in the village have been strengthened, and the overall cleanliness and sanitary conditions have vastly improved. Furthermore, infrastructure upgrades, such as road repairs and resurfacing, have enhanced the accessibility and aesthetics of the area.
4	Older districts are updated more slowly; Historic buildings are given new use; Income has increased; Road drainage system is problematic; Top-down approach to updating; Poorly done infrastructure; Regular folklore events; Many historic buildings preserved; Historic celebrities; Various cuisines.	10	Over the past three years, our store has transitioned from being a tea restaurant to being a tea and fruit store due to the epidemic. This shift in business model has led to an increase in income. However, despite this positive development, we face several challenges related to the local infrastructure and environment.

(continued on next page)

Table 2 (continued)

Number of people	Coding (concept)	Number	Original Comments
...		<p>Firstly, the village has not undergone significant updates in the past five years, resulting in an outdated infrastructure that is inadequate to support the growing business needs of the area. Specifically, the road quality is poor, resembling a “tofu dregs” project that is neither smooth nor flat. Heavy rainfall often leads to flooding in our store, which is in a low-lying area. Despite our efforts to raise this issue with the authorities and seek solutions, there has been inadequate implementation of measures to address the problem. As a result, we have had to take matters into our own hands and make some alterations to mitigate the flooding. Furthermore, the government’s apparent shirking of responsibility in maintaining and improving the local infrastructure is concerning. Prior to the construction of the road, our property was not prone to flooding. However, now, even our own homes are at risk. Another challenge we face is the large influx of people to the area, which has put a strain on the already inadequate infrastructure. This situation has negatively impacted business, as potential customers are often deterred by the poor conditions. In conclusion, while our business has shown resilience and adaptability in the face of adversity, the ongoing issues with local infrastructure and flooding continue to pose significant challenges. There is an urgent need for the government and relevant authorities to take proactive measures to address these problems and create a more conducive environment for businesses and residents alike.</p>
...

Table 3
Selectively coded excerpts of interview data.

	First-level coding	Quantity	Second-level coding	Quantity
Interview text	Site attraction; Personal emotions.	2	Come here to play; Come many times; Well worth watching.	3
	Net celebrity punch card; Site inclusion.	2	Attracts a lot of young people (3); Suitable for children; Suitable for punching live.	3
	A good geographical location; Convenient transportation.	2	Good location (2); Convenient transportation.	2
	Decoration style creativity; Atmosphere sense.	2	The shop is very distinctive (6); Have regional characteristics (3); More interesting than the mall; Comfortable overall environment; The transformation is not bad; It’s interesting; There was smoke from fireworks.	7
	Historical landscape; Building reuse.	2	Preserving many historic buildings (5); New use functions of historical buildings (3); Retain the original historical style and environmental structure; The architecture is beautiful; Lots of old stuff.	5
	The environment of the old area is bad.	1	The area had poor sanitation before the renovation; The environment of the old area is bad; The environment is complex.	3
	The flow of people.	1	Large flow of people (2).	1
	Loose management system; Individual business.	2	The overall control measures are loose; The shops are self-employed; Beishan Art Museum is well managed; Disordered management in the village.	4
	Personal feelings; Environmental state.	2	The health environment is good (2); Quiet environment (2); Suitable for staying quietly.	3
	High prices in new districts; Increased turnover.	2	The updated regional prices are relatively high (3); Resident business income has increased.	2
	Update speed.	1	The renewal speed of the old area is relatively slow.	1
	Infrastructure construction.	1	Problems with road drainage; The infrastructure is not doing well; The old village is low-lying and prone to flooding; The old village building facilities are messy; The old village streets are uneven; Too few parking Spaces.	6

contrasting the remaining interview transcripts and online textual data, no novel concepts, categories, or logical relationships emerged, as all were encompassed within the existing coded dataset. Consequently, it can be inferred that the theory underlying the “Beishan Village Tourism Environmental Perception Model” has reached saturation.

5. Influencing factors of tourism environment perception in Beishan village

The environmental perception model of Beishan Village precisely pinpoints four primary factors influencing environmental

Table 4
Selective coding excerpts of network data.

	First-level coding	Quantity	Second-level coding	Quantity	
Web text data	Personal feelings; Environmental state.	2	The environment is very pleasant (17); The environment is very relaxing (12); The atmosphere is very good (10); Very human fireworks smell (9); Fresh and comfortable (7); Romantic and warm environment (7); Comfortable and fun (6); Quiet and beautiful environment (4); The mystery of Soviet-style garden (3); Beautiful environment (4); A clean and elegant atmosphere (3); Makes people feel good (4); The environment is very healing (6); Highly ornamental (3); The environment is simple and elegant (2); A very attractive place (2); Full of memories (2); The environment is particularly sensory (2); The environment is very Jiangnan atmosphere.	19	
	The uniqueness of design method; The creativity of the decoration style.	2	Unique design (19); Design sense is not obtrusive, integrated with the environment (3); Obvious historical traces (4); Preserving the historical elements of the old building (3); Drawn by design (3); The store design is very advanced (4); Japanese typhoon and Lingnan historical architecture integration (2); The decoration style is very cute (2); Space compound; Store design is very careful; The remodeled shops have Southeast Asian characteristics; It has the feeling of Wuzhen; The store design is very ritualistic; An interesting shop; The environment design is simple and fresh; The light is good; A stylish French restaurant.	16	
	Internet celebrity shop; Cultural landmark; Art space.	3	Old warehouse (26); Day Shop (20); Yang's Grand Ancestral Hall (20); Stop cloud Study (12); Medicinal Emperor Temple Herbal Tea (9); Beishan Compound (8); Beishan Guild Hall (6); Sanshi Teahouse (4); Nanping Manman (2); Summer Rain Courtyard (2); This space; Lar French Tavern; Image art space; The free market; Boutique art coffee shop.	15	
	Historical objects.	1	A wealth of vintage items (13); Beautiful and interesting Items (3).	2	
	Cultural heritage; Environmental atmosphere.	2	Retro art (14); Retro nostalgia (8); Long history (7); Quaint (7).	4	
	The diversity of spatial functions; The richness of space activities.	2	Literature and art gathering place (17); Various types of shops (10); Various exhibitions (8); Treasure spots (4); Various cultural and creative Spaces (2); Occasional sharing sessions (2); Urban villages (2); Famous historical and cultural villages; Antique furniture; Zhuhai cultural and creative industry base.	10	
	Historical and cultural connotation; Humanistic value.	2	The collision of history and modernity (12); Combination of tradition and art (4); The combination of humanities, arts and commerce (2); Spreading Chinese culture (2); Has a unique cultural heritage and the mark of The Times (2); The vitality of national culture; It has high artistic value.	7	
	Folk customs culture; Popular culture; Festivals and events.	3	Cross talk (2); Spring and respect the elderly; Rich life customs and activities; Beishan International Jazz Festival; Beishan CAI Li Buddha victory dragon Lion Group.	5	
	Social interaction; Convenient communication.	2	Business attitude is very good (5); Everyone is very approachable; The locals are simple; The neighbors are very friendly.	4	
	Full of commercialization; The environment in the old town is very bad.	2	Serious commercialization (2); Internet celebrity gathering place (2); Internet celebrity village; The renovation of old buildings is only a small part; The environment of unrebuilt places is bad; Not much space.	6	
	Historical figures; Red culture.	2	The ancient village produced a Dushi and a general, and the modern revolutionary pioneer Yang Pao 'an; The Yang family will later live in seclusion in Beishan ancient village.	2	
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perception: natural geographical conditions, historical and cultural backgrounds, institutional management practices, and urban development initiatives. Amongst these, natural geographical and historical-cultural factors constitute external inherent determinants, whereas institutional management and urban development elements represent internally formulated factors. These factors mutually influence and constrain each other. The four key factors can directly or indirectly impact the audience's perception and potential impression of the tourism environment in Beishan Village.

Natural geographical factors constitute the fundamental components driving the transformation and development of the environmental space in Beishan Village. These factors form the basis for integrating primary and subsequent elements, encompassing climatic conditions, traffic accessibility, hydrological features, and the tourism environment. Specifically, Beishan Village is situated within a subtropical monsoon marine climatic zone, characterized by a pleasant and mild climate throughout the year, conducive to promoting physical and mental relaxation. As the lone urban village industrial park in Zhuhai City, Beishan Village is centrally located and surrounded by high-rise buildings, enjoying convenient transportation and proximity to a vibrant business district. This strategic location has garnered significant investor and visitor interest. Through meticulous micro-renewal efforts, Beishan Village has introduced novel functionalities while preserving the original architectural space layout, optimizing useable space, and enhancing road systems. The serene, green environment offers tourists and villagers an urban-rural experience distinct from typical urban spaces. Nevertheless, certain infrastructure enhancements have not fully mitigated environmental and spatial challenges posed by natural conditions, such as flooding in low-lying areas. In conclusion, natural geographical factors play a pivotal role in shaping environmental perception and can profoundly influence the interplay with other perceptual elements.

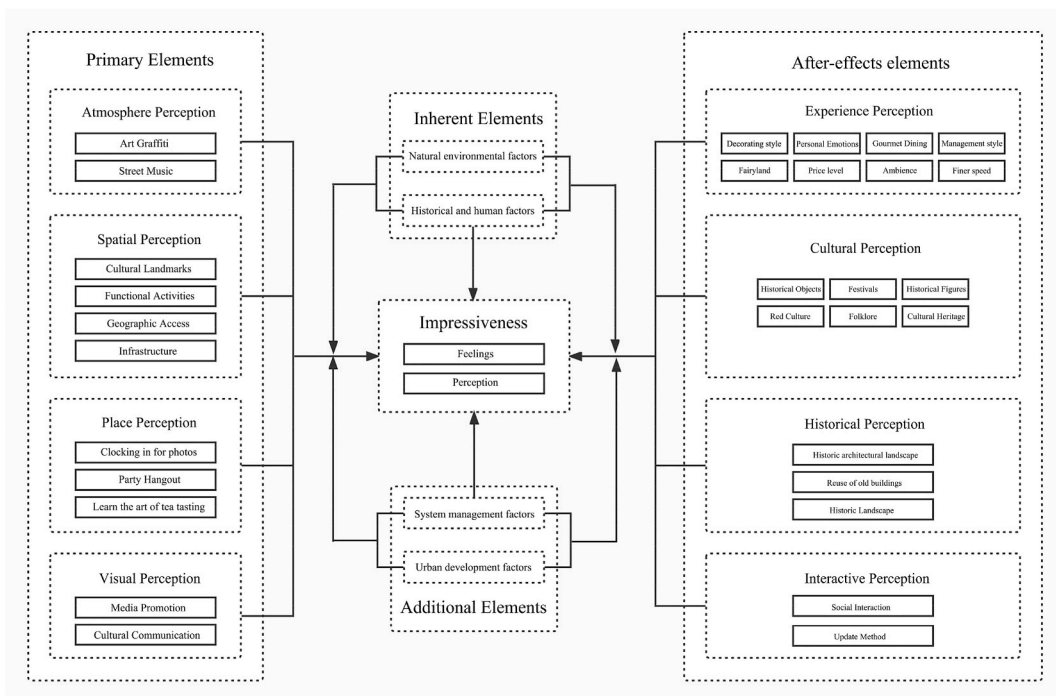


Fig. 4. Theoretical model of tourism environment perception in Beishan village.

Historical and cultural factors, encompassing era, historical significance, artistry, and regionality, constitute the core of human activities and form an essential component of Beishan Village’s reuse value. The village’s era and historical significance are primarily evident in its overall style and characteristics. Beishan Village retains original village traces, including numerous historical buildings, ancestral halls, and landscapes, creating a rich historical ambiance that contrasts sharply with the surrounding urban landscape. Artistry manifests in various forms, including street graffiti, concerts, exhibitions, and cultural and creative shops, highlighting Beishan Village as the only creative industrial park in Zhuhai originating from a traditional village. Regionality is reflected in local characters, artifacts, cultural heritage, religious rites, and folk activities. Historically, Beishan Village has produced military commanders, and rumors suggest descendants of the famous Yang family, a prominent military family in Chinese history, once resided here in secrecy. Moreover, the village boasts a wealth of preserved historical buildings, notably the Yang Ancestral Hall, built during the Tongzhi period of the Qing Dynasty, which remains the largest ancestral hall in Zhuhai. Traditional festivals, such as the spring festival for the elderly, and unique folk customs like “turning on the lights,” “tying the lights,” “sending the stove,” and “throwing fried doughnuts,” are celebrated annually, showcasing the village’s rich cultural heritage.

Institutional management encompasses several critical elements, including marketing management, regional operation management, infrastructure management, and safety regulation management. These elements are intricately linked to the overall “impressiveness” of the rural environment and have implicit impacts on users’ experiences. Marketing management involves the strategic dissemination of sales information and the sale of goods through various media, including the Internet, mass media, and printed materials. Regional operation management refers to the oversight of business practices within a specific area, aiming to enhance visitors’ tour experience expectations. Infrastructure management entails the provision of essential public facilities for residents, such as transportation, utilities, green spaces, educational and cultural amenities, and healthcare services. A robust infrastructure plays a pivotal role in fostering economic development and spatial construction. Lastly, safety regulation management involves the development of precautionary measures for potential safety incidents throughout the tour process and the mitigation of unsafe conditions within the region. Through field research and online data analysis, our team observed that Beishan Village has effectively utilized major internet media platforms for marketing, supported by a professional photography team, positively impacting its tourism popularity. Nevertheless, there are institutional management gaps that need addressing. For instance, some businesses have raised concerns about the lack of signage for centrally located stores, while popular stores enjoy more prominent signage. Additionally, there are issues with road construction and drainage facilities, leading to rainwater backflow during rainy days, for which the village committee has not provided adequate solutions.

Urban development encompasses several key elements that align with emerging trends, including the preservation of a downtown’s tranquility, the fusion of tradition and modernity, and the historical style coupled with functional rejuvenation. These elements are crucial for the precise positioning of villages within urban planning frameworks. The “sense of silence in the downtown area” is a distinctive advantage in Beishan Village’s development. In contrast to the bustling commercial districts that surround it, Beishan Village offers a serene environment, enriched by its floral and architectural aesthetics. This pristine natural setting draws significant attention. The “sense of trend combining tradition and modernity” is exemplified in Beishan Village’s ability to preserve traditional

customs and festivals while introducing contemporary events like the Beishan International Music Festival. This blend makes the village an attractive destination for entertainment, appealing to both young and older demographics, and injecting vitality into the community. The “sense of place with historical style and functional regeneration” reflects Beishan Village’s strategy of attracting investments based on its positioning as a creative industrial park. Many historical buildings in the village retain their original architectural features while adapting new functionalities. For instance, former factories have been repurposed as exhibition spaces and old buildings now serve as restaurants, study areas, and guesthouses.

6. Tourism environment optimization design strategy of Beishan village

Beishan Village serves as a pivotal model for the renewal and transformation of traditional villages in Zhuhai City. The village has undergone comprehensive changes, evolving from a backward, dull, shabby, and monotone historical style. The influx of creative industries has significantly contributed to rural development by enhancing capital, introducing advanced technologies, attracting talent, and improving the environmental space. However, this process has also presented numerous challenges and contradictions, exhibiting a spiral upward trend. Currently, based on an analysis of influencing factors derived from textual data and theoretical models, it is imperative to continuously optimize and adjust several aspects to promote the sustainable operation of Beishan Village’s environment. These aspects include infrastructure construction, brand image, management systems, rural sharing platforms, digital tours, and other related factors.

Improving infrastructure construction. Infrastructure plays a crucial role in shaping both the living environment and commercial activities in rural areas. In Beishan Village, particular attention is given to the water supply and drainage system, as well as the road signage system. Firstly, given the undulating terrain of Beishan Village, low-lying areas are particularly vulnerable to drainage issues. Implementing rational improvements can effectively mitigate natural disasters such as floods and waterlogging, thereby reducing potential damage to rural infrastructure and elevating the quality of life for villagers. Secondly, Beishan Village, renowned for its diverse business offerings, attracts a multitude of tourists. However, its winding roads pose navigation challenges. A robust road signage system is essential to safeguard the interests of local businesses, improve spatial navigation efficiency, and enable tourists to effortlessly locate businesses. This not only aids in increasing business visibility but also fosters the formation of business clusters, promoting commercial exchanges and cooperation. Furthermore, well-designed signage can enhance the visual aesthetics of the rural space and establish landmark features, further adding to the allure of commercial activities. Considering these prominent needs, Beishan Village must prioritize the optimal design of its drainage and road signage systems. This holistic approach will lead to dual benefits: an improved rural living environment and invigorated commercial activities. Such a comprehensive design strategy is pivotal in fostering a more sustainable, livable, and commercially vibrant rural tourism environment.

Shaping regional brand culture. The transformation of the Beishan Village Creative Industry Park into a commercially successful entity is undeniable. However, the influx of foreign businesses has led to a diversification of business forms, driving economic growth. Nonetheless, it is imperative to preserve the unique local history, culture, and natural resources to prevent the erosion of rural culture and the subsequent loss of its authenticity. This uniqueness encompasses elements such as regional traditional culture, the inheritance of handicrafts, and natural landscapes. By prominently showcasing these distinctive features, Beishan Village can cultivate a recognizable regional brand culture. For instance, the creation of “Yuniao Market” in Vanke Liangzhu Culture Village effectively aligns with the ancient Liangzhu cultural relics, echoes the evolution of the Liangzhu lifestyle, and harmonizes with contemporary business models, thereby emphasizing its distinct brand identity. Hence, tapping into the village’s unique brand holds significant importance in shaping its tourism environment. Accentuating the village’s exclusive culture, history, and traditions can foster rural tourism development, craft a distinctive perceived image, and establish a more alluring and competitive tourism landscape for the village.

Strengthening the institutional management system. Historically, the transformation and development of Beishan Village have followed a top-down approach, often neglecting the voices of the villagers themselves. To foster sustainable rural development, it is imperative to establish an institutional management system that respects and incorporates the participation and opinions of the villagers. Firstly, the institutional design must prioritize the creation of an open, transparent, and fair participation mechanism. This can be achieved by implementing regular citizen participation meetings, actively soliciting feedback, and establishing communication platforms to substantially reflect villagers’ participation rights in institutional management. Secondly, the institutional framework should align with the socio-economic characteristics of the village. This necessitates conducting comprehensive social surveys and research to tailor policies and regulations to the specific needs of the villagers. A one-size-fits-all approach must be avoided, emphasizing the diversity and unique challenges of rural development to ensure feasible and practical policies. Furthermore, a robust monitoring mechanism is essential to guarantee effective implementation and protect villagers’ rights. This entails the establishment of independent supervisory bodies, strengthening the rule of law, and providing accessible complaint channels. These measures serve to restrain and rectify any potential abuses of power or improper behaviors, ultimately safeguarding the legitimate rights and interests of the villagers. In conclusion, refining the institutional management system aims to foster holistic rural development, with villagers at its core. By implementing reasonable laws, regulations, and policies, we can fully respect and protect the participation rights and interests of the villagers, paving the way for sustainable transformation and healthy development in rural construction.

Establishing a rural sharing economy platform. Beishan Village, with its advantageous geographical location, exceptional transportation facilities, and substantial support from the Zhuhai Municipal Government, holds inherent strengths for the creation of a rural sharing economy platform. This platform has the potential to drive rural revitalization, foster coordinated economic growth, and ultimately enhance the quality of life for Beishan villagers while boosting the village’s economic dynamism. Initially, we should leverage Beishan Village’s strategic position as an urban village and its proximity to key transportation hubs. We propose introducing specific sharing economy services, such as marketing regional specialties and tourism services, to augment the appeal of the sharing

economy platform. Furthermore, capitalizing on Beishan Village's transportation infrastructure, we aim to develop a convenient and efficient transportation network. This network will facilitate the seamless operation of the local sharing economy, including the establishment of a streamlined logistics system and the adoption of shared rapid transportation solutions. In terms of policy backing, we will capitalize on Zhuhai City's tax incentives, entrepreneurial support, technical training, and other relevant policies. These measures are designed to encourage both enterprises and individuals to invest and initiate businesses in Beishan Village. Additionally, we recommend collaborating with pertinent government departments to establish an information-sharing mechanism. This mechanism will ensure that the government remains informed and responsive to the evolving needs of Beishan Village's sharing economy platform, providing targeted assistance as necessary.

Creating a digital touring experience. Focusing on the intricacies of Beishan Village's internal transportation system and the convenience of its existing tour routes, we propose enhancing the tourism service experience through the practical application of network technology. Firstly, the complexity of Beishan Village's internal transportation poses significant challenges for tourists. Due to the village's complex geographical environment and the lack of comprehensive transportation planning, tourists often encounter redundant or overlapping routes while navigating within the village. To address this, we suggest establishing a digital transportation information platform that provides real-time traffic updates and navigation guidance. This will assist tourists in efficiently planning and selecting their tour routes. Secondly, by leveraging big data analytics to collect tourists' movement patterns and preferences, we can gain deeper insights into their behavioral patterns and needs. This data-driven approach will facilitate the optimization of the rural environment, spatial layout, and improvement of service efficiency. Additionally, it will provide valuable data support for future development, promoting refined management of rural tourism. Furthermore, the integration of network technology can significantly enhance the rural tourism service experience. By establishing a digital tourism service platform tailored for Beishan Village, tourists can obtain a real-time overview of the village's spatial environment, including attraction ticketing, visitor counts, parking availability, store opening hours, and locations, among others. This will enable tourists to avoid queues and waits, enhancing their overall experience. Additionally, the online platform can provide rich cultural, historical, and geographical information, deepening tourists' understanding and appreciation of Beishan Village. In summary, the design strategy of building a digital platform can not only elevate tourists' travel experiences but also contribute to promoting the digitization and development of the village. By improving the internal transportation system, offering personalized tour planning, and providing digital tourism services, the overall image and attractiveness of the village can be significantly enhanced. Digital rural tourism presents new opportunities and momentum for rural economic development, encompassing not only the prosperity of rural tourism but also the sustainable development of rural communities and the improvement of the socio-economic landscape.

7. Discussion and conclusion

7.1. Discussion

In this study, we applied Grounded Theory to conduct an in-depth analysis of the multifaceted perceptions of the rural tourism environment in Beishan Village, Zhuhai City. Our field research encompassed three primary stakeholders: residents, tourists, and businesses, revealing several key insights. Our findings indicate that the tourism environmental perception of Beishan Village manifests at multiple levels, including natural environmental aesthetics, local cultural heritage, community interaction and participation, and service quality perception. Notably, the efficacy of infrastructure development and management systems is pivotal in boosting satisfaction among these three groups with the environmental space and their eagerness to engage in tourism activities.

The scenic beauty and rich historical and cultural heritage of Beishan Village significantly contribute to a positive perceptual experience for both tourists and local businesses. This observation aligns with existing theories on rural tourism environmental perception [22,23,32], emphasizing the crucial role of environmental quality and cultural distinctiveness in fostering a memorable tourism experience. Furthermore, our study innovatively highlights that the level of collaborative engagement among residents, tourists, and businesses in rural transformation and development is a vital catalyst for the successful implementation of the "industrial park + tourism" model in Beishan Village. This underscores the effective utilization of Grounded Theory in examining the relationship between community participation perception and behavioral tendencies in the realm of rural tourism. In comparison to similar studies, although there is some overlap with previous research in identifying perceptual evaluation factors such as shared service and environmental perception, authenticity perception, sensory landscape, and visual perception [27,29,34,36], our methodology marks a significant advancement. Unlike previous approaches that relied solely on preexisting evaluation frameworks [47–49], we adopted a bottom-up analytical approach using primary data. This allowed us to develop a theoretical framework tailored to our specific research subject, ensuring that our findings are both relevant and targeted.

This study extends beyond the relatively constrained viewpoints presented in the current literature [22,50,51] by adopting a multifaceted perspective. It comprehensively considers and integrates the shared perceptual evaluations of residents, tourists, and businesses regarding the rural physical and socio-cultural environments. This approach underscores the distinctive strengths of China's rural tourism environment at the socio-cultural level. While prior research primarily focuses on the value of natural and cultural resources in rural tourism [28,36,37], our study employs Grounded Theory to delve deeper into how these resources specifically and intricately influence the perceptual judgments and behavioral intentions of diverse stakeholders.

Through an in-depth interpretation of interview transcripts and online narratives, we postulate that the proactive engagement of residents and businesses in the process of rural transformation and upgrading has forged a dual-engine mechanism. This mechanism activates the inherent vitality of the rural economy and reinforces community cohesion, offering a novel addendum to prevailing research perspectives [52,53]. Residents' participation in the conception, maintenance, and service aspects of rural tourism projects

not only reinforce their sense of belonging to their environment and culture but also significantly contributes to the personalization and differentiation of rural tourism offerings. The proactive amalgamation of businesses, through the introduction of contemporary market-driven operational concepts and pioneering business models, has effectively augmented the quality and competitiveness of rural tourism products, thereby drove the structural transformation and upgraded of rural industries. This mechanism exhibits a bidirectional feedback loop in practice: on one hand, the proactive investment of residents and businesses elevates the overall allure of rural tourism, drawing more tourist traffic, generating economic benefits, and further stimulating their enthusiasm and spirit of innovation; on the other hand, the successful execution of rural tourism endeavors and the accruing economic benefits, in turn, bolster community infrastructure, enrich the quality of life, and attract a broader base of villagers to engage in the development of rural tourism and allied industries, forming a virtuous cycle of sustainable progress. Hence, this mechanism plays a pivotal role in advancing rural economic recovery and sustainable growth strategies. Its impact extends beyond augmenting the perceptual experience of the rural milieu, profoundly influencing the innovation and reconstruction of rural economic and social development paradigms. Future research and practical implementations urgently require further exploration and promotion of this participatory development model. It is imperative to ensure the consistent and profound engagement of residents and businesses through policymaking, education, and training, to foster profound integration and collaborative advancement between rural tourism and rural economic development.

7.2. Conclusion

This study utilizes grounded theory to explore the diversity of environmental perceptions in rural tourism and its intrinsic connection to the transformation and sustainable development of rural tourism destinations. Through an in-depth analysis of the perceptions held by residents, tourists, and businesses in Beishan Village, Zhuhai City, several key findings emerge. Primarily, it is revealed that four dimensions—natural geographical features, historical and cultural heritage, institutional management efficiency, and urbanization process—play a pivotal role in shaping the rural tourism experience. Specifically, factors such as atmospheric perception, spatial perception, visual aesthetics, experiential perception, cultural identity, historical cognition, interactive communication, and a sense of place belongingness significantly influence participants' (residents, tourists, and businesses) overall perception and behavioral intentions towards the rural tourism environment in Beishan Village.

Moreover, the study uncovers that the perception of the rural tourism environment in Beishan Village encompasses more than just the appreciation of natural landscapes and local culture. It is enriched through active engagement in local community activities, where community-oriented tourism interactions effectively strengthen tourists' emotional ties and local attachment, thereby increasing their satisfaction and likelihood of repeat visits. Additionally, the study identifies differences in tourism environmental perception between rural residents and local businesses, which are primarily reflected in the infrastructure level, brand image building, and the efficiency of the management system. Based on these findings, this study proposes targeted optimization strategies aimed at promoting high-quality development of rural tourism destinations. These strategies include strengthening infrastructure development, fostering a regional characteristic brand culture, enhancing the institutional management system, establishing a rural sharing economy platform, and innovating digital tourism experiences.

In summary, this study offers both theoretical guidance and practical insights crucial for the transformation and sustainable progress of comparable rural regions in China and beyond. Our research not only deepens the comprehension of the perception mechanism in the rural tourism context but also presents precise and implementable strategic directions for the continued advancement of Beishan Village and other analogous rural tourism locales. Prospective areas of exploration could include examinations of disparities in rural tourism environmental perception across various regions, cultures, and ecological settings. By conducting horizontal comparisons and longitudinal in-depth analyses, we can extract a generalized perception model applicable to multiple rural tourism contexts. Additionally, further investigation is warranted on methods to scientifically translate perception elements into tailored tourism planning strategies, detailed product designs, and suggestions for service improvements. This will enable us to meet the growing and diversified demands of the global rural tourism market, ultimately promoting a higher quality and more sustainable trajectory for the entire industry.

Nonetheless, despite utilizing grounded theory to unveil the underlying structure and impact mechanism of rural tourism environmental perception—specifically through an in-depth examination of Beishan Village in Zhuhai—we acknowledge inherent limitations in our research approach. Grounded theory, during the data coding and theory-building phases, can be influenced by researchers' subjective interpretations and theoretical abstractions. This might introduce biases in accurately capturing the nuances of tourist perception. To bolster the reliability and validity of our findings, future studies could incorporate quantitative methodologies, such as large-scale questionnaire surveys and big-data analyses. These methods can mitigate subjective factors and allow for cross-validation, thereby ensuring the stability and reliability of our theoretical model. Moreover, while this study centers on a specific case area, providing valuable insights into rural tourism environmental perception, its generalizability is confined. As such, it cannot be directly extrapolated to other rural tourism scenarios with distinct geographical characteristics. Consequently, broadening the geographical scope of our investigations to encompass a wider array of rural tourism regions will facilitate the construction of a more universally applicable theoretical framework for understanding rural tourism environmental perception.

Data availability Statement

The data associated with this study have not been deposited into a publicly available repository. The data associated with this study will be made available on request.

CRedit authorship contribution statement

Jianqiang Yin: Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Jingzhao Feng:** Resources, Project administration, Investigation. **Mengyan Jia:** Writing – review & editing, Visualization, Validation, Supervision, Software.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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