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Evaluation and Optimization Paths of Urban Underground Public Space Based on Thematization

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Abstract

Against the backdrop of the post-COVID-19 pandemic era, economic recovery is the most crucial task for countries worldwide. Through thematic design, underground public spaces can create spaces with unique themes and cultural atmospheres, attracting more citizens and tourists to visit and experience, promoting tourism and business development, and contributing to the recovery of the urban economy. In this paper, the IPA–Kano model is used to evaluate urban underground public spaces to understand the public's preferences for further renovation and optimization, and underground theme blocks located in Shanghai, Chongqing, and Beijing are selected for comparison. Then, based on an analysis of the relationship between design elements and users' subjective perception of underground theme blocks, three design elements, namely, basic, important, and attractive, are identified as having different impacts on underground theme blocks. Finally, the optimization path of the underground theme blocks is determined by integrating the actual performance of these three types of design elements. The study results point out that thematic storefront billboards and thematization of public facilities are the design elements that should be prioritized for improvement. The key elements affecting visitor satisfaction derived from this paper can be used as a guide for the design and renovation of similar projects in the future, as well as data support and a theoretical basis for future decision-makers.

Keywords: thematization; urban underground public space; evaluation; optimization paths

1. Introduction

The role and function of underground space are becoming increasingly apparent amid global high-density urban development. For example, underground space can reduce pressure on land development and improve overall urban space utilization. Functionally, underground public space can provide citizens with more activities and entertainment venues; for example, underground shopping malls, shopping centers, and other commercial facilities can offer residents a full range of shopping, leisure, and entertainment experiences [1]. In terms of transportation, underground public space can extend transportation facilities, ease pressure on surface transportation, and improve urban traffic conditions [2]. In terms of spatial environment creation, it not only extends the city's activity space and improves the ecological environment but also enhances the city's planning layout and increases its aesthetics and practicality [3]. In terms of safety and refuge, underground public space can serve as an emergency refuge during natural disasters, wars, and other

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emergencies, providing better protection and stability. Well-designed underground public space can improve a city's disaster prevention and mitigation capacity and enhance its resilience [4]. The role of underground public space as a composite functional space in the city is becoming increasingly evident and essential [5].

After global recognition of underground space's influence, many countries, including China, have built numerous underground public spaces, often relying on rail transit, which has either become part of the urban pedestrian system or supplemented aboveground businesses [6]. However, due to the impact of offline consumption after the COVID-19 pandemic, including the impact of online consumption on offline consumption and the various crises after the COVID-19 pandemic, many built underground public spaces are now poorly operated, underutilized, or closed down. The space's attractiveness decreases daily [7]. Accordingly, some cities have tried to increase the attractiveness of underground public spaces by creating themed spaces to attract more people for consumption and entertainment, which differs from the traditional business model of supplementing them with above-ground businesses. Some studies confirm that thematizing underground public spaces not only enhances their attractiveness and attracts more people and attention, but also promotes related industries such as tourism, culture, and commerce, thereby revitalizing underground public spaces [8]. Therefore, thematic shaping of underground public space is an issue that urgently needs attention and research today.

As urban rail transit networks expand underground, planning and renewing underground public spaces have become increasingly intertwined with rail transit optimization and TOD. In recent years, related research has expanded from route and operational optimization to include transit network design, TOD land-use allocation, dynamic passenger flow analysis, and multi-objective optimization of underground spaces [9–13]. Related methods have also gradually evolved from traditional evaluation approaches to data-driven methods such as multi-objective optimization, simulation, and machine learning. Overall, existing research primarily focuses on rail transit operational efficiency, land use in station areas, accessibility, and TOD's overall performance, while paying insufficient attention to micro-level design quality and thematic experiences within underground public spaces. For underground themed streets that integrate transportation, commercial, and cultural functions, existing macro-level transportation-land-use optimization frameworks struggle to explain how specific design elements influence user perceptions and renewal needs. Therefore, it is necessary to start from user perceptions to better identify the importance of key design elements in underground themed streets and establish optimization priorities, thereby bridging the gap between macro-level TOD optimization and the micro-level thematic design of underground spaces.

Existing research indicates that the thematic design of underground public spaces has gradually become an important means of linking the functional organization of underground spaces, their distinctive character, and expressions of urban culture. For example, some scholars explored an integrated aboveground-and-underground development mode for spatial theming and urban cultural design through the case of the Ping-Long Road underground space in Suzhou, creating the characteristics of an underground-space neighborhood [8]. Some scholars propose a new solution for protecting the old city's traditional culture and neighborhood characteristics through thematic development of underground space, using Dongguan Street in Yangzhou as a case study [14]. Nevertheless, existing research continues to focus primarily on design strategies, cultural expressions, and practical models for the thematic development of underground public spaces, while lacking quantitative identification of the relative importance of different design elements in shaping the perception of thematic spaces and the mechanisms through which they function. In particular, research on evaluating and renewing existing underground themed streets of-

ten relies on satisfaction surveys, post-use evaluations, or single-dimensional assessment methods that typically focus on whether users are "satisfied or dissatisfied" but struggle to distinguish between the actual performance of design elements and their potential importance. Consequently, existing evaluation methods remain inadequate in addressing questions such as "Which design elements are key to shaping the thematic character of underground spaces?" "Which elements should be prioritized for improvement?" and "What differentiated optimization strategies should be adopted for different types of elements?" At the same time, underground themed streets are characterized by their enclosed nature, dependence on the built environment, and the interplay of multiple elements. Users' perception of a space's thematic character is not determined solely by a single design element's performance but may be influenced by the combined effects of perceived element importance, satisfaction levels, and their nonlinear interactions. Consequently, conducting spatial renovations based solely on satisfaction levels may make it difficult to accurately identify latent needs that users have not explicitly expressed but which actually have a significant impact. Then, the quality of the design elements of the underground theme blocks is measured and evaluated using the IPA–Kano model, and the optimization path of the design elements of the underground theme street is analyzed based on the measurement results combined with the actual performance of the attributes. Some scholars applied the IPA–Kano framework to evaluate design elements in underground building atria and identify improvement priorities across three cases in Chongqing. Their study provides a relevant methodological reference for evaluating user perceptions of underground spatial environments [15]. However, underground building atria and underground theme streets differ in their spatial functions and thematic design requirements. Whereas the former study focused on atrium-related design elements, the present study examines thematic design attributes in underground commercial streets, including decorative expression, spatial nodes, and experience-oriented activities and marketing. This study further shifts the focus of research on underground public spaces from general assessments of spatial quality and user performance to decision-making for renewing micro-level thematic design elements, aiming to establish an analytical chain comprising "perceptual evaluation—identification of implicit needs—attribute classification—optimization of priorities." On the one hand, it provides an analytical approach for the design research of underground themed commercial streets that identifies key areas for design intervention based on user perceptions; on the other hand, it offers a methodological reference for bridging the gap between subjective perceptual evaluations and design renewal decisions in the study of underground public spaces. The framework's effectiveness still depends on the project's spatial typology, regional culture, functional structure, and user characteristics; therefore, further validation through additional case studies is needed to assess its applicability across regions and typologies.

2. Literature Review

2.1. Research on the Optimization of Rail Transit Networks and TOD

As urban rail transit networks expand, the synergistic relationship between rail transit and land use has become a key focus in urban and transportation planning research. Traditional rail transit planning primarily focuses on internal transportation-system issues, such as route layout, capacity, operations, and passenger flow, whereas Transit-Oriented Development (TOD) further emphasizes the synergy between rail transit facilities and land use, public services, population distribution, and urban spatial development. Consequently, recent research has gradually shifted from optimizing individual transportation networks to integrating the optimization of transportation systems, land use, and spatial development, with trends toward model integration, multi-objective optimization, and data-driven ap-

proaches. Zhang et al. (2025) and Bao et al. (2025) conducted network-wide coordinated optimization from the perspectives of train routes, schedules, vehicle rotations, and dynamic passenger demand, respectively [16,17]. Chen et al. (2024) integrated commuter rail network design with TOD [9], while He et al. (2025) further used NSGA-II to achieve multi-objective land-use optimization in rail transit station areas [10]. Sun et al. (2024) and Wang et al. (2024) further refined the quantitative identification of the transportation–land use relationship through TOD evaluation systems and spatial data analysis, respectively [11,12]. Meanwhile, Amini Pishro et al. (2025) introduced partial differential equations and machine learning to comprehensively analyze spatiotemporal passenger flow at rail transit stations and TOD characteristics [13]. A recent study on the underground space at Qingdao North Station further combined ABM, NSGA-II, and TOPSIS to incorporate user behavior, evacuation efficiency, and spatial functions into TOD underground-space optimization [18]. In summary, existing research has established a progressively deeper research pathway, ranging from rail transit network optimization to land-use allocation in TOD station areas, to coordinating transportation and land use, and finally to comprehensive underground-space optimization. However, the focus of this research remains primarily on macro- or meso-level aspects such as transportation efficiency, accessibility, land use, passenger flow management, and station area functions, with insufficient attention paid to micro-level design elements within underground themed streets, such as spatial interfaces, thematic nodes, scene creation, and user perception. Accordingly, this study further narrows its scope to the spatial experience level of underground themed streets. Drawing on existing concepts of transportation-space synergy optimization, it uses bivariate correlation analysis to identify the latent importance of design elements based on user importance perceptions and satisfaction data. By integrating the IPA–Kano model, the study identifies design-element demand attributes, evaluates performance, and establishes optimization priorities, thereby developing a design-element optimization method tailored to revitalizing underground themed streets.

2.2. Classification of Indicators

Thematic decorative elements enhance thematic expression and improve the visitor experience in underground theme blocks, creating a unique thematic image that increases attractiveness. They can also create a competitive advantage over other commercial places, attract more tourists and investors, and enhance the commercial value of underground theme blocks. Kusumowidagdo and Sachari (2015) studied tourists' preference for themed corridors in shopping centers in Indonesia in their study of Gandaria City, an Indonesian Shopping Centre, through a mixed-methods approach such as focus groups and surveys, and the results showed that thematic decorative elements are more critical in shaping the theme [19]. Yahya and Guntama (2023), in "Case Study on Thematic Decoration of The Avatar Pandora: The Way of Water in Senayan City Mall," studied the attractiveness of the visual communication of the thematic decoration to the visitors of Senayan City Shopping Center through the methods of data collection and data analysis, and the results of the study showed that the theme decoration has sufficient attraction to the visitors [20].

Spatial node design elements for the underground theme blocks play an essential role in guiding and dispersing pedestrian flow, clarifying the spatial layout, and creating a rich sense of spatial hierarchy. Spatial node design elements can also integrate closely with underground theme blocks to strengthen the thematic atmosphere. Spatial nodes can become a key highlight of the underground theme blocks, attracting more attention, encouraging longer stays, and enhancing the brand image. With thoughtful spatial node design, underground theme blocks can offer visitors a more comfortable, convenient, and engaging tour and shopping experience. Cui and Chen (2014) analyzed the importance of

node space in underground space planning and design elements in Tianjin urban planning. The study showed that nodes are strategically significant points in space that users can enter and that serve as central focal points for people's travel to and from [21]. Beyond shaping spatial nodes thematically, some scholars argue that spatial nodes can play a vital role in space navigation, especially in underground public spaces, where they can indicate evacuation directions [22].

Situational design elements can enhance a space's storytelling and visitors' experience. Yang and Liu (2020) explored the potential of spatial narrative to logically link aboveground and underground spaces through the Tianhuan shopping mall in Guangzhou's New Central Business District. The results show that spatial narrative facilitates perceptual connections between above- and below-ground spaces and enhances visitors' experience [23]. At the same time, they found that thematic expression in spatial narrative can enhance spatial experience and help visitors understand the theme, thereby improving the tourist experience [24].

In conclusion, this research takes the three dimensions of thematic decorative elements, space node design elements, and situational design elements as the classification of indicators in the evaluation system, and all the elements as the elements in the evaluation system will be classified into these three categories.

2.3. Evaluation Elements

The thematic character of underground public spaces is not formed by a single spatial element but results from the combined effects of various factors, including spatial form, thematic decoration, key-node design, and immersive experiences. Because research on systematic evaluation indicators for "themed underground streets" remains limited, this study did not directly incorporate all general evaluation indicators for underground public spaces. Instead, starting from the objective of creating thematic spaces, it first synthesized existing research on public spaces, commercial districts, indoor commercial spaces, and cultural spaces, and then screened evaluation factors based on the following three principles: (1) Thematic relevance, meaning that the element directly contributes to the formation of the space's thematic image, cultural imagery, or thematic atmosphere; (2) Perceptual evaluability, meaning that users can form a relatively clear evaluation of the element through visual, auditory, behavioral, or spatial perceptions; (3) Design intervenability, meaning that the element can be adjusted through design, renovation, or operations, thereby providing concrete targets for optimization in subsequent thematic renovations. Therefore, the indicator system developed in this study focuses primarily on "which spatial elements—that can be designed and perceived—influence the thematic experience of underground themed streets," rather than attempting to establish a comprehensive evaluation system covering all functional and performance aspects of underground public spaces. Building on this foundation and incorporating relevant conclusions from existing research on the visual identity of themed spaces, spatial nodes, and contextual experiences, this study categorizes the candidate elements into three dimensions—themed decorative elements, spatial node design elements, and contextual design elements—based on their hierarchical roles in the formation of thematic identity, resulting in a total of 18 evaluation factors. These three dimensions correspond to the physical carriers, spatial organizational nodes, and situational experience levels of the underground themed street's thematic character, forming a thematic evaluation framework comprising "spatial interfaces and decoration—spatial nodes—dynamic situational experiences."

Thematic decorative elements primarily establish the visual identity of the underground-themed street, convey cultural symbols, and shape the spatial atmosphere; users can perceive these thematic components most directly. Yang and Ma (2015) con-

firmed that floor decorative elements are not only associated with the overall elements of other spaces but also play an essential role in creating a thematic sequence for the whole space [25]. Wang et al. (2012) analyzed commercial streets and found that the interface plays a crucial role in the overall spatial imagery. At the same time, non-commercial interfaces decisively shape the aesthetics and thematic imagery of spatial interfaces [26]. Kusumowidagdo et al. (2016) analyzed the atriums of Gandaria City Mall and Ciputra World in Indonesia through the sequential exploratory method. They found that ceiling decorations are the most attractive decorative element in the atriums. These decorative elements attract visitors and create a thematic division that differentiates the two shopping centers [27]. Wu et al. (2014) analyzed the impact of outdoor billboards on Hong Kong's traditional commercial streets, including Nathan Road and Sai Yeung Choi Street South in Mong Kok. They found that billboards are a primary means of disseminating information, creating distinctive landscapes, and guiding local and foreign tourists [28]. At the same time, thematic storefront billboards are essential to creating unique thematic style features. Huang and Shu (2021) use six public libraries in Taiwan as a case study and conduct a network survey, finding that matching colors can create a spatial atmosphere in thematic spaces [29]. Zhang and Tian (2023) start from the perspective of Wuhan's lake culture and use the methods of literature research, case analysis, and design practice to find that a good IP image can resonate with the public and target groups, and the design of the IP image needs to match the expressed theme closely [30]. Fan and Li (2012) found that spatial context conveys spatial emotions through various morphological elements. Indoor spatial morphology can influence people's experience of thematic space [31]. To summarize, under the thematic decorative elements dimension, this research selects seven elements, decorative floor covering, non-commercial interface decoration, ceiling decoration, thematic storefront billboard, thematic and color matching degree, logo IP image design, and indoor spatial morphology, as the constituent elements of the evaluation system. These seven elements correspond to different visual media—namely, the ground plane, vertical surfaces, ceiling surfaces, commercial information displays, the color system, thematic symbols, and spatial forms—and provide relatively comprehensive coverage of the primary physical expression surfaces for thematic information within the underground themed street. At the same time, they offer significant scope for design intervention, making them suitable as foundational indicators for thematic evaluation and subsequent optimization.

Spatial nodes are key elements in themed underground streets, connecting different spaces, organizing crowd activities, and enhancing spatial recognition. Their thematic design not only creates memorable spatial landmarks but also transforms the thematic culture from static decoration into a spatial experience. Zhao (2019) found through his analysis of Xiaobailou Langxiang Underground Street in Tianjin that entrances and exits, as the only visible elements of the underground space, play an irreplaceable role in the transition of the themed space. At the same time, Zhao also found that the sunken plaza, as a design way to connect other spaces, is closely integrated with thematic activities and helps ease crowd gathering and evacuation [32]. Zhang and Xu (2023) found, through their research on the design of children's amusement facilities in indoor commercial spaces, that thematizing amusement facilities makes them more interesting and innovative, making the themed space more attractive and thus bringing more significant economic benefits [33]. By exploring how to integrate urban culture and experiential design into public facility products, Cai (2010) found that thematizing public facilities is a requirement for developing urban culture construction [34]. Wang et al. (2022) found that theme-based checkpoints have solid characteristics and are crucial elements for enhancing spatial attractiveness, based on research on the spatial perception of internet-famous spots in Chongqing City using web text analysis [35]. In summary, this research selects five elements as components of the evalua-

tion system under the dimension of spatial node design elements: entrance and exit design, sunken plaza, thematization of amusement facilities, thematization of public facilities, and theme-based checkpoints. Unlike a simple evaluation of spatial circulation efficiency, each of these five elements has distinct spatial node characteristics and can simultaneously carry thematic symbols, activities, or experiences. Entrances and exits, as well as sunken plazas, primarily facilitate the transition and organization of thematic spaces; amusement facilities and public amenities enhance the integration of thematic content into usage scenarios; and themed photo spots reinforce spatial recognition and a sense of place. Therefore, these five indicators reflect the impact of node design on thematic coherence across different levels: "spatial transition—spatial organization—functional experience—place recognition."

Unlike static spatial decoration and node design, situational design elements primarily utilize temporal changes, active participation, sensory stimulation, and online–offline interactions to transform the theme from a "spatial presentation" into a "situational experience." Xu and Guo (2023) found that the number of thematic business formats significantly affects a space's thematic atmosphere, based on their study of business formats in the historical and cultural blocks of Taiping District in Changsha [36]. Edensor and Hughes (2021) examined how the interplay of light and shadow influences everyday sensory experiences and emotional responses, suggesting that variations in illumination can shape distinctive spatial atmospheres and visual perceptions, thereby enhancing visitors' sensory engagement and emotional connection with a place [37]. Yu et al. (2020) analyzed four theme reading spaces at Beijing Normal University and found that themed activities could enhance these spaces' interactivity [38]. Shuai and Shen (2006) confirmed that matching clothing with related themes can create mental associations [39]. Zhu (2010) found, through an investigation of the relationship between background music and consumer psychology and behavior, that music matched to thematic spaces can create a thematic atmosphere that fits them and increase visitors' satisfaction [40]. Kuang and Xie (2021) found that combining online and offline theme marketing can create a complementary effect and jointly enhance brand influence and market competitiveness in their study of the development path of online–offline integration for cultural tourism enterprises based on virtual tourism experience [41]. In summary, under the dimension of situational design elements, this study will select the six elements of the number of thematic business formats, changes in light and shadow, thematic activities, thematic clothing matching for staff, matching of music and theme, and online and offline thematic marketing as the constituent elements of the evaluation system. The six elements—business format and content, visual experience, activity participation, staff presentation, auditory experience, and communication and interaction—collectively create a dynamic contextual experience, overcoming the limitations of evaluating thematic coherence based solely on physical space and static decor. Consequently, these three indicator categories cover the three primary dimensions of thematic development in underground themed streets: the physical environment, spatial nodes, and contextual experience.

3. Research Method

3.1. IPA–Kano Model

By combining IPA and the Kano model, the IPA–Kano framework integrates importance–performance assessment with attribute classification based on its relationship to user satisfaction [42]. Researchers have increasingly applied the IPA–Kano framework in fields such as urban management, service evaluation, urban planning, and architectural design [43,44]. It combines IPA-based prioritisation of design attributes with Kano-based classification of user requirements, with explicit importance plotted along the horizontal axis and implicit importance along the vertical axis. Elements in the first quadrant have

the highest levels of both explicit and implicit importance. The second quadrant consists of attractive elements with low explicit importance and high implicit importance. The third quadrant contains unimportant elements with the lowest explicit and implicit importance. The fourth quadrant consists of basic elements with high explicit importance and low implicit importance (Figure 1). The model predicts user satisfaction and provides causal path analysis, offering guidance for evaluating design elements and proposing optimization paths [15].

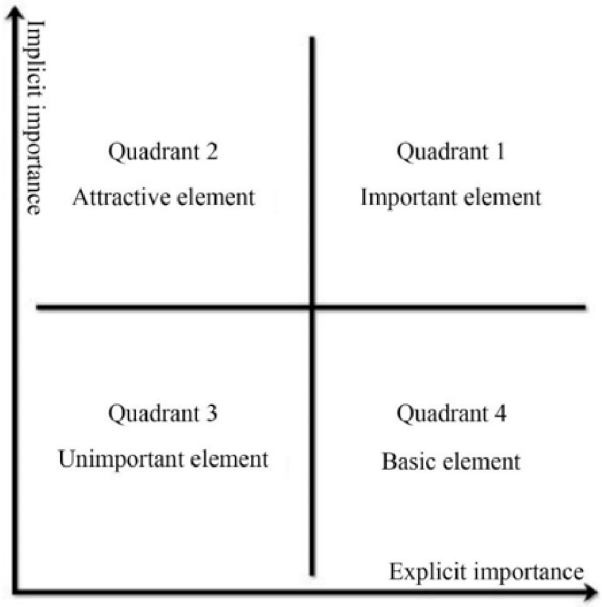


Figure 1. IPA–Kano model.

For user satisfaction analysis, the commonly used methods are AHP (Analytic Hierarchy Process) and SD (Method of Semantic Differential). AHP is a decision-making tool that breaks down a complex problem into interrelated factors through hierarchical decomposition and determines each factor's relative importance through pairwise comparisons. It determines each factor's relative importance by comparing them pairwise. This approach suits scenarios that require trade-offs and choices among many factors, such as project selection and resource allocation [45]. SD focuses on describing and analyzing the concepts and constructs of the object of study through semantic differences. It suits research on experiences and perceptions in areas such as products, spaces, and services, and helps explain people's psychological responses and perceptions of different objects [46]. Although these two methods are more commonly used in evaluation, they lack quantitative analysis of optimization elements and provide only a comprehensive assessment of the evaluation object. At the same time, they also lack quantitative analysis of specific elements. The IPA–Kano model offers a better way to address this problem. First, the IPA–Kano model is more comprehensive and in-depth, so it can more accurately identify the analyzed object's shortcomings and propose targeted improvement measures. Second, the IPA–Kano model is more intuitive and easier to understand; it is usually presented in charts and graphs that visually show the relationship between service importance and satisfaction. This makes the results easier to interpret and helps managers and decision-makers quickly grasp the current service status and develop improvement strategies. At the same time, the IPA–Kano model is more operational and practical, providing an analysis method, specific operational steps, and case examples. Its practical application can guide enterprises and service providers in effectively improving service quality and customer satisfaction [47]. Therefore, this research uses the IPA–Kano model.

In this study, "optimization" refers to prioritizing and selectively improving design elements based on user perceptions within the existing spatial constraints of an underground-themed street, rather than deriving a globally optimal solution through objective functions, constraints, and mathematical algorithms. Specifically, IPA identifies performance gaps by comparing the perceived importance of design elements with actual satisfaction levels, while the Kano model further reveals the demand attributes of different elements and their differentiated impacts on user satisfaction. Together, these two approaches form a design decision-making chain comprising "importance identification—performance diagnosis—demand classification—priority determination—strategy matching." Therefore, this paper defines IPA–Kano as a user-perception-based design optimization decision framework that identifies which design elements to prioritize with limited update resources and which improvement strategies to adopt, complementing formal mathematical optimization approaches centered on solution-seeking.

3.2. Experimental Process

The experimental process consists of the following three steps.

(1) The mean values of importance and satisfaction of the design elements in these three cases of underground theme blocks were calculated through the questionnaire survey and collating the questionnaire results. The importance and satisfaction bivariate values were correlated using SPSSAU data statistical analysis platform to extract the implicit importance of the design elements of the underground theme blocks [48], which was calculated using the following formula.

$$r_{xy} = \frac{\sum x_i y_i - nxy}{(n-1)s_x s_y} = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{\sqrt{n\sum x_i^2 - (\sum x_i)^2}\sqrt{n\sum y_i^2 - (\sum y_i)^2}} \quad (1)$$

The coefficients take values between −1.0 and 1.0, with variables close to 0 being no correlation and close to 1 or −1.0 being a strong correlation. We constructed the IPA–Kano matrix to examine the relationship between explicitand implicit importance. We plotted explicit importance scores on the horizontal axis, while implicit importance, calculated through bivariate correlation analysis between importance and satisfaction ratings, was shown on the vertical axis. The mean scores of the 18 design attributes for both dimensions served as reference coordinates to divide the matrix into four quadrants, determining each attribute's relative position.

(2) Based on the results of the quadrant attribution of the design elements of the underground theme blocks, combined with the ranking of the satisfaction level of each specific element, the analysis and extraction of the design element priority (Table 1) were carried out, and the key optimization elements were filtered out.

(3) Correlation analysis was carried out based on the key optimization elements analyzed and overall tour satisfaction.

Table 1. Optimization priority definitions.

Optimization Priority	Quadrant	Satisfaction Ranking
1	Basic Elements	13~18
2	Important Elements	13~18
3	Attractive Elements	13~18
4	Basic Elements	7~12
5	Important Elements	7~12
6	Attractive Elements	7~12

3.3. Measurement of Implicit Importance and Its Relationship with the Kano Model

In this study, explicit importance refers to the importance respondents directly assign to individual thematic design elements, whereas implicit importance characterizes the relative statistical association between importance perceptions and satisfaction evaluations. Unlike explicit importance, which respondents rate directly, the implicit-importance indicator is derived from the observed relationship between two sets of user evaluations. The correlation coefficient is used as a relative indicator of this association. A stronger positive correlation indicates a closer correspondence between respondents' importance ratings and their satisfaction ratings for the corresponding design element. This measure therefore provides supplementary basis for comparing the relationship between perceived importance and experienced satisfaction across design elements. However, it should not be interpreted as an objective measure of a design element's contribution to overall satisfaction, nor does it establish a causal relationship between importance and satisfaction. Its interpretation is also conditional on the specific variables correlated, the survey design, and the characteristics of the respondents.

The correlation-based indicator and the Kano model serve complementary, not interchangeable, purposes. Correlation analysis characterizes the strength and direction of the association between the specified evaluation variables, whereas the Kano model classifies design requirements according to their distinct relationships with user satisfaction, such as basic, performance, and attractive attributes. As a result, these approaches provide different types of information: the former describes statistical association, while the latter distinguishes requirement characteristics. When interpreted alongside explicit importance and satisfaction performance in the IPA framework, they provide a broader basis for identifying and differentiating design-improvement priorities. Importantly, the correlation coefficient does not determine a Kano category, and integrating these methods does not establish causal effects of design interventions on satisfaction.

3.4. Indicator System

As a special form of urban underground public space, underground theme blocks add vitality and character to urban underground space through unique theme design and decoration. Underground theme blocks fully utilize urban underground space resources and inject new vitality into urban commercial development. Through unique themes and creative designs, they attract many tourists for shopping and leisure and become an important part of urban commerce. Rational planning and design can fully leverage the characteristics and advantages of underground theme blocks to promote diversified and sustainable development of urban underground space [49]. The core feature of underground theme blocks lies in their distinctive theme design. Through unique decorations, lighting, artwork, and store design, underground theme blocks can create a distinctive environment for visiting and shopping. The thematic creation of spatial nodes brings visitors a new visual and sensory experience. Second, underground theme streets usually bring together various types of stores, including clothing, restaurants, and entertainment, forming a diversified commercial ecosystem [50]. At the same time, underground theme streets also serve as a platform for showcasing urban culture and art.

The 18 evaluation indicators were organized into three dimensions: theme-oriented decorative elements, spatial node design elements, and situational design elements. This classification was intended to capture three complementary aspects of thematic design in underground commercial streets: the visual expression of thematic identity, the design of key spatial nodes, and the creation of thematic experiences through activities, sensory cues, services, and marketing. The indicators represent identifiable design features that users can evaluate based on their experience of the study sites. The three dimensions there-

fore provide an analytical framework for organizing design-related attributes, rather than assuming all 18 indicators measure a single latent construct interchangeably. To improve conceptual clarity, define each indicator by its specific evaluation target and distinguish it from potentially overlapping attributes. For example, "thematic consistency of public facilities" refers to how well the appearance and visual expression of public facilities align with the overall thematic environment. It does not refer to the number of facilities or their general functional performance. Similarly, interpret indicators on signage, lighting, and commercial activities according to their specified thematic-design attributes rather than as broad measures of overall environmental quality. These operational definitions aim to reduce ambiguity in interpreting individual indicators.

Therefore, in this research, we construct an indicator system for the thematic elements of underground public space based on the literature review in the previous section. The dimension layer is divided into three: B1, B2, and B3, for a total of 18 elements (Table 2).

Table 2. Design elements of underground theme blocks.

B1 Thematic decorative elements	C1 Decorative floor covering C2 Non-commercial interface decoration C3 Ceiling decoration C4 Thematic storefront billboard C5 Thematic and color matching degree C6 Logo IP image design C7 Indoor spatial morphology
B2 Spatial node design elements	C8 Entrance and exit design C9 Sunken Plaza C10 Thematization of amusement facility C11 Thematization of public facility C12 Theme-based checkpoints
B3 Situational design elements	C13 Number of thematic business formats C14 Changes in light and shadow C15 Thematic activities C16 Thematic clothing matching for staff C17 Matching of music and theme C18 Online and offline thematic marketing

3.5. Questionnaire Design and Sampling Procedure

The study data came from distributing and collecting importance and satisfaction questionnaires, each containing 39 questions. Importance scores were based on users' preferences for the design elements of the underground theme blocks, and the questionnaire used a nine-point scale. For instance, in C1, the questionnaire asks, "Do you think that the decorative floor covering is important for the thematic shaping of the underground blocks?" Here, "1" means extremely unimportant, "2" very unimportant, "3" unimportant, "4" slightly unimportant, "5" average, "6" slightly important, "7" important, "8" very important, and "9" extremely important. The weighted average score of each variable was adopted as the importance score, which measures the explicit importance of each design element of the underground theme blocks. The questionnaire uses a nine-point scale based on users' satisfaction with the actual performance of the attributes of the underground theme block design elements. For example, in Shanghai underground theme block C1, the questionnaire asks, "Are you satisfied with the thematic shaping of the decorative floor covering of Lane 1192 Old Shanghai Style Blocks?" Here, "1" means extremely dissatisfied, "2" very dissatisfied, "3" dissatisfied, "4" slightly dissatisfied, "5" average, "6" slightly satisfied, "7" satisfied, "8" very satisfied, and "9" extremely satisfied. The weighted average score for each variable served as the attribute performance score, reflecting tourists'

satisfaction with the design elements of the underground theme blocks. The satisfaction questionnaire also included a question about tourists' overall satisfaction with the tour of the underground theme blocks. For example, in the Shanghai underground theme blocks, the questionnaire asks, "How satisfied are you with the whole tour of the Lane 1192 Old Shanghai Style Blocks?" The Importance and Satisfaction Questionnaire covered 18 design elements and overall tour satisfaction, and recorded participants' gender and whether they were local residents or tourists.

We recruited participants through online channels. This survey employed non-probability convenience sampling. To ensure the evaluation was relevant to the research subjects, we required respondents to have personally visited and experienced the corresponding themed districts whenever possible. Additionally, for respondents who had not visited these areas, we included photos and videos of the themed neighborhoods in our online survey to provide visual references for evaluating specific thematic design elements. This approach aimed to facilitate assessment of observable features, including Thematic storefront billboards and the thematization of public facilities, even among respondents without direct experience of the sites. However, visual materials cannot fully convey spatial, functional, and experiential characteristics encountered during an actual visit. Furthermore, because we did not record respondents' visitation status in a format that allows reliable identification for each case, we could not analyze visitors' and non-visitors' evaluations separately. The resulting assessments should therefore be understood as perceived evaluations of the presented design attributes, rather than evaluations grounded exclusively in direct on-site experience. We retained responses that met the predefined validity criteria for analysis and excluded incomplete questionnaires that did not meet the criteria.

In each city—Shanghai, Chongqing, and Beijing—we selected an underground theme block to conduct an online questionnaire survey using the "Sojump" platform. We collected 610 questionnaires; after excluding invalid responses, we obtained 601 valid questionnaires: 200 from Lane 1192 Old Shanghai Style Blocks, 200 from Chongqing Fangyuan Live Blocks, and 201 from Wangfujing Hepingguoju Old Beijing Style Blocks. We analyzed the questionnaire's reliability and validity in SPSSAU for 18 items; Cronbach's alpha and KMO values exceeded 0.9, indicating good reliability and validity (Table 3). A high Cronbach's alpha indicates high internal consistency, while a high KMO value suggests a strong common-factor basis among the variables. However, an excessively high α value may also indicate redundancy among items; therefore, this study considers item content in its assessment, rather than treating a single indicator as sufficient evidence of the scale's quality. We assessed the statistical prerequisites for subsequent factor-based analyses using KMO and Bartlett's test.

Table 3. Reliability and validity analysis of the questionnaire.

	Cronbach Alpha Value		**Kaiser–Meyer–Olkin**	
	Satisfaction	**Importance**	**Satisfaction**	**Importance**
Lane 1192 Old Shanghai Style Blocks	0.935	0.945	0.949	0.958
Chongqing Fangyuan Live Blocks	0.902	0.912	0.921	0.940
Wangfujing Hepingguoju Old Beijing Style Blocks	0.905	0.918	0.933	0.937

We obtained approximately 200 valid responses for each case, providing a broadly comparable sample size to examine users' reported importance and satisfaction ratings and

identify relative design priorities within each site. This sample allocation also facilitates descriptive comparisons among the three cases.

3.6. Research Cases

This study selected three underground theme streets located in Shanghai, Chongqing, and Beijing as comparative case studies. The selection was purposive, not intended to provide a statistically representative sample of all underground public spaces. The three sites were selected according to three principal criteria: (1) spatial and functional relevance: each site constitutes an underground, pedestrian-oriented commercial environment in which commercial activities and pedestrian circulation coexist; (2) thematic distinctiveness: each site exhibits identifiable thematic design features that can be evaluated in terms of decorative elements, spatial nodes, and situational design; and (3) public accessibility and user experience: each site is accessible to the general public during its normal operating hours, allowing users to evaluate its design characteristics through direct experience. Including cases in three major Chinese cities provides an opportunity to examine whether perceived importance, satisfaction levels, and optimization priorities for thematic design elements are consistent across urban contexts. The comparative design aims to identify recurring patterns and case-specific differences rather than assume the three sites represent all underground commercial environments. Differences in local context, commercial composition, spatial configuration, and thematic expression may influence users' evaluations and therefore need to be considered when interpreting the results.

In this study, we define an underground theme street as a publicly accessible, underground, pedestrian-oriented commercial environment organized in a street-like spatial configuration and characterized by an identifiable thematic design. Although such spaces may be privately owned and commercially operated, the general public can access their pedestrian circulation and activity areas during normal operating periods. Therefore, we regard them as privately operated but publicly accessible commercial public spaces. This definition distinguishes the study objects from underground transport hubs, restricted-access facilities, and underground infrastructure spaces.

This study selected three underground theme blocks, namely Lane 1192 Old Shanghai Style Blocks, Chongqing Fangyuan Live Blocks, and Wangfujing Hepingguoju Old Beijing Style Blocks, as evaluation cases. Lane 1192 Old Shanghai Style Blocks is themed around traditional Shanghai architecture, such as Shikumen, alleyways, and Western-style houses, vividly recreating Shanghai in the 1930s. Chongqing Fangyuan Live Blocks features a cyberpunk, national-style theme, offering visitors a vibrant, creative space for shopping, leisure, and entertainment. Wangfujing Hepingguoju Old Beijing Style Blocks is themed on old Beijing courtyard houses, old-time stores, and hutongs, closely restoring the style, living conditions, and cultural essence of old Beijing in the 70s and 80s. These three cases are all located in the main urban areas of their cities, all within the business districts. The themes are distinctive, with a certain degree of local popularity and high foot traffic.

4. Data Analysis

4.1. Basic Data Description

Through the distribution and collection of importance and satisfaction questionnaires, the base data, i.e., the average values of importance and satisfaction, were obtained (Table 4). In the case of Lane 1192 Old Shanghai Style Blocks, the design elements that ranked high in importance were decorative floor covering, thematic storefront billboard, sunken plaza, changes in light and shadow, and online and offline thematic marketing, while the design elements that ranked low were entrance and exit design, theme-based checkpoints, number of thematic business formats, and thematic clothing matching for

staff. For Chongqing Fangyuan Live Blocks, the design elements that ranked high in importance were decorative floor covering, thematic storefront billboards, thematic clothing matching for staff, and matching music and theme. In contrast, the design elements that ranked low were indoor spatial morphology, theme-based checkpoints, number of thematic business formats, and changes in light and shadow. For Wangfujing Hepingguoju Old Beijing Style Blocks, the design elements that ranked higher in importance were decorative floor covering, ceiling decoration, entrance and exit design, and the number of thematic business formats. In contrast, the design elements that ranked lower were non-commercial interface decoration, indoor spatial morphology, matching of music and theme, and online and offline thematic marketing. A comparison between the groups shows that, in terms of importance, decorative floor covering scores higher in all three underground theme block cases. Regarding satisfaction, the higher- and lower-performing design elements differ and vary widely.

In terms of satisfaction, the higher-ranked design elements of Lane 1192 Old Shanghai Style Blocks are decorative floor covering, non-commercial interface decoration, thematic and color matching degree, and theme-based checkpoints, while the lower-ranked design elements are indoor spatial morphology, sunken plaza, thematic activities, matching of music and theme, and online and offline thematic marketing. For Chongqing Fangyuan Live Blocks, the higher-ranked design elements in terms of satisfaction are decorative floor covering, ceiling decoration, thematic activities, and matching of music and theme. In contrast, the lower-ranked design elements are non-commercial interface decoration, thematization of amusement facilities, thematization of public facilities, and theme-based checkpoints. For Wangfujing Hepingguoju Old Beijing Style Blocks, the design elements that ranked higher in satisfaction were entrance and exit design, thematic and color matching degree, number of thematic business formats, and changes in light and shadow. In contrast, those that ranked lower were non-commercial interface decoration, indoor spatial morphology, thematization of public facilities, and matching of music and theme.

Table 4. Importance and satisfaction averages of design elements of the three underground theme block cases.

	Design Elements	**Lane 1192 Old Shanghai Style Blocks**		**Chongqing Fangyuan Live Blocks**		**Wangfujing Hepingguoju Old Beijing Style Blocks**	
		Average Value of Importance	**Average Value of Satisfaction**	**Average Value of Importance**	**Average Value of Satisfaction**	**Average Value of Importance**	**Average Value of Satisfaction**
B1 Thematic decorative elements	C1 Decorative floor covering	6.23	6.20	6.69	6.28	6.48	6.02
	C2 Non-commercial interface decoration	5.98	6.07	6.44	6.12	6.09	5.97
	C3 Ceiling decoration	6.13	6.01	6.32	6.34	6.29	6.00
	C4 Thematic storefront billboard	6.23	5.96	6.47	6.18	6.28	6.09
	C5 Thematic and color matching degree	6.11	6.10	6.39	6.15	6.17	6.16
	C6 Logo IP image design	6.19	6.02	6.33	6.22	6.26	6.05
	C7 Indoor spatial morphology	6.13	5.88	6.29	6.13	6.12	5.91

Table 4. *Cont.*

	Design Elements	Lane 1192 Old Shanghai Style Blocks		Chongqing Fangyuan Live Blocks		Wangfujing Hepingguoju Old Beijing Style Blocks	
		Average Value of Importance	Average Value of Satisfaction	Average Value of Importance	Average Value of Satisfaction	Average Value of Importance	Average Value of Satisfaction
B2 Spatial node design elements	C8 Entrance and exit design	5.92	5.99	6.43	6.22	6.40	6.18
	C9 Sunken Plaza	6.29	5.78	6.33	6.17	6.13	6.02
	C10 thematization of amusement facility	6.08	6.03	6.37	5.94	6.22	5.99
	C11 Thematization of public facility	6.18	5.99	6.33	6.11	6.23	5.92
	C12 Theme-based checkpoints	5.78	6.20	6.24	6.11	6.18	6.04
B3 Situational design elements	C13 Number of thematic business formats	5.81	6.00	6.27	6.17	6.32	6.11
	C14 Changes in light and shadow	6.29	5.98	6.25	6.15	6.28	6.13
	C15 Thematic activities	6.22	5.95	6.38	6.37	6.21	6.01
	C16 Thematic clothing matching for staff	5.78	5.97	6.46	6.14	6.13	6.10
	C17 Matching of music and theme	6.05	5.74	6.48	6.37	6.07	5.97
	C18 Online and offline thematic marketing	6.37	5.95	6.35	6.17	5.98	6.02
Overall tour satisfaction		5.87		6.25		5.90	

4.2. Extraction of Implicit Importance of Design Elements

Explicit importance refers to users' direct evaluation of a design element's importance, while implicit importance refers to the importance status reflected in users' evaluations of other aspects. Explicit and implicit elements are interrelated concepts that must be compared and combined to evaluate design elements. This study defines "implicit importance" as the relative degree of association between the perceived importance of a design element and user satisfaction, and uses the correlation coefficient between the two as a metric for measuring latent priority needs—that is, the stronger the correlation, the closer the correspondence between the perceived importance of that element and the actual user experience [51]. This metric reflects relative importance in terms of association, rather than causal relationships or objective weightings, and is primarily used to compare different design elements and identify optimization priorities. Because this study uses a 9-point Likert scale, individual items are ordinal variables but can be approximated as continuous under conditions of comprehensive multi-item measurement and relatively fine-grained categorization. Therefore, the Pearson correlation coefficient measures the linear relationship between importance and satisfaction, and its applicability is tested based on data distribution and correlation characteristics [52]. When the data significantly deviate from the assumption of a linear relationship or continuity, Spearman's rank correlation is used to test robustness. The study extracted the implicit importance by correlating the two variables, importance and satisfaction, using SPSSAU online statistical analysis platform (Version: 25.0). After the calculations, Table 5 shows all correlation coefficients; the p-value is less than 0.05, indicating that the correlations are statistically significant. This study distinguishes between statistical significance and association strength, using the Pearson

correlation coefficient (r) as the effect size and the *p*-value to determine statistical significance [53,54]. A larger absolute value of the correlation coefficient indicates a stronger association between the perceived importance of design elements and satisfaction, and thus a higher reference value for optimization prioritization; conversely, a smaller but statistically significant correlation coefficient merely indicates the existence of a statistical association and does not imply high practical optimization value. Therefore, this study does not rely solely on ($p < 0.05$) as the sole criterion for determining optimization importance. Instead, it comprehensively considers statistical significance, the correlation effect size, and IPA–Kano need attributes to establish the relative optimization priorities of design elements.

Calculations were based on explicit and implicit importance data, followed by quadrant plotting to produce quadrant attribution results for all elements (Figure 2). Similarities and differences coexist in the quality measurements of the design elements of the three underground theme block cases (Table 6). The design elements located in the same quadrant across cases were decorative floor covering and theme-based checkpoints. In all three cases, decorative floor covering was in the important quadrant, and theme-based checkpoints were in the attractive elements quadrant.

Most design elements in the three underground theme block cases fall into different quadrants. Ceiling decoration is a basic element in Quadrant 4 for Old Shanghai Style Blocks and Wangfujing Old Beijing Style Blocks, but it is unimportant in Quadrant 3 for Chongqing Fangyuan Live. The thematic storefront billboard element falls in Quadrant 4 for Old Shanghai Style Blocks and Chongqing Fangyuan Live, and in Quadrant 1 for Wangfujing Old Beijing Style Blocks. The element of thematic activities is in Quadrant 4 for Old Shanghai Style Blocks, Quadrant 1 for Chongqing Fangyuan Live, and Quadrant 3 for Wangfujing Old Beijing Style Blocks. The element of online and offline thematic marketing is in Quadrant 4 for Old Shanghai Style Blocks, Quadrant 3 for Chongqing Fangyuan Live, and Quadrant 2 for Wangfujing Old Beijing Style Blocks. The element of thematic and color matching degree is in Quadrant 1 for Old Shanghai Style Blocks and Chongqing Fangyuan Live, and in Quadrant 2 for Wangfujing Old Beijing Style Blocks. The logo IP image design element is in Quadrant 1 for Old Shanghai Style Blocks and Wangfujing Old Beijing Style Blocks, and in Quadrant 3 for Chongqing Fangyuan Live. The sunken plaza element is located in Quadrant 1 for Old Shanghai Style Blocks, Quadrant 3 for Chongqing Fangyuan Live, and Quadrant 2 for Wangfujing Old Beijing Style Blocks. The element of thematization of public facilities is located in Quadrant 1 for Old Shanghai Style Blocks, Quadrant 2 for Chongqing Fangyuan Live, and Quadrant 4 for Wangfujing Old Beijing Style Blocks. The element of changes in light and shadow is located in Quadrant 1 for Old Shanghai Style Blocks, Quadrant 3 for Chongqing Fangyuan Live, and Quadrant 4 for Wangfujing Old Beijing Style Blocks. The non-commercial interface decoration element is located in Quadrant 3 for Old Shanghai Style Blocks and Wangfujing Old Beijing Style Blocks, and in Quadrant 1 for Chongqing Fangyuan Live. The entrance and exit design element is located in Quadrant 3 for Old Shanghai Style Blocks, Quadrant 1 for Chongqing Fangyuan Live, and Quadrant 4 for Wangfujing Old Beijing Style Blocks. The element of amusement facility thematization is located in Quadrant 3 for Old Shanghai Style Blocks, Quadrant 2 for Chongqing Fangyuan Live, and Quadrant 1 for Wangfujing Old Beijing Style Blocks. The element of the number of thematic business formats is in Quadrant 3 for Old Shanghai Style Blocks, Quadrant 2 for Chongqing Fangyuan Live, and Quadrant 1 for Wangfujing Old Beijing Style Blocks. The element of thematic clothing matching for staff is in Quadrant 3 for Old Shanghai Style Blocks and Wangfujing Old Beijing Style Blocks, and in Quadrant 4 for Chongqing Fangyuan Live. The element of matching music and theme is in Quadrant 2 for Old Shanghai Style Blocks, Quadrant 4 for Chongqing Fangyuan Live, and Quadrant 3 for Wangfujing Old Beijing Style Blocks.

Table 5. Implicit importance and satisfaction ranking of design elements for three underground theme block cases.

	Lane 1192 Old Shanghai Style Blocks			Chongqing Fangyuan Live Blocks			Wangfujing Hepingguoju Old Beijing Style Blocks		
	Implicit Importance Score	Average Value of Satisfaction	Satisfaction Ranking	Implicit Importance Score	Average Value of Satisfaction	Satisfaction Ranking	Implicit Importance Score	Average Value of Satisfaction	Satisfaction Ranking
C1 Decorative floor covering	0.684 **	6.20	1	0.512 **	6.28	4	0.437 **	6.02	9
C2 Non-commercial interface decoration	0.424 **	6.07	4	0.336 **	6.12	15	0.318 **	5.97	15
C3 Ceiling decoration	0.391 **	6.01	7	0.315 **	6.34	3	0.243 **	6.00	13
C4 Thematic storefront billboard	0.357 **	5.96	13	0.234 **	6.18	7	0.391 **	6.09	6
C5 Thematic and color matching degree	0.434 **	6.10	3	0.333 **	6.15	11	0.367 **	6.16	2
C6 Logo IP image design	0.493 **	6.02	6	0.319 **	6.22	5	0.339 **	6.05	7
C7 Indoor spatial morphology	0.562 **	5.88	16	0.287 **	6.13	14	0.301 **	5.91	18
C8 Entrance and exit design	0.374 **	5.99	9	0.381 **	6.22	5	0.273 **	6.18	1
C9 Sunken Plaza	0.455 **	5.78	17	0.265 **	6.17	8	0.348 **	6.02	9
C10 thematization of amusement facility	0.418 **	6.03	5	0.333 **	5.94	18	0.348 **	5.99	14
C11 Thematization of public facility	0.436 **	5.99	9	0.359 **	6.11	16	0.323 **	5.92	17
C12 Theme-based checkpoints	0.481 **	6.20	1	0.332 **	6.11	16	0.354 **	6.04	8
C13 Number of thematic business formats	0.341 **	6.00	8	0.395 **	6.17	8	0.340 **	6.11	4
C14 Changes in light and shadow	0.468 **	5.98	11	0.241 **	6.15	11	0.279 **	6.13	3
C15 Thematic activities	0.311 **	5.95	14	0.396 **	6.37	1	0.237 **	6.01	12
C16 Thematic clothing matching for staff	0.332 **	5.97	12	0.271 **	6.14	13	0.306 **	6.10	5
C17 Matching of music and theme	0.529 **	5.74	18	0.288 **	6.37	1	0.326 **	5.97	15
C18 Online and offline thematic marketing	0.291 **	5.95	14	0.267 **	6.17	8	0.370 **	6.02	9

(indicates: ** $p < 0.01$).

Table 6. Evaluation results of design elements of underground theme blocks.

Attribution of Elements	Lane 1192 Old Shanghai Style Blocks	Chongqing Fangyuan Live Underground Blocks	Wangfujing Hepingguoju Old Beijing-Style Underground Blocks
Basic element (Quadrant 4)	C3 Ceiling decoration	C4 Thematic storefront billboard	C3 Ceiling decoration
	C4 Thematic storefront billboard	C16 Thematic clothing matching for staff	C8 Entrance and exit design
	C15 Thematic activities	C17 Matching of music and theme	C11 Thematization of public facility
	C18 Online and offline thematic marketing		C14 Changes in light and shadow
Important element (Quadrant 1)	C1 Decorative floor covering	C1 Decorative floor covering	C1 Decorative floor covering
	C5 Thematic and color matching degree	C2 Non-commercial interface decoration	C4 Thematic storefront billboard
	C6 Logo IP image design	C5 Thematic and color matching degree	C6 Logo IP image design
	C7 Indoor spatial morphology	C8 Entrance and exit design	C10 Thematization of amusement facility
	C9 Sunken Plaza	C15 Thematic activities	C13 Number of thematic business formats
	C11 Thematization of public facility		
	C14 Changes in light and shadow		
Unimportant element (Quadrant 3)	C2 Non-commercial interface decoration	C3 Ceiling decoration	C2 Non-commercial interface decoration
	C8 Entrance and exit design	C6 Logo IP image design	C7 Indoor spatial morphology
	C10 Thematization of amusement facility	C7 Indoor spatial morphology	C15 Thematic activities
	C13 Number of thematic business formats	C9 Sunken Plaza	C16 Thematic clothing matching for staff
	C16 Thematic clothing matching for staff	C14 Changes in light and shadow	C17 Matching of music and theme
		C18 Online and offline thematic marketing	
Attractive element (Quadrant 2)	C12 Theme-based checkpoints	C10 Thematization of amusement facility	C5 Thematic and color matching degree
	C17 Matching of music and theme	C11 Thematization of public facility	C9 Sunken Plaza
		C12 Theme-based checkpoints	C12 Theme-based checkpoints
		C13 Number of thematic business formats	C18 Online and offline thematic marketing

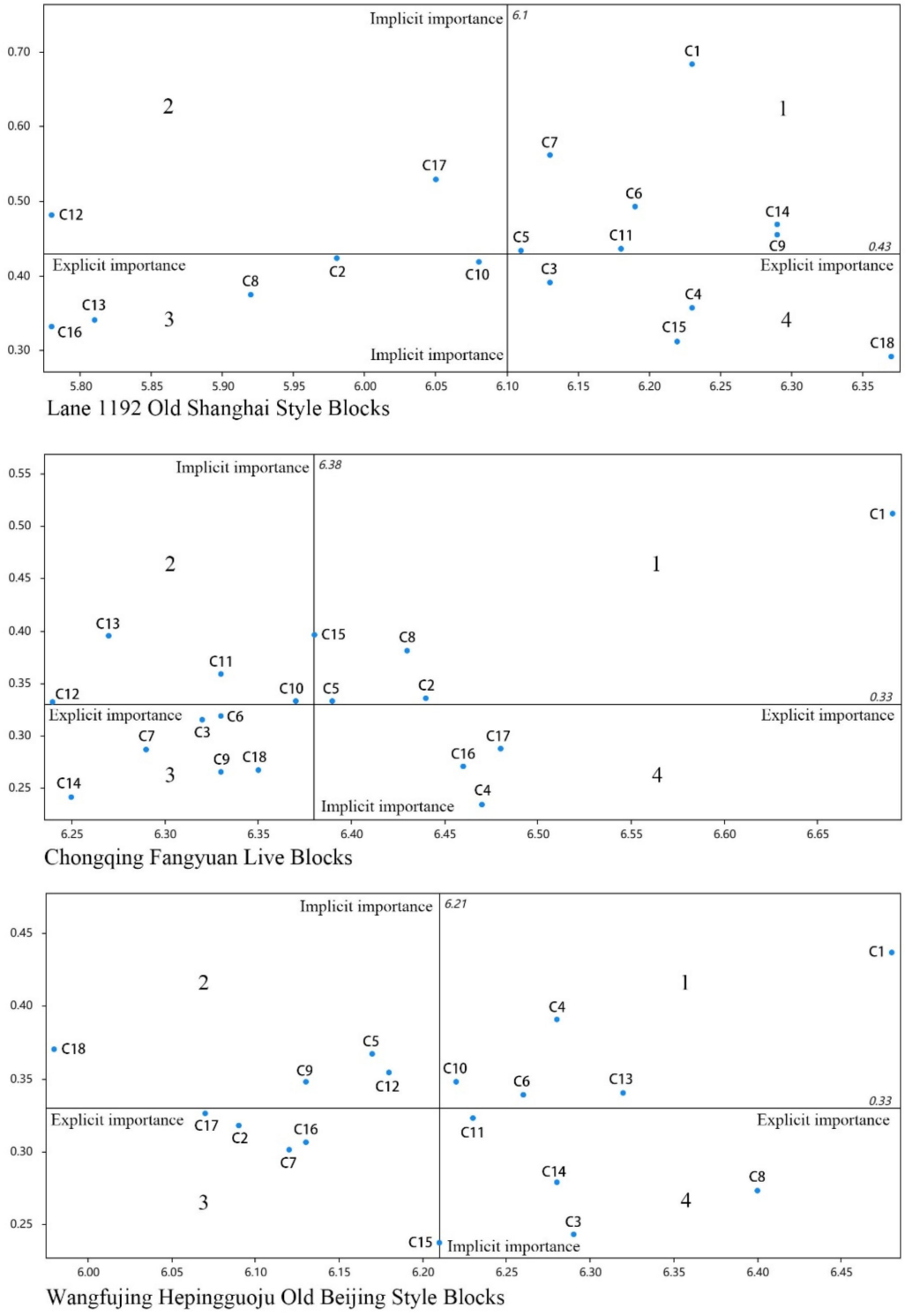


Figure 2. IPA–Kano quadrant analysis of underground theme blocks in three cases.

4.3. Optimization Analysis of Design Elements

Based on the quadrant attribution results and the satisfaction ranking of each element (Table 5), we analyzed and extracted the design element priorities. In the three underground theme block cases, two design elements, a thematic storefront billboard and the thematization of a public facility, appeared in the improvement priorities table (Table 7) and are therefore the elements to focus on for optimization.

Table 7. Improvement priorities of design elements of underground theme blocks.

	Lane 1192 Old Shanghai Style Blocks	**Chongqing Fangyuan Live Blocks**	**Wangfujing Hepingguoju Old Beijing Style Blocks**
Priority 1	C4 Thematic storefront billboard	C16 Thematic clothing matching for staff	C3 Ceiling decoration
	C15 Thematic activities		C11 Thematization of public facility
	C18 Online and offline thematic marketing		
Priority 2	C7 Indoor spatial morphology C9 Sunken Plaza	C2 Non-commercial interface decoration	C10 Thematization of amusement facility
Priority 3	C17 Matching of music and theme	C10 Thematization of amusement facility	
		C11 Thematization of public facility	
		C12 Theme-based checkpoints	
Priority 4	C3 Ceiling decoration	C4 Thematic storefront billboard	
Priority 5	C6 Logo IP image design	C5 Thematic and color matching degree	C1 Decorative floor covering
	C11 Thematization of public facility		C4 Thematic storefront billboard
	C14 Changes in light and shadow		C6 Logo IP image design
Priority 6		C13 Number of thematic business formats	C9 Sunken Plaza
			C12 Theme-based checkpoints
			C18 Online and offline thematic marketing

4.4. Correlation Analysis Between Common Elements and Overall Tour Satisfaction

Based on the experimental results, we screened the common elements and conducted a correlation analysis with overall tour satisfaction. After calculating the correlation coefficients between the two common elements, thematic storefront billboard and thematization of public facilities, and overall tour satisfaction through the SPSSAU statistical analysis software, the correlation coefficients are shown in Table 8, in which the significance *p*-values are less than 0.05, which indicates that there is a positive correlation between the two common elements and the overall tour satisfaction.

Table 8. Correlation between satisfaction with common elements and overall tour satisfaction.

	Lane 1192 Old Shanghai Style Blocks		**Chongqing Fangyuan Live Blocks**		**Wangfujing Hepingguoju Old Beijing Style Blocks**	
	Satisfaction	**Correlation Coefficient**	**Satisfaction**	**Correlation Coefficient**	**Satisfaction**	**Correlation Coefficient**
C4 Thematic storefront billboard	5.96	0.282 **	6.18	0.232 **	6.09	0.265 **
C11 Thematization of public facility	5.99	0.383 **	6.11	0.260 **	5.92	0.360 **
Overall tour	5.87		6.25		5.90	

(indicates: ** $p < 0.01$).

5. Discussion

5.1. Optimization Path Analysis of Underground Theme Block Shaping

The present findings can be discussed in relation to Jia et al. [15], who applied the IPA–Kano framework to three underground building atria in Chongqing. Both studies use user evaluations to identify design attributes that warrant different levels of attention for improvement. However, the two studies address different spatial settings and analytical emphases. Jia et al. focused on atrium-related elements, whereas the present study examines thematic-design attributes in underground commercial streets across Shanghai, Chongqing, and Beijing. The indicator framework therefore places greater emphasis on the relationships among thematic expression, commercial interfaces, spatial nodes, and experience-oriented activities. This distinction matters when interpreting priorities for improvement. In the present study, thematic storefront billboards and the optimization of public facilities appear among the elements requiring attention across the three cases, although their relative priority varies. These findings extend the discussion of underground-space design from the physical configuration and facilities of atria to how thematic identity is expressed through commercial and public-use interfaces.

Thematic storefront billboards (Figures 3–5) are a key element of underground themed streets, and they correlate with visitors' overall satisfaction with their visit. This finding aligns, to some extent, with existing research on the visual environment of commercial streets. Previous studies have shown that commercial signage not only conveys commercial information, but its scale, location, color, and relationship to building facades also influence the visual quality, sense of order, and aesthetic evaluation of the street environment. Eye-tracking and survey results from studies on commercial streets also indicate that storefront signage is a prominent visual element when users observe the commercial street landscape, and that its visual presentation is linked to street satisfaction and aesthetic evaluation [55]. Therefore, this study recognizes thematic storefront billboards as a key focus for optimization—not merely because of their commercial promotional function, but because they simultaneously serve multiple purposes, including information identification, shaping the storefront interface, and conveying a thematic visual expression. Compared to ground-level commercial streets, underground themed streets feature a relatively enclosed spatial environment, where users rely more on artificial lighting, storefronts, signage systems, and wayfinding information to identify shops and key points within the space. Therefore, signage in underground-themed streets is not merely an independent medium for commercial communication; it also helps form a continuous underground street landscape. When the scale, color, typography, graphics, and materials of the billboard harmonize with the overall theme, its visual information can further reinforce the spatial theme's recognition; conversely, if the billboards of different stores lack coordination in size, color, and form, this may create visual competition and undermine the orderliness of the overall spatial environment. Existing research on commercial signage also indicates that the visual characteristics of commercial signage and its relationship with the surrounding built environment influence users' evaluations of the visual quality and aesthetic appeal of commercial streets [56]. Consequently, this study's findings further illustrate that optimizing billboards in underground themed streets should not be limited to "adding thematic elements," but should instead emphasize coordination between the communication of commercial information and the theme's overall visual order.



Figure 3. Storefront billboards of Lane 1192 Old Shanghai Blocks. (Source: Photographs taken by the authors).



Figure 4. Storefront billboards of Chongqing Fangyuan Live Blocks. (Source: Photographs taken by the authors).



Figure 5. Storefront billboards of Wangfujing Hepingguoju Old Beijing Style Blocks. (Source: Photographs taken by the authors).

Thematization of public facilities (Figures 6–8) with thematic designs has also received significant attention, but its mechanism of action differs somewhat from that of storefront billboards. Research on existing public spaces generally indicates that public facilities do not merely serve basic functional purposes; their layout, accessibility, ease of use, and design quality can all influence users' evaluations. Related studies link the functional organization and ease of use of public facilities to user satisfaction, while recent user-centered research further emphasizes the need to evaluate public facilities' functionality and user experience based on actual usage needs [57]. In underground public spaces, public facilities also complement spatial functions, enhance usability, and strengthen environmental recognition. Existing research on underground spaces indicates that users' perceptions of underground public spaces involve not only spatial functions but also multiple aspects such as the spatial environment, design layout, and public facilities [58]. This study further found that when public facilities are incorporated into a themed design system, their evaluation is no longer limited to "whether they can meet basic usage needs," but also involves the degree to which they harmonize with the overall environment of the underground themed street. Although benches, trash cans, lighting fixtures, rest areas, and other public facilities are relatively small-scale spatial elements, their high visibility and frequent use mean that their form, materials, colors, and decorative language can all serve as important cues for users in perceiving the themed environment. Therefore, the significance of thematic public facilities lies not simply in "stylizing" or "decorating" them, but in ensuring that, while fulfilling their basic functions, they form a relatively consistent visual and cultural expression with the spatial theme. In the spatial environment of an underground-themed street—with a clearly defined thematic orientation—public facilities also maintain thematic continuity and facilitate spatial recognition. In other words, thematic public facilities must meet the requirements of functional suitability and thematic expression simultaneously. The optimization needs for theming public facilities identified in this study reflect the synergistic relationship between functional requirements and thematic expression.

The cross-case comparison shows that improvement priorities for thematic storefront billboards and thematization of public facilities differ across Shanghai, Chongqing, and Beijing. In Shanghai, thematic storefront billboards fall in the basic quadrant and rank first in improvement priority, while themed public facilities fall in the important quadrant and rank fifth. This suggests that improving the visibility, legibility, and thematic consistency of shopfront signage should receive immediate attention, while public facilities should be maintained and refined to reinforce the overall thematic environment. In Chongqing, thematic storefront billboards remain in the basic quadrant but rank fourth, while thematization of public facilities falls within the attractive quadrant and ranks third. Accordingly, signage improvements can focus on targeted enhancements to visual coherence and information recognition, while public facilities offer opportunities for more distinctive, theme-related designs that enrich the spatial experience. In Beijing, thematic storefront billboards fall in the important quadrant and rank fifth, while thematization of public facilities falls in the basic quadrant and ranks first. The primary focus should therefore be on ensuring that public facilities meet users' fundamental expectations while remaining visually consistent with the thematic setting; shopfront signage can be improved through ongoing refinement rather than treated as the most urgent intervention. Overall, although these two design elements recur across all three cases, their quadrant positions and priority rankings indicate that improvement strategies should be tailored to each site's evaluation results. These recommendations provide a basis for allocating design resources according to users' reported perceptions and should not be interpreted as evidence of causal effects on overall satisfaction.



Figure 6. Public facilities of Lane 1192 Old Shanghai Blocks. (Source: Photographs taken by the authors).



Figure 7. Public facilities of Chongqing Fangyuan Live Blocks. (Source: Photographs taken by the authors).



Figure 8. Public facilities of Wangfujing Hepingguoju Old Beijing Style Blocks. (Source: Photographs taken by the authors).

5.2. Deficiencies and Prospects of the Research

This study still has certain limitations. The number of case studies and the geographic scope are relatively limited, as the analysis focused solely on three underground-themed

streets in Shanghai, Chongqing, and Beijing. The findings primarily reflect the perceptual characteristics of specific cases and user groups, and their cross-regional applicability requires further verification. In the future, the study could expand the number of case studies to include underground-themed commercial spaces across different cities, cultural regions, and international contexts to test the applicability of the study's conclusions and analytical framework. The research methodology has certain limitations: the quadrant classification in IPA analysis depends on the coordinate axes and threshold settings, and design elements near the quadrant boundaries may suffer from insufficient classification stability [59]. Therefore, evaluate the classification results comprehensively by considering importance, satisfaction, and specific case scenarios, rather than treating them as fixed categories. In the future, researchers can further test classification stability by expanding the sample size and conducting sensitivity analyses under different threshold conditions. The conceptual scope of some design elements remains relatively broad. For example, "thematic public facilities" encompasses a variety of facilities—such as seating, lighting fixtures, and trash cans—which differ in both function and visual attributes. Future research could further refine facility types and evaluate them in terms of form, color, materials, patterns, and thematic coherence to enhance the specificity and explanatory power of the indicators. Finally, this study primarily relied on questionnaires to collect data on users' subjective perceptions and did not sufficiently integrate objective data such as spatial configuration, behavioral trajectories, visitor flow, and operational metrics. Furthermore, the correlation analysis cannot directly prove a causal relationship between design elements and satisfaction. Future research could combine behavioral data with pre- and post-intervention surveys to further validate the actual impact of thematic design elements and incorporate factors such as design costs and implementation conditions into updated decision-making analyses.

The same respondents completed the same questionnaire to rate importance and satisfaction. This single-source, single-method design may introduce common method bias, potentially affecting the observed associations between the variables and, consequently, the estimated implicit importance of individual design attributes [60]. Although the correlation-based procedure provides a consistent basis for comparing attributes within the present analytical framework, the resulting coefficients may partly reflect shared measurement methods or response tendencies rather than relationships attributable solely to the design attributes themselves. Second, the bivariate correlations indicate statistical associations, not causal effects. Accordingly, interpret the implicit-importance scores and resulting improvement priorities with caution. Future research could reduce these concerns by combining survey responses with independent measures of spatial characteristics or behavioral observations, and by collecting data from multiple sources or at different time points where feasible. Another limitation is potential heterogeneity in respondents' evaluation experiences. Although we provided images and videos to illustrate the spatial environments and thematic design elements, respondents who had not visited the study sites may have relied primarily on visual information, whereas actual visitors could also draw on their direct spatial and functional experiences. Because we did not record visitation status in a format that allows reliable case-specific identification, we could neither quantify the number of non-visitors for each case nor assess whether excluding them would change the results. Accordingly, we cannot verify the robustness of the IPA–Kano classifications and improvement priorities to the inclusion of non-visitors. Therefore, interpret the findings as reflecting respondents' reported perceptions, with caution regarding their representativeness of actual visitors' evaluations. Future studies should explicitly record visitation history, recruit sufficient numbers of actual visitors, and compare results across

visitor groups to assess how sensitive design-improvement priorities are to respondents' experience of the sites.

At the same time, this study has not fully integrated objective data such as spatial measurements, behavioral trajectories, visitor flow characteristics, and long-term operational performance; consequently, it still has limitations in explaining the relationship between design elements and actual spatial usage behavior. Third, this study focuses primarily on micro-level thematic design elements of underground themed streets and does not incorporate foundational or macro-level performance factors—such as transportation accessibility, spatial connectivity, safety, transportation integration, and overall operational performance—into the same evaluation framework. Consequently, this study's findings should be understood as an analysis of thematic design quality in underground themed streets, rather than a comprehensive evaluation of the overall performance of underground public spaces. Future research could be expanded in three areas. First, the number of case studies and the geographic scope could be broadened to include underground public spaces from different cities, cultural regions, and types in a comparative study, in order to examine the stability and variability of design elements and their optimization priorities across different spatial contexts. Second, questionnaire-based perception data could be combined with objective information such as spatial syntax, spatial morphometry, behavioral observations, movement trajectories, visitor flow data, and operational data. Cross-validating subjective perceptions with objective performance metrics could strengthen the explanatory power of design evaluation. Third, longitudinal surveys and comparative studies before and after design interventions can observe the relationship between specific design adjustments and changes in user satisfaction. At the same time, subsequent decision-making frameworks should incorporate variables such as design costs, spatial constraints, implementation difficulties, and resource allocation. Furthermore, explore integrating IPA–Kano priority analysis with multi-objective optimization methods to improve the verifiability and contextual adaptability of decision-making for renewing underground public spaces.

6. Conclusions

Using three underground-themed streets in Shanghai, Chongqing, and Beijing as case studies, this study used a questionnaire survey to gather users' evaluations of the importance and satisfaction levels of these themed streets' design elements. It further utilized the correlation between importance and satisfaction to identify the implicit importance of these design elements. Based on this, the IPA–Kano model was applied to identify demand attributes and optimization priorities for different design elements, thereby formulating differentiated optimization pathways for each. The analysis results of the three case studies indicate that thematic storefront billboards and the thematization of public facilities have high optimization priorities in the cases examined. This suggests that thematic visual expression and the thematic integration of public facilities are design elements worthy of particular attention when users perceive the spatial quality of underground themed streets. Methodologically, the IPA–Kano analytical framework developed in this study links explicit importance, satisfaction, implicit importance, and demand attributes, providing a user-perception-based decision-making method to identify, evaluate, and prioritize the renewal of existing design elements in underground themed streets. Its primary function is to help prioritize limited renewal resources and determine the sequence of design interventions, rather than to derive a universally applicable optimal spatial solution. The research findings provide empirical evidence on users' perceptions of thematic design elements and their relative priorities for optimization. They therefore offer a practical ref-

erence for designers, developers, and managers when allocating limited renewal resources among different design elements.

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Institutional Review Board Statement: This study used an anonymous online questionnaire to collect participants' perceptions of design elements in underground theme streets. The survey did not involve any clinical intervention, experimental manipulation, collection of sensitive personal information, or identifiable private data, and participation was entirely voluntary. The questionnaire focused exclusively on participants' perceptions and evaluations of the study sites. Based on this, we believe that this research does not fall within the scope of application as stipulated in the "Ethical Review Measures for Life Sciences and Medical Research Involving Humans" jointly issued by the National Health Commission of China, the Ministry of Education, and the Ministry of Science and Technology (Document No. 4 of 2023 issued by the National Health Commission of China). The third item of this document clearly states that it is applicable to "life sciences and medical research involving humans". The official website of this measure is https://www.gov.cn/zhengce/zhengceku/2023-02/28/content_5743658.htm (accessed on 16 October 2026)". Meanwhile, referring to the operational guidelines for ethical review exemptions provided by major domestic research institutions (such as the official explanations of hospitals), this research falls under the category of "method for researchers to record information without being able to contact the participants", and during the research process, we have strictly adhered to academic ethical norms, including but not limited to: clearly explaining the research purpose to all participants, ensuring voluntary participation, anonymizing all data to protect personal privacy, etc., which meets the conditions for exemption from formal ethical review. For example, the website of the relevant hospital's statement is https://www.ahslyy.com.cn/col276/871949 (accessed on 16 October 2026). It clearly states that researchers can record information without contacting participants and be exempt from ethical review.

Informed Consent Statement: Informed consent was obtained from all participants included in the study.

Data Availability Statement: The data that support the findings of this study are available from the author Yao Hu, upon reasonable request.

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References

1. Cui, J.; Broere, W.; Lin, D. Underground space utilisation for urban renewal. *Tunn. Undergr. Space Technol.* **2021**, *108*, 103726. [CrossRef]
2. Broere, W. Urban underground space: Solving the problems of today's cities. *Tunn. Undergr. Space Technol.* **2016**, *55*, 245–248. [CrossRef]
3. Hunt, D.V.L.; Makana, L.O.; Jefferson, I.; Rogers, C.D.F. Liveable cities and urban underground space. *Tunn. Undergr. Space Technol.* **2016**, *55*, 8–20. [CrossRef]
4. Wei, X. Analysis of Civil Air Defense Building Design and Urban Underground Space Planning. *Eng. Constr.* **2023**, *6*, 173–175. (In Chinese)
5. Hong, X.; Ji, X. Analytical Study on the Necessity of Integrating Underground Public Space and Rail Transit in Urban Center. In Proceedings of the ISCTT 2021; 6th International Conference on Information Science, Computer Technology and Transportation, Xishuangbanna, China, 26–28 November 2021.

6. Xu, Y.; Chen, X. Current Situation and Prospect of Comprehensive Development of Underground Space in Metro Area. *Chin. J. Undergr. Space Eng.* **2023**, *19*, 1–12+21. [CrossRef]
7. Yu, Y.; Zhou, R.; Wu, B.; Yao, X.; Fan, L. Evolution Mechanism and Optimization Path of Commercial Space in Metro Station Area under TOD Guidance: Three Cases in Chengdu. *Planner* **2022**, *4*, 107–114. (In Chinese)
8. Liu, J.; Cheng, Y. Research on the Development of Underground Characteristic Blocks Based on the Construction of Public Space. *Chin. J. Undergr. Space Eng.* **2020**, *16*, 325–333. (In Chinese) [CrossRef]
9. Chen, X.; Dong, C.; Tao, S.; Peng, Q.; Liu, J. Integrated Transit-Oriented Development (TOD) with suburban rail network design problem for maximizing profits. *Transp. Lett.* **2024**, *16*, 1318–1337. [CrossRef]
10. He, J.; Wang, J.; Zhang, D. Land use structure optimization in rail transit station area under TOD (Transit Oriented Development) mode. *Urban Mass Transit* **2025**, *28*, 48–51. [CrossRef]
11. Sun, Y.; Han, B.; Lu, F. An overview of TOD level assessment around rail transit stations. *Urban Rail Transit* **2024**, *10*, 1–12. [CrossRef]
12. Wang, J.; Tan, W.; Huang, J. Extending TOD through the interrelationship between transport and land use: A case study of Beijing. *Land Use Policy* **2024**, *144*, 107257. [CrossRef]
13. Pishro, A.A.; Zhang, S.; L'Hostis, A.; Hu, Q.; Liu, Y.; Zhang, Z.; Nguyen, V.D.; Fu, Y.; Li, T. Partial differential equations and machine learning integration for transit-oriented development. *Appl. Soft Comput.* **2025**, *184*, 113703. [CrossRef]
14. Qin, Y.; Hu, Z. Research on the Development and Utilization of the Underground Space of the Traditional Characteristic Blocks in the Old City—A Case of Dongguan Street in Yangzhou. *Urban. Archit.* **2020**, *17*, 7–10. (In Chinese)
15. Jia, X.; Yan, B.; Wang, J.; Fang, L. Evaluation and Optimization Paths of Design Elements of Underground Building Atria Based on IPA–Kano Model. *Buildings* **2023**, *13*, 789. [CrossRef]
16. Zhang, S.; Li, D.; Wang, Y.; Wang, Y. Integrated optimization of train routing and timetable of rail transit network with time-varying passenger demand. *Arch. Transp.* **2025**, *75*, 41–71. [CrossRef]
17. Bao, X.; Zhang, Q.; Yin, H.; Wang, E.; Xiao, Y. Integrated optimization of demand-oriented timetabling and rolling stock circulation planning with flexible train compositions and multiple service routes on urban rail lines. *Transp. Res. Part C Emerg. Technol.* **2025**, *174*, 105071. [CrossRef]
18. Kong, W.; Feng, W.; Liu, Y. Underground space planning optimization under the TOD model using NSGA-II: A case study of Qingdaobei Railway Station and Its Surroundings. *Sustainability* **2025**, *17*, 9761. [CrossRef]
19. Kusumowidagdo, A.; Sachari, A. Visitor Preference Factors toward Shopping Centres' Thematic Corridor Study of Gandaria City, Indonesian Shopping Centre. *J. Arts Humanit.* **2015**, *4*, 8–19. [CrossRef]
20. Yahya, Z.; Guntama, E.A. Visual Communication as a Promotional Strategy Attraction of Shopping Center (Case Study on Thematic Decoration of The Avatar Pandora: The Way of Water in Senayan City Mall). *J. Econ. Bus. Gov. Chall.* **2023**, *6*, 37–49. [CrossRef]
21. Cui, L.; Chen, C. Research on the Elements of Underground Space Planning and Design in Tianjin Urban Planning. *Sci. Technol. Inf.* **2014**, *6*, 46–47. (In Chinese) [CrossRef]
22. Hu, B.; Zhou, Y. Public Safety Design of Underground Walking Space. *Chin. J. Undergr. Space Eng.* **2017**, *13*, 573–578. (In Chinese) [CrossRef]
23. Yang, C.; Liu, J. Research on Continuous Integration of Ground and Underground Based on Spatial Narrative Techniques. *Chin. J. Undergr. Space Eng.* **2020**, *16*, 1591–1595. (In Chinese) [CrossRef]
24. Liu, J.; Yang, C. Research on the Use of Space Narrative to Create Underground Space Scene. *Chin. J. Undergr. Space Eng.* **2020**, *16*, 647–655. (In Chinese) [CrossRef]
25. Yang, Y.; Ma, Y. A Brief Talk about the Application and Expression of Floor Decoration Art in Interior Design. In Proceedings of the International Conference on Social Science, Education Management and Sports Education (SSEMSE 2015), Beijing, China, 10 April 2015. [CrossRef]
26. Wang, R.; Chen, K.; Cui, C. Commercial Street Planning Guided by Urban Design Guidelines. *Planners* **2012**, *28*, 107–111. (In Chinese)
27. Kusumowidagdo, A.; Sachari, A.; Widodo, P. Visitors' perceptions on the important factors of atrium design in shopping centers: A study of Gandaria City Mall and Ciputra World in Indonesia. *Front. Archit. Res.* **2016**, *5*, 52–62. [CrossRef]
28. Wu, J.; Huang, W.; Li, X. Analysis on the relationship of Hong Kong Mong Kok outdoor advertisements and city commercial space. *Shanxi Archit.* **2014**, *40*, 18–21. (In Chinese) [CrossRef]
29. Huang, J.; Shu, M. The Practice Research of Reading Space Construction of Public Libraries in Taiwan Province of China. *Libr. Inf. Serv.* **2021**, *65*, 80–88. (In Chinese) [CrossRef]
30. Zhang, J.; Tian, T. Application Research of IP Image Design under the concept of Environmental Protection—A case study of "Wuhan Lake IP Image Concept Design". *J. Educ. Humanit. Soc. Sci.* **2023**, *14*, 207–213. [CrossRef]
31. Fan, W.; Li, H. The Emotional Expression of Indoor Space Form in the Interaction between Human and Living Space. *Art. Des.* **2012**, *94*, 74–76. (In Chinese) [CrossRef]

32. Zhao, J. Analysis on Design of Underground Space in Tianjin: An Example of Langxiang Underground Street. *Earth Environ. Sci.* **2019**, *233*, 022030. [CrossRef]
33. Zhang, Z.; Xu, J. Research on the design of children's play equipment in indoor commercial space. *Art. Sci. Technol.* **2023**, *36*, 181–183. (In Chinese) [CrossRef]
34. Cai, Z. The Theme of Public Facilities in Urban Design Product Experience. *Art. Des.* **2010**, *2*, 97–98. (In Chinese) [CrossRef]
35. Wang, Z.; Zhang, S.; Yang, L. Research on Spatial Perception of Internet-famous Spot in Chongqing Based on Web Text Analysis. *J. Hum. Settl. West China* **2022**, *37*, 126–131. (In Chinese) [CrossRef]
36. Xu, C.; Guo, S. The characteristics of business formats and their influencing factors in historical and cultural blocks: A case study of Taiping District in Changsha City. *J. Chin. Ecotourism* **2023**, *13*, 152–168. (In Chinese) [CrossRef]
37. Edensor, T.; Hughes, R. Moving through a dappled world: The aesthetics of shade and shadow in place. *Soc. Cult. Geogr.* **2021**, *22*, 1307–1325. [CrossRef]
38. Yu, J.; Gong, J.; Sun, Y.; Huang, Y. Theme Creative Makes Reading Space Alive: Practicing on Creative Design of the Reading Theme Space in Beijing Normal University. *Libr. J.* **2020**, *5*, 55–63. (In Chinese) [CrossRef]
39. Shuai, M.; Shen, L. Method to balance the function and sensation in fashion design. *J. Text. Res.* **2006**, *27*, 90–92. (In Chinese)
40. Zhu, L. First Exploration of Research on Background Music and Consumer Psychology. *Art. Sci. Technol.* **2010**, *4*, 33–35. (In Chinese) [CrossRef]
41. Kuang, H.; Xie, W. Development path of online-offline integration of cultural tourism enterprises based on virtual tourism experience. *Enterp. Econ.* **2021**, *6*, 129–137. (In Chinese) [CrossRef]
42. Matzler, K.; Sauerwein, E.; Heischmidt, K. Importance-performance analysis revisited: The role of the factor structure of customer satisfaction. *Serv. Ind. J.* **2003**, *23*, 112–129. [CrossRef]
43. Yin, J.; Cao, X.; Huang, X.; Cao, X. Applying the IPA-Kano model to examine environmental correlates of residential satisfaction: A case study of Xi'an. *Habitat Int.* **2016**, *53*, 461–472. [CrossRef]
44. Du, Y.; Chen, J. Research on the Quality Attribution of Design Elements for the Entrance and Exit of Subway in Cold Region Based on IPA-KANO Method. *Archit. J.* **2018**, *S1*, 144–148. (In Chinese)
45. Vaidya, O.S.; Kumar, S. Analytic hierarchy process: An overview of applications. *Eur. J. Oper. Res.* **2006**, *169*, 1–29. [CrossRef]
46. Huang, Y.; Chen, C.H.; Khoo, L.P. Products classification in emotional design using a basic-emotion based semantic differential method. *Int. J. Ind. Ergon.* **2012**, *42*, 569–580. [CrossRef]
47. Kuo, Y.F.; Chen, J.Y.; Deng, W.J. IPA–Kano model: A new tool for categorising and diagnosing service quality attributes. *Total Qual. Manag. Bus. Excell.* **2012**, *23*, 731–748. [CrossRef]
48. Lai, I.K.W.; Hitchcock, M. Importance–performance analysis in tourism: A framework for researchers. *Tour. Manag.* **2015**, *48*, 242–267. [CrossRef]
49. You, Y. Characteristic Embodiment of Company A Theme Commercial Block under Cultural Creativity. *Mark. Mod.* **2019**, *15*, 11–12. (In Chinese) [CrossRef]
50. Li, N. Investigation and Multivariate Statistical Analysis on the Usage Behavior of Cultural Theme Commercial Street in Hefei. *Archit. Cult.* **2021**, *11*, 70–71. (In Chinese) [CrossRef]
51. Taplin, R.H. The value of self-stated attribute importance to overall satisfaction. *Tour. Manag.* **2012**, *33*, 295–304. [CrossRef]
52. Norman, G. Likert scales, levels of measurement and the "laws" of statistics. *Adv. Health Sci. Educ.* **2010**, *15*, 625–632. [CrossRef]
53. Schober, P.; Boer, C.; Schwarte, L.A. Correlation coefficients: Appropriate use and interpretation. *Anesth. Analg.* **2018**, *126*, 1763–1768. [CrossRef]
54. Schober, P.; Bossers, S.M.; Schwarte, L.A. Statistical significance versus clinical importance of observed effect sizes: What do P values and confidence intervals really represent? *Anesth. Analg.* **2018**, *126*, 1068. [CrossRef]
55. Zhu, C. On the design of billboard in the historical commercial street. *Shanxi Archit.* **2008**, *34*, 49–50. (In Chinese) [CrossRef]
56. Kim, B.; Park, J. The Visual Effect of Signboards on the Vitality of the Streetscapes Using Eye-Tracking. *Sustainability* **2021**, *13*, 30. [CrossRef]
57. Li, X.; Chen, J.; Feng, H.; Brown, R.; Zhu, R. Development and Application of a Street Furniture Design Evaluation Framework: Empirical Evidence from the Yangzhou Ecological Science and Technology New Town. *Buildings* **2025**, *15*, 2973. [CrossRef]
58. Zeng, R.; Shen, Z. Post-occupancy evaluation of the urban underground complex: A case study of Chengdu Tianfu Square in China. *J. Asian Archit. Build. Eng.* **2023**, *22*, 139–154. [CrossRef]
59. Azzopardi, E.; Nash, R. A critical evaluation of importance-performance analysis. *Tour. Manag.* **2013**, *35*, 222–233. [CrossRef]
60. Podsakoff, P.M.; MacKenzie, S.B.; Lee, J.Y.; Podsakoff, N.P. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879. [CrossRef]

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