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Comprehensive Evaluation of the Implementation Effect of Commercial Street Quality Improvement Based on AHP-Entropy Weight Method—Taking Hefei Shuanggang Old Street as an Example

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Abstract: In the global context of sustainable urban development, urban regeneration is an activity to improve the form and function of urban space in built-up areas. Commercial streets are one of the most active factors in urban space and an important factor in promoting urban prosperity and reflecting urban vitality, yet these streets have not kept pace with the public's quest for quality through theoretical change, and this can even affect public comfort and well-being. In order to effectively undertake urban regeneration and improve the quality of urban streets and residents' satisfaction, design factors for the quality enhancement of commercial streets are explored in order to rationalise residents' demand preferences and their priorities, enhance residents' sense of belonging, and provide suggestions for the optimisation of the design of subsequent urban street regeneration in China. By summarising the literature and the content requirements of the quality enhancement scheme for Shuanggang Old Street in Hefei, this study applied a questionnaire survey and scientifically developed an index system containing five evaluation indicators, including spatial carrying capacity, street attractiveness, travel safety, environmental comfort, and social interaction. A combination of hierarchical analysis and entropy weighting was used to identify the most influential factors on the implementation of the quality improvement of the commercial street and design optimisation suggestions. The evaluation results show that travel safety and social interaction significantly affect the evaluation of the quality improvement of commercial streets, as well as highlighting the needs of residents for street environments and services and the role of local governments.

Keywords: comprehensive evaluation; commercial streets; entropy method; hierarchical analysis; quality enhancement; urban regeneration

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1. Introduction

Cities are here to stay, and the future of cities is the future of humanity. The departure of some residents from major cities in the early stages of the new coronavirus pneumonia epidemic was a temporary response that will not fundamentally change the global urbanisation process. The pace of urbanisation throughout the world will continue to accelerate over the next 30 years: the world urbanisation rate is expected to increase from 56% in 2021 to 68% by 2050. This will mean an additional 2.2 billion people living in cities, mainly in Africa and Asia. Urbanisation levels are expected to increase further across the globe, although urban development in highly urbanised and more developed regions will enter a period of stabilisation or deceleration.

The street plays a pivotal role in a city [1], not only as an important public space for the city, but also as the primary place in which citizens conduct commercial activities. It can not only meet people's daily consumption needs for shopping, leisure, and other

functions, but also can provide a good activity location for rest and entertainment for city residents. The spatial quality of commercial streets has a direct impact on the living environment and quality of residence of residents, and its importance is self-evident [2], so it has received widespread attention. The street environment is one of the most important factors influencing the quality of a street. The traditional transformation of streets by top-down government-led design no longer meets the needs of the population, which requires designers to consider more factors when carrying out street transformation. This paper combines the results of research related to the field of study and abroad to analyse and summarise the factors influencing the design of commercial street space, summarising the interrelationships between the indicators and the quantitative criteria, at the same time building up a comprehensive evaluation model. It is necessary for the designers to place themselves in the position of the users, to compare the specific uses of the street space at the beginning of the design phase, to further understand the operation of the street and the subjective evaluation of the users so as to examine whether the use of the street meets the design expectations, and to provide effective feedback for the improvement of the quality of the street in the future.

1.1. Urban Regeneration and Street Renewal

Urban regeneration is a comprehensive, holistic, policy-oriented, and strategic social system project. It is a government-led urban regeneration effort [3] whose main objectives are to improve the living environment, protect and improve people's livelihoods, promote the upgrading of urban industries, improve urban functions, adjust the urban structure, enhance urban vitality, preserve cultural traditions, enhance urban quality, promote harmonious social development, and promote urban civilisation. The study of urban regeneration originated from the desire to solve urban problems such as the decay of old urban centres and the poor living environment; to address these problems, urban regeneration theories such as organic regeneration [4], systematic regeneration, and sustainable development were proposed [5–7], spanning from the initial residential regeneration to neighbourhoods and commercial areas, making urban regeneration more representative.

At the beginning of the 14th Five-Year Plan in China, the transformation of the old method of urban development led to new requirements and a clear positioning of the concept of "organic renewal" in cities. Street space is one of the most important factors affecting the overall competitiveness and public satisfaction of a city. The quality of street space has become a new issue for urban public space, as urban liveability places higher demands on street space and highlights the need to improve the quality of street space to stimulate urban vitality and promote sustainable urban development. It has been extensively researched by scholars worldwide, but research has mostly focused on quantitative feature-based and topological relationship analysis [8–10]. As Chinese scholars continue to study spatial syntax and urban street patterns, more and more scholars have begun to focus on the integration, intelligence, and depth of streets [11–13], trying to reveal the complex socio-economic activities between streets and buildings and the deep relationships behind them. In commercial streets, speed reduction is used to increase pedestrian safety [14], while pedestrians are given a free path to pass through in order to strengthen the synergistic links between buildings on both sides of the road and the transformation of the street into a public space.

1.2. Factors Influencing Street Quality

The discussion of the quality of commercial street space is broadly divided into two categories, namely the discussion of street space quality indicators and the assessment of street space quality. The former focuses on the description of the relationship between various elements and functions in the physical environment, while the latter focuses more on the analysis of the state and psychological feelings of people in the course of their behavioural activities. The study of spatial quality indicators refers to the identification of factors that influence the quality of a street and their quantitative evaluation through

modelling, quantitative statistics, and objective judgement. Based on a summary of the literature, Sun Ruifeng et al. established a database for quantitative research on street space quality based on multiple sources, such as spatial morphological data and streetscape pictures, and constructed a street space quality evaluation index system based on two dimensions: material space composition and subjective space perception [15]. The composition of street space includes the economic and technical indicators of buildings on both sides of the street, public service facilities [16], the street environment [17], and traffic capacity [14], etc. Different elements of the composition of street space have different bearing capacities and different levels of attractiveness within the street space, which in turn affects the quality of street space. The subjective perception of street space consists of three main indicators: street safety [18], comfort [17], and sociality [19].

The built environment in 21st-century cities is facing serious challenges, not only in terms of redesigning the physical environment, but also in terms of reshaping public space into a more suitable location for walking and social interaction. High connectivity values and rich diversity are among the most important features of the built heritage, reflecting the character of a building's façade while eliciting tranquillity, aspiration, and well-being. Inhibitors of walkability are associated with poor-quality and narrow pavements, cars parked on the pavement, dirty streets, and motorised traffic and vehicle noise, which lead to negative emotions in the perception of walking, such as fatigue, anger, disgust, discomfort, and insecurity, which negatively affect the well-being of residents, depending on age and gender [20].

The above influences are the basic framework for the quality of the street, considering that the renewal of the street has other characteristics, such as the type of structure, especially the harmonious relationship between old and new buildings, and the need to satisfy the human perceptual psychological evaluation and rational design approach [21]. In turn, the visual perceptions of people in the street need to be considered, and the important influence of the visual perception of the street on urban planning has been studied in terms of street space, vertical interfaces, decorative elements, and colour aesthetics, which can help to improve the quality of life of residents [22]. Meanwhile, Cheng Liang also analysed the visual perception of urban streets in Jianye District, Nanjing, China, using streetscape images and proposed four indicators for evaluating the visual perception of streets, including significant area saturation, visual entropy, the green landscape index, and the sky openness index [23]. Defining a framework for assessing the walkability of a city can highlight the strengths and weaknesses in its urban environment. All aspects that have a direct impact (evidence-based) on promoting the adoption of healthy lifestyles or promoting active transport should be considered [24].

1.3. Street Quality Assessment

There are many different kinds of people living in streets, and quality improvements to street spaces affect different people and need to be analysed for different research perspectives, such as children's health [25], elderly health [26], and the post-epidemic era [27]. All of the various evaluations relate to populations, human spatial perceptions relate to health gains, and road area ratios are weaker than other indicators. The evaluation of different urban functions can be biased. Among the existing methods, the use of the quantitative analysis of street quality is quite well established, and various methods have been developed, such as streetscape imagery [28], Open Street Maps (OSMs) [29,30], satellite imagery, and remote sensing methods [31]. All of these have used different methods to analyse the various elements of street quality and have accumulated a number of indicators that can be used to evaluate street quality. These methods use streetscape images, POI data, or map data to record three-dimensional city profiles and user interactions from a human perspective, but, in practice, there are certain problems; for example, the development of indicators and the differentiation of conditions are more dependent on people's subjective judgement [32], the relationship between the factors affecting the spatial quality of the street is not clear, and the focus between the factors is not clear. This paper proposes

and establishes a set of spatial quality evaluation systems for urban street space planning and design.

The evaluation of street quality based on these data is generally based on the local state of the street and a quantitative analysis of street quality, and lacks other influencing factors of street quality (such as street comfort and street attractiveness), requiring street users to evaluate street quality subjectively and thus intuitively feel the influencing factors of street quality. However, there is currently no comprehensive theoretical system for evaluating the quality of urban streets, and there is a lack of corresponding methods and technical support. In addition, the evaluation of the effectiveness of street quality improvement measures in China is rarely addressed. In this paper, by drawing on relevant research results at home and abroad, we design a quality improvement transformation plan and a corresponding street quality index system suitable for the actual situation in China, and we carry out research on the evaluation of street quality improvement. Specifically, hierarchical analysis and the entropy method are used as research methods to evaluate the street quality, and optimisation strategies are given based on the evaluation results.

Our paper is organised as follows. Section 2 reviews the current situation in the study area and the establishment of an evaluation indicator system based on relevant requirements and a questionnaire survey. Section 3 describes the recovery of the questionnaire data and conducts the analysis and discussion. Section 4 summarises the conclusions.

2. Study Area and Methodology

2.1. Study Area

The data used in this study to present and analyse the evaluation of the effectiveness of the implementation of quality improvement in commercial streets come from Hefei, one of the most well-known cities in Central Anhui Province, China. The streets are built in the traditional Jianghuai style and have a large number of residents. The area has many buildings with distinctive characteristics that can effectively reflect the quality of the street. Specifically, Hefei Shuanggang Old Street (Figure 1), located in the Luyang district of Hefei, was completed in 1986 and is approximately 520 m long and 40 m wide, with around 170 shops along the street, operating in hundreds of varieties. The whole block is distributed in a long north–south direction, which is also interspersed with Shuanggang a lane to Shuanggang six lanes and Lily Garden Lane, close to the Shuanggang vegetable market, distributed with many long-standing food and snack vendors, clothing stores, and local product and department stores. It has a dense flow of people, as it is convenient for residents to live in an important commercial area. The street is lined with buildings dating from around the 1980s and 1990s, which are multi-storey residential buildings, mostly owned by private owners, constituting a variety of residential, commercial, and office uses. Most of these buildings were built between the end of the last century and the beginning of this century, and their design concepts and functions have changed; however, in appearance, they still retain many traces of the architectural style of the old Shanghai era and have a certain degree of value for renovation and use. This group of privately owned buildings was formed as a result of urban expansion and is both a result of urban development and an integral part of the city.

The buildings have not yet reached the end of their serviceable life; their structural performance is good, and their functions also meet the needs of commercial and residential use, but only due to poor management and maintenance, or limited to the technical level at that time, etc., the buildings show external dilapidation. In 2021, a quality improvement renovation was carried out (Figure 2), covering the area of Shuanggang Old Street and the branch lanes on both sides, with a total renovation area of approximately 7 hectares. The design of this renovation is based on the basic elements of renovating infrastructure and improving public facilities, with a focus on local conditions and practicality, so as to improve the living environment and living standards of the residents. This study takes the shops along both sides of the street and the façades of the residential buildings above the shops as the target and uses the overall evaluation data of residents or visitors to study

them. In view of this, this paper selects Shuanggang Old Street in Hefei as a case study, constructs an index system for evaluating the implementation effect of commercial street quality improvement, further examines the influence of index factors on the evaluation of the commercial street effect, and finally completes the evaluation of the implementation effect of Shuanggang Old Street's quality improvement and the analysis of the influence factors.

Figure 1. Location analysis map.

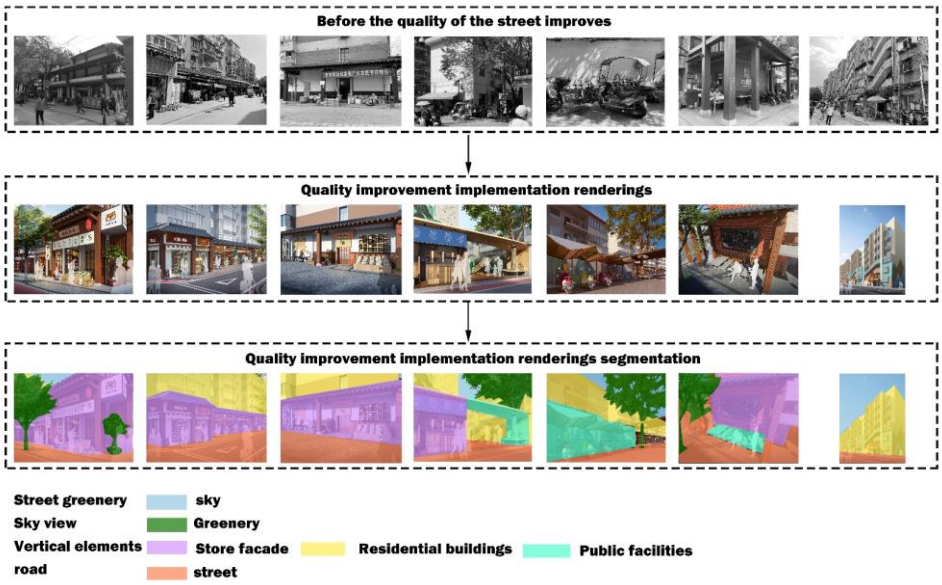


Figure 2. Quality enhancement effect.

2.2. Method Selection

There are two broad categories of impact factor determination methods: subjective weighting and objective weighting. The subjective weighting method is based on the evaluator's subjective perception of the importance of the influencing factors and judgement of the actual situation and is given by experts in the field using hierarchical analysis, statistical analysis, etc.; the objective weighting method is based on the information reflected in the influencing factors, such as the entropy weighting method, principal component analysis,

etc. Although the subjective weighting method can effectively determine the order of the weights given to the influencing factors according to their importance, the decision-making results are more subjective and arbitrary; although the objective weighting method has a strong mathematical theoretical basis and discards the influence of the subjectivity of the weights, the weights determined sometimes contradict the reality and do not reflect the will of the evaluator.

The AHP method was developed by Saty in the 1970s and is used to assign weights to evaluation indicators in the decision-making process [33]. It combines the advantages of the Analytic Hierarchical Process (AHP) and the fuzzy evaluation method. In this method, each solution is given different weights [34], thus enabling decision makers to select the best attributes from these solutions that best suit their business development needs. In this paper, an AHP method based on a hierarchical structure is proposed to solve the decision-making problem, i.e., the opinions of experts are quantified and ranked according to the sub-levels to which they belong. On this basis, a pairwise comparison between linguistic variables based on a 9-point scale is proposed. The difficulty is well solved. In each set of comparisons, AHP can calculate the geometric mean, the arithmetic mean, and the integral between them for each comparison matrix. The AHP is therefore reliable and intuitive in assigning relative weights to the indicators of the sustainability assessment tool [35].

Entropy is a measure of the degree of disorder in a system. The lower the entropy, the greater the amount of effective information; the greater the entropy, the smaller the amount of effective information. The entropy weighting method is used to calculate the weight of each evaluation index—that is, to use the effective information of the evaluation index to calculate the value—and the greater the effective information, the greater the weight [36].

In order to avoid the subjective assignment method being influenced by experts' empirical knowledge, the AHP method is used, i.e., the choice of comparing two scores at multiple levels, conducting consistency tests on the respective constructed judgment matrices, and adopting the arithmetic average of weights for the scores to be fused to obtain the AHP weights. Moreover, in order to avoid the objective assignment method, which in turn places too much emphasis on the internal variation between the data of each evaluation index and lacks a targeted analysis of the actual situation, the entropy weighting method is used. Therefore, this paper uses a combination of subjective and objective assignment methods, and after calculating the weights using the AHP method and the entropy weighting method, respectively, the AHP and entropy weighting methods are combined to finally arrive at a comprehensive weighting of indicators with higher credibility [37,38].

2.3. Construction of the Evaluation Indicator System

The evaluation of the implementation effect of commercial street quality improvement needs to be reflected by certain indicators. It is necessary to follow the policy guidance of the Chinese central and local governments, combine the content requirements of the commercial street quality improvement programme, and draw on relevant research results to develop a scientific and reasonable evaluation index system for the implementation effect of commercial street quality improvement.

In this study, the object of research involving spatial quality is the urban street—that is, the spatial quality of the urban street. The former consists of two dimensions [15], spatial carrying capacity [39] and street attraction [40], which reflect the volume of the buildings around the street, the degree of enclosure, and the impact of its physical space on the gathering of people on the street; meanwhile, the latter consists of three dimensions [18], i.e., travel safety [18], environmental comfort [17], and social interactivity [19], which reflect people's subjective satisfaction with the physical space of the street.

2.4. Space Carrying Capacity

The spatial carrying capacity of the street consists of the physical space element and the access element, which is the carrier of people and their activities [15]. Therefore, it is necessary to frame the quality enhancement work in the case location in terms of its content. The quality improvement work of Shuanggang Old Street includes the design of infrastructure improvement (road surface renovation design and traffic organisation design in the area), demolition and addition, landscape environment improvement design (road landscape, greening design, landscape facilities and accessories, and signage design), building façade improvement design, and outdoor supporting design, as shown in Figure 2. Therefore, in the specific construction of the evaluation index system, corresponding guidelines are proposed according to the relevant quality enhancement implementation plan.

Considering that the updated design of the building will have a certain sense of dissonance with the surrounding buildings, we consider D1, the harmony between old and new buildings. For the design of building façade enhancement in the quality improvement work, D2, the richness of the building façade, is considered. Dirty and unkempt streets can bring negative emotions in terms of pedestrians' perceptions, which can adversely affect the well-being of residents [20]; thus, we develop D3, the neatness of street pavement, to evaluate the street pavement condition in the design of road surface improvements in the renewal design. Pedestrian facilities have traditionally been the 'residual space' of urban street design, with a wealth of street facilities enabling pedestrians to enjoy life in a pleasant environment for resting, communicating, and shopping [16], and D4, the abundance of street furniture, was developed to test pedestrian satisfaction with the renewed design.

2.4.1. Street Attraction

According to the basic principles of Hefei's urban planning guidelines, they focus on aesthetic, ecological low-carbon, comprehensive and coordinated, people-oriented, and efficient characteristics as the core. Shuanggang Old Street is an important commercial street in Hefei, with rich and heavy historical and cultural connotations, and the any-optional operation mode has created unique cultural connotations and spatial forms. Nowadays, some traditional commercial streets are attached to the lifestyles of streets, retaining some historical veins and folk culture features, with a strong atmosphere of city life, which is the main feature in the architecture of traditional Chinese commercial streets. In order to improve the level of service and quality of the entire urban transport system, the street accessibility D5 was developed to test the ease with which pedestrians can choose their mode of transport to reach their destination [41]. The most conspicuous device in a commercial street is the shop sign, which is a tangible expression of urban culture [42], and cultural uniqueness D6 was developed to test the cultural expression of the shops in the updated design of the street. The main body of buildings in a commercial street is the shops, which present different visual characteristics in the street due to differences in street context and shop scale [42]. Shop diversity D7 was developed to examine the richness of the shops and businesses in Shuanggang Old Street.

2.4.2. Travel Safety

Walking is the most basic form of human transport [43]. Humans experience the full range of the urban street environment on foot, so a good urban streetscape is very attractive to citizens and walking is important for reviving the quality of local and urban streets. Nowadays, there has been a gradual focus on the interrelationship between the physical characteristics of the street and the behavioural practices of its users, and the character and function of the pavement is increasingly being re-examined. Pavements are often occupied by individualised street surfaces and encroachments by street vendors, resorting only to delineating pavement widths without regard to pedestrians and therefore lacking the expected efficiency [44]. A good pedestrian environment on the street increases the frequency of outdoor activities and thus has an impact on the behaviour of street users—for example, fewer vehicles and the appropriate placement of street furniture [18]. We develop

the vehicle disturbance index D8 to examine the impact of pedestrian disturbance by vehicles. Moreover, the percentage of street appurtenances D9 was developed to examine the pedestrian walking experience.

2.4.3. Environmental Comfort

Street quality enhancement does not only focus on improving the street environment and facilities, but also on enhancing the subjective perception of the street. The subjective perception of space reflects the overall impression that street users have of the city and their attitudes and behaviour as they carry out various social activities in the city, thus influencing people's daily activities and outdoor activities. The walkability of the built environment is influenced by many factors. In addition to the configuration of everyday amenities, street greenery can have a significant impact on walkability [28]. Green vision D10 was developed to examine the perception of street greenery among pedestrians. Cities have a high-density environment, and the use of streets as public open spaces makes congestion feel comfortable and vibrant, enhancing the liveability of the urban environment [45]. Street openness D11 was developed to examine the street space openness index. Architectural colour is always the most intuitive aspect of the streetscape, and since 1950, scholars have been exploring the links between architectural colour and human psychology [46], the structure of architectural space [47], and colour culture. Colour richness D12 was developed to examine the richness of colour in the street environment.

2.4.4. Social Interactivity

People are the main spatial users and the users who can intuitively observe and perceive the quality of the street. A comfortable, safe, and sociable street is more attractive to people, making them more inclined to stay longer, and, at the same time, the street space shows more vitality and dynamism, and its quality is more acceptable to the crowd [15]. We developed crowd gathering D13 to test the street crowd interaction index. The social interface index D14 was developed to examine the index of social spaces in the street.

In this context, the objective physical space enhancement effect and the subjective spatial perception are the starting points for the study. A system of indicators for evaluating the effectiveness of the implementation of commercial street quality enhancement is constructed and the two aspects are evaluated by the quality of the completion of each specific element. The system of indicators for evaluating the effectiveness of commercial street quality improvement is shown in Table 1.

Table 1. Indicator system for evaluating the effectiveness of implementing quality improvement in commercial streets.

Target Level	Guideline Level	Programme Level	Indicator Description
An evaluation of the effectiveness of the implementation of commercial street quality improvement	B1 Objective physical space	C1 Spatial carrying capacity [42]	D1 Harmony between old and new buildings D2 Richness of the building façade D3 Neatness of street pavement [20] D4 Abundance of street furniture [16]
		C2 Street attraction [40]	D5 Street accessibility [41] D6 Cultural uniqueness [42] D7 Shop diversity [42]
	B2 Subjective spatial perception	C3 Travel safety [18]	D8 Vehicle disturbance index D9 Percentage of street appurtenances
		C4 Environmental comfort [17]	D10 Green vision [28] D11 Street openness [45] D12 Colour richness [46,47]
		C5 Social interactivity [19]	D13 Crowd gathering D14 Social interface index

2.5. Questionnaire Design

Based on an extensive literature review of the built environment and street quality, a total of 14 attributes were selected to assess evaluation of the effectiveness of the implementation of street quality improvements. These 14 attributes were evaluated through a questionnaire survey on Shuanggang Old Street. The questionnaires were distributed on the Questionnaire Star and were first administered as an open-ended questionnaire, requiring the subjects to be either local residents or citizens who had visited the renewed and upgraded Shuanggang Old Street and had some impression of it, to evaluate the effectiveness of the implementation of the indicator descriptions in Table 1. The questionnaire was in the form of a scale [48] and each question consisted of a set of nine responses, with the scores categorised as 1, 2, 3, 4, 5, 6, 7, 8, and 9 in order of the degree of evaluation of the effect of the statement (Table 2). Participants were asked to rank the importance of each attribute using a 9-point scale. The questionnaire included basic information (gender, age, education level, and whether they had visited Shuanggang Old Street) and an evaluation of the effectiveness of the implementation of the commercial street quality improvement (e.g., how well do you think Shuanggang Old Street is coordinated with the old and new buildings?, etc.). The questionnaires were precisely distributed onsite by subject members with expertise in the field, and the distribution points were located in representative nodes of Shuanggang Old Street, mainly in the branch lanes of the Honest Tea House, Lao Song Grain and Oil Factory, Li's Dumpling Shop, and Key Shop under the Big Tree.

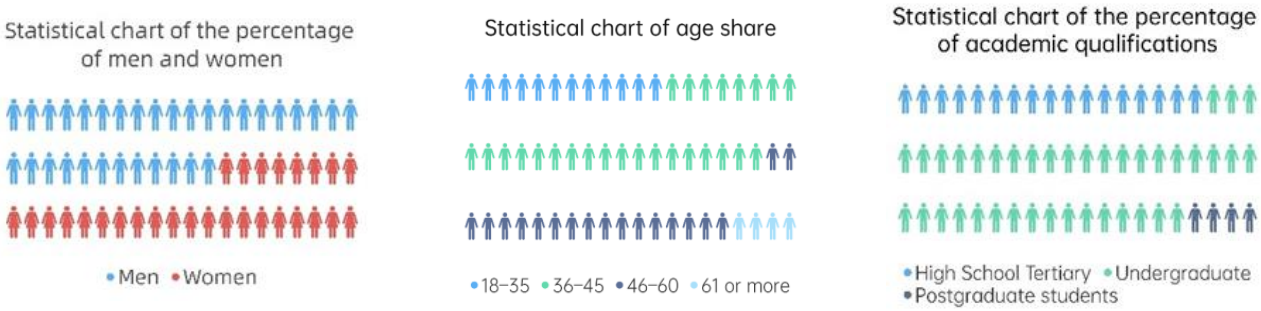
Table 2. Description of the indicator conversion questionnaire.

Indicator Description	Description
D1 Harmony between old and new buildings	What do you think of the harmony between the old and new buildings in Shuanggang Old Street?
D2 Richness of the building facade	What do you think of the richness of the façade along Shuanggang Old Street?
D3 Neatness of street pavement	What do you think of the cleanliness of the road surface in Shuanggang Old Street?
D4 Abundance of street furniture	What do you think of the richness of the street facilities in Shuanggang Old Street? (public seating, landscaping, leisure facilities, litter bins, newspaper kiosks, etc.)
D5 Street accessibility	What do you think of the traffic organisation of Shuanggang Old Street? (how easy it is to get to a certain place)
D6 Cultural uniqueness	What do you think of the cultural uniqueness of Shuanggang Old Street?
D7 Shop diversity	What do you think of the diversity of shops in Shuanggang Old Street?
D8 Vehicle disturbance index	How disturbed do you think the street is by vehicles?
D9 Percentage of street appurtenances	What do you think of the proportion of street furniture in Shuanggang Old Street? (Intersection crossing facilities, motor vehicle separation facilities, barrier-free facilities)
D10 Green vision	Do you think there is enough greenery in Shuanggang Old Street?
D11 Street openness	What do you think of the visibility along Shuanggang Old Street?
D12 Colour richness	What do you think of the colourfulness of Shuanggang Old Street?
D13 Crowd gathering	How crowded do you think Shuanggang Old Street is?
D14 Social interface index	What do you think of the percentage of places where people can interact with each other on Shuanggang Old Street?

3. Results and Analysis

A total of 276 open-ended questionnaires were distributed, and 258 valid questionnaires were returned, with an effective rate of 93.47%. The proportions of men and women were 46.51% and 53.49%, respectively, with the largest age group being 36–45 years old,

followed by 45–60 years old(Figure 3). Frequency analysis and AHP hierarchical analysis were then performed on the data from 258 respondents. The weight values of each indicator were derived and a consistency test was completed [49].



(**A**) (**B**) (**C**)

Figure 3. Statistical chart of the questionnaire data. (**A**) Statistical chart of the percentage of men and women. (**B**) Statistical chart of age share. (**C**) Statistical chart of the percentage of academic qualifications.

3.1. Credibility Analysis

The validity study was used to analyse the rationality and practical significance of the research items. The validity analysis used factor analysis as a data analysis method to examine the status of the data validity level by conducting a comprehensive analysis of KMO values, commonality, variance explained values, and factor loading coefficient values, respectively. This study found that different researchers used different methods of analysis for the same question; there was some variation in the reliability of the data. KMO values were used to judge the appropriateness of information extraction and commonality values were used to eliminate unreasonable research items.

Finally, the reliability coefficient Cronbach's alpha was used to assess the internal consistency of the obtained factors. This coefficient has been used to measure the reliability of questionnaires with multiple Likert scale questions [50–52]. A Cronbach's alpha value of 0.70 or higher indicates good reliability of the data. A KMO value between 0.8 and 1.0 indicates adequate sampling, while values between 0.7 and 0.8 are still acceptable [53,54].

The questionnaire data were imported into SPSS statistical software for factor analysis and reliability testing. From the above table, we can see that the value of Cronbach's alpha was 0.817, which is above 0.8, thus indicating that the research data had a high level of reliability (Table 3); the analysis yielded the sample data test statistic KMO = 0.664 with a significance level of $p < 0.05$, which passed the validity test and satisfied the applicable conditions of factor analysis (Table 4).

Table 3. Cronbach reliability analysis.

Number of Items	Number of Samples	Cronbach's Coefficient
14	258	0.817

Table 4. KMO and Bartlett tests.

KMO		**0.664**
Bartlett	Approximate cardinality	3077.934
	df	91
	p value	0.000

3.2. AHP-Entropy Weighting Method to Determine Weights

The basic idea of AHP is to first establish a hierarchical structure describing the functions or characteristics of the system according to the evaluation requirements, then compare the relative importance of the risk factors by two and give the corresponding scale to form a judgment matrix of one factor at the upper level to the related factors at the lower level, in order to give the relative importance sequence of related factors to a factor at the upper level. AHP is a useful method for the quantitative analysis of non-quantitative events, especially when the structure of the target factors is complex and the necessary data are not available, and when the evaluator's empirical judgement needs to be quantified.

The entropy weighting method determines the weight of an indicator based on the magnitude of the information load of each indicator. According to information theory, to examine the role of each factor in the indicator system, the variability of the indicator must be studied. The greater the variability of the indicator, the greater the information content of the indicator and the greater the discriminatory effect of the indicator, i.e., the greater the "differentiating power" of the indicator. This means that the weight of each indicator should be determined by the variation in the attribute values of the options under the indicator; the greater the variation, the greater the weight of the indicator; conversely, the smaller the weight.

3.2.1. AHP Determination of Weights

AHP was applied to determine the subjective weights of the influencing factors.

1. Constructing a judgement matrix. A judgement matrix represents a two-by-two comparison of all factors under a criterion. In this paper, the nine-scale method is used to construct the judgment matrix. The maximum eigenvalue λ_{max} of this matrix is first found corresponding to the eigenvector w_i, and then normalised to obtain the weight vector of risk factors. The evaluation indicators are compared two-by-two using a scale of 1 to 9. The judgement matrix A is as follows.

$$A = \begin{pmatrix} \alpha_{11} & \alpha_{12} & \cdots & \alpha_{1n} \\ \alpha_{21} & \alpha_{22} & \cdots & \alpha_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ \alpha_{n1} & \alpha_{n2} & \cdots & \alpha_{nn} \end{pmatrix} \quad (1)$$

2. Consistency test. The constructed judgment matrix is tested for consistency, as shown in Equations (2)–(3):

$$\mathrm{CI} = \frac{\lambda_{max} - n}{n - 1} \quad (2)$$

$$\mathrm{CR} = \frac{\mathrm{CI}}{\mathrm{RI}} \quad (3)$$

Here, CI is the consistency index; λ_{max} is the maximum eigenvalue of the matrix; n is the order of the matrix; CR is the consistency ratio; and RI is the average random consistency index.

If CR < 0.10, then the judgment matrix passes the consistency test; otherwise, the matrix needs to be readjusted.

The data are brought into the formula to calculate the D1–D14 weight values (Table 5).

Table 5. AHP indicator description weighting values.

Item	Eigenvectors	Weighting Values	Maximum Eigenvalue	CI Value
D1 Harmony between old and new buildings	1.137	0.0812	14.000	0.000
D2 Richness of the building facade	1.116	0.0797		
D3 Neatness of street pavement	1.079	0.0771		
D4 Abundance of street furniture	0.958	0.0684		
D5 Street accessibility	0.869	0.0621		
D6 Cultural uniqueness	1.007	0.0718		
D7 Shop diversity	1.000	0.0715		
D8 Vehicle disturbance index	1.006	0.0718		
D9 Percentage of street appurtenances	0.880	0.0629		
D10 Green vision	1.079	0.0771		
D11 Street openness	0.902	0.0645		
D12 Colour richness	1.060	0.0757		
D13 Crowd gathering	1.024	0.0731		
D14 Social interface index	0.884	0.0631		

As can be seen from the results in the table, all judgement matrix consistency evaluations met the requirement of CR less than 0.1 and passed the consistency test.

3.2.2. Entropy Weighting Method for Determining Weights

Using the entropy weighting method to determine objective weights, weights were calculated for the indicator descriptions in Table 1, and the specific calculation process for the entropy weighting method was as follows.

3. Create a judgment matrix $R = \left(\chi_{ij}\right)_{nm} = (i = 1,2,\ldots,m; j = 1,2,\ldots,n)$ for n samples and m evaluation factors.

Normalise the judgment matrix to obtain the normalised judgment matrix $y = \left(y_{ij}\right)_{nm}$, as shown in Equation (4):

$$y_{ij} = \frac{\chi_{ij} - \chi_{min}}{\chi_{max} - \chi_{min}} \tag{4}$$

Here, y_{ij} is the element of the i-th row and j-th column of the matrix y; χ_{ij} is the j-th evaluation indicator measure of the i-th sample; x_{min} is the minimum value in different samples for the same indicator; x_{max} is the maximum value in different samples for the same indicator.

4. Calculate the entropy and entropy weight of the j-th indicator, as shown in Equations (5)–(7):

$$H_j = -\frac{1}{\ln n}\left(\sum_{i=1}^{n} f_{ij} \ln f_{ij}\right) \tag{5}$$

$$f_{ij} = \frac{1 + y_{ij}}{\sum_{j=1}^{n} + y_{ij}} \tag{6}$$

$$w_i = \frac{1 - H_j}{m - \sum_{j=1}^{m} H_j} \tag{7}$$

Here, H_j is the entropy of the indicator; f_{ij} is the element of the i-th row and j-th column of the matrix; w_j is the entropy weight of the indicator. The calculation leads to Table 6.

Table 6. Entropy method indicator description weighting values.

Item	Information Entropy Value e	Information Utility Value d	Weighting w_i
D1 Harmony between old and new buildings	1.137	0.0812	0.0417
D2 Richness of the building facade	1.116	0.0797	0.0422
D3 Neatness of street pavement	1.079	0.0771	0.0477
D4 Abundance of street furniture	0.958	0.0684	0.0876
D5 Street accessibility	0.869	0.0621	0.1018
D6 Cultural uniqueness	1.007	0.0718	0.0644
D7 Shop diversity	1.000	0.0715	0.0628
D8 Vehicle disturbance index	1.006	0.0718	0.0844
D9 Percentage of street appurtenances	0.880	0.0629	0.1014
D10 Green vision	1.079	0.0771	0.0554
D11 Street openness	0.902	0.0645	0.0957
D12 Colour richness	1.060	0.0757	0.0586
D13 Crowd gathering	1.024	0.0731	0.0615
D14 Social interface index	0.884	0.0631	0.0948

3.2.3. Combined Weighting Calculation

The AHP and entropy methods are used to calculate the weights, one for the subjective assignment and one for the objective assignment. The combination is used to calculate the combined weights, as shown in Equation (8):

$$W_i = \frac{W_{AHP} W_{Entropy}}{\sum_{i=1}^{n} W_{AHP} W_{Entropy}} \quad (8)$$

The AHP-entropy method of determining weights is very adaptable. The integrated weight values of each factor in the scheme layer in the objective were obtained as shown in Table 7.

Table 7. Combined weighting values for indicator descriptions.

Item	AHP Weights W_{AHP}	Entropy Weights $W_{Entropy}$	Combined Weighting Values W_i
D1 Harmony between old and new buildings	0.0812	0.0417	0.0489
D2 Richness of the building facade	0.0797	0.0422	0.0482
D3 Neatness of street pavement	0.0771	0.0477	0.0532
D4 Abundance of street furniture	0.0684	0.0876	0.086
D5 Street accessibility	0.0621	0.1018	0.0905
D6 Cultural uniqueness	0.0718	0.0644	0.066
D7 Shop diversity	0.0715	0.0628	0.0647
D8 Vehicle disturbance index	0.0718	0.0844	0.087
D9 Percentage of street appurtenances	0.0629	0.1014	0.092
D10 Green vision	0.0771	0.0554	0.0618
D11 Street openness	0.0645	0.0957	0.0876
D12 Colour richness	0.0757	0.0586	0.0632
D13 Crowd gathering	0.0731	0.0615	0.0647
D14 Social interface index	0.0631	0.0948	0.0859

4. Discussion

According to the results of the comprehensive weight value determined by the AHP and entropy weight method (Figure 4), all factors have a positive and significant impact on the residents' evaluation of the implementation effects of the quality improvement of commercial streets. The importance of evaluation indicators is determined by the overall weighting. Among them, the proportion of street ancillary facilities has the greatest impact, followed by street accessibility, street openness, the vehicle interference index, street facility richness, the social interface index, cultural uniqueness, store diversity, crowd gathering, colour richness, the green visual rate, street pavement cleanliness, new and old building

coordination, and building façade richness. In addition, some indicators also have a strong impact on the AHP and entropy weight methods.

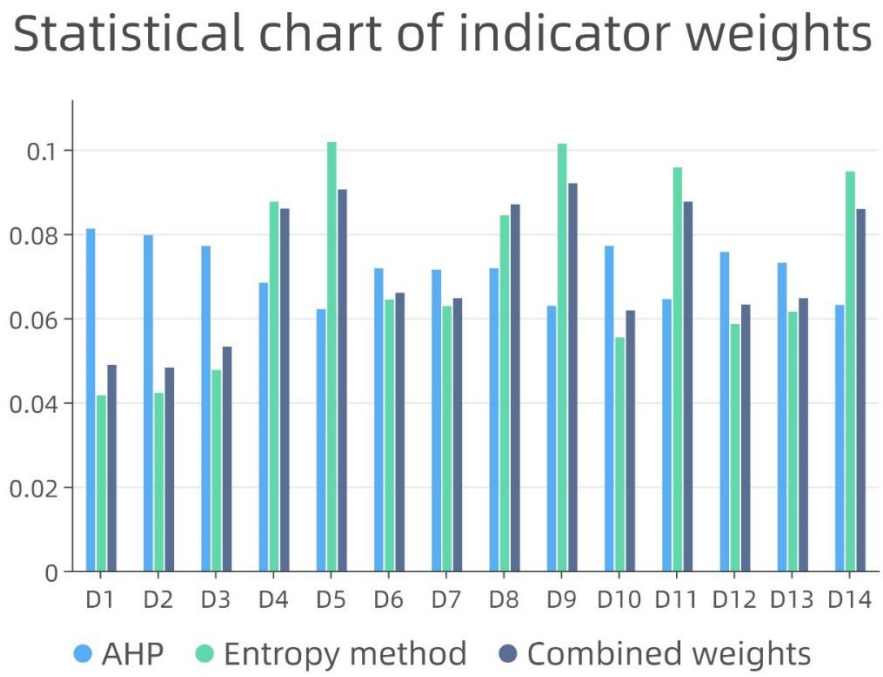


Figure 4. Weight value chart.

According to the order of influence of index weights, the residents' comprehensive evaluation of implementation effects of improving the quality of commercial streets is analysed by three types of indicators: space carrying capacity, environmental comfort, and travel safety. Space bearing capacity includes the coordination of old and new buildings, the richness of building façades, and the cleanliness of the street pavement. Environmental comfort includes cultural uniqueness and store diversity. Travel safety includes the vehicle disturbance index and proportion of street accessories. Next, we will analyse the weighting results based on the importance of the metric.

4.1. Spatial Carrying Capacity

Harmony between old and new buildings: In urban regeneration in China, it is the policy of the local government to upgrade urban communities, urban streets, etc., in order to enhance urban competitiveness and improve the urban landscape. Urban regeneration remains a government-led and important area of intervention and continues to adapt to the new challenges and opportunities of the 21st century. In this empirical analysis, Shuanggang Old Street is a district of renewal, and government intervention is an important factor affecting the renewal project, indicating that the government's planning for urban renewal projects accelerates ecological restoration, texture remodelling, and functional improvement, and compensates for the shortcomings of public space and service facilities. The coordination of the old and new buildings can be obtained through a variety of design methods, from the perspective of the structural connection and transition design of the expansion of the new building, the separation treatment of the foundation parts of the new and old buildings, as well as the lightweight structural connection between the superstructures and the transition of the atrium space. From the perspective of the façade and material design of the expanded new building, attention should be paid to the design of many details, such as texture, scale and proportion, and colour.

Richness of the building façade: The number and composition of elements on the façade of the building, and the contrasting relationship between them, determine the visual quality and interest. Great urban architecture requires that, at every scale, from different viewing distances, the surface of the building can present a wealth of detail. There are also

many highlights that can be discovered in the design of building façades, such as changing the spatial structure with dynamic façades, balancing old and new buildings through the style of façades, adding ecological elements to create green spaces, and researching materials to design high-performance façades. Therefore, the combined weight of the richness of the building's façade reflects the satisfaction of the residents, which will have a positive impact on the improvement of street quality and vice versa.

Neatness of street pavement: The street pavement is designed to be renovated in the quality improvement work of Shuanggang Old Street, but as Shuanggang Old Street is an important commercial street in Hefei, there are more shops along the street and most of the residents are elderly people who have been living there since the 1980s; the overall quality of life of the residents is not high and therefore more domestic waste is produced. There are higher institutional requirements for the disposal of domestic waste in the streets than in Western countries. Under different systems, residents have different expectations of street surface tidiness in Hefei and in developed western countries. Urban sanitation, as an important component of fine management, should be delineated as an area of responsibility, using the requirements of fine environmental governance as a standard. Therefore, the government and the community should encourage residents to participate in street governance and subsequent renewal management, while carrying out resident activities and related educational programmes to improve the overall quality of resident participation.

4.2. Environmental Comfort

Cultural uniqueness, the comprehensive weight value of shop diversity, is greater than 0.6, indicating that cultural uniqueness and store diversity have a certain impact on the evaluation of the quality improvement of commercial streets. Commercial streets are the epitome and essence of urban commercial forms, and, in Hefei, a city where spiritual pursuit is greater than material pursuit, people are no longer limited to clothing and food, but also pursue spiritual pleasure and spiritual satisfaction. The desire for historical and cultural accumulation is particularly strong, so the integration of architectural style, landscape elements, and commercial subjects with the local characteristic cultural atmosphere should be emphasised. With the rapid development of the market economy and the advent of the Internet information age, consumers' choice of goods is more meticulous, the common competition of different brands of similar goods is very obvious, and more international brands have also entered the perceptions of the people, thereby enhancing the shopping experience of consumers. The environment of the commercial street is one of the most important factors for the prosperity of the commercial street, and the current consumers do not only buy the goods themselves, but also the real vitality of the modern business form lies in feeling and experience. Therefore, in the design, it is important to rely on the existing historical and cultural resources of the city, or deliberately reflect the culture of a certain period in the design; the architectural form, street pieces, environmental creation, and even sales form are integrated into specific elements, reflecting the connotations of urban history and culture, so the commercial block is an important carrier of urban history and culture, and the development of commercial blocks plays an important role in protecting the characteristics of urban history and culture and continuing the urban context.

4.3. Travel Safety

The vehicle disturbance index and the percentage of street appurtenances have a significant impact on the evaluation of the effects of quality improvement of commercial streets. Most of the residents of Shuanggang Old Street are elderly, the daily travel mode is mostly walking, and there are more shops on both sides of Shuanggang Old Street. The shopping experience is easily disturbed by incoming and outgoing vehicles, so that they have a stronger sense of travel security, and the elderly are more sensitive to vehicle interference on commercial streets. Street ancillary facilities are the highest in the comprehensive weight, 0.092, which indirectly indicates the satisfaction of residents with street ancillary facilities,

mainly because the streets of Shuanggang Old Street are narrow, the traffic flow is large, the speed of vehicles is slow, and they pay attention to traffic safety. However, residents' daily travel will still be disturbed by vehicle noise, affecting the walking experience, and policies or actions should be formulated to restrict vehicles from travelling within the specified time, in order to improve the safety of street travel.

5. Conclusions

This paper investigates the evaluation of the quality enhancement effects of important commercial streets in Hefei, which have undergone certain quality enhancement renovation designs. The aim of this study is to use the AHP and entropy method to comprehensively evaluate the influencing factors of the quality enhancement effect of commercial streets. The results show that (1) travel safety and social interaction significantly affect the evaluation of the quality enhancement effect of commercial streets; (2) residents' evaluation of the coordination of old and new buildings and the comfort of the street environment at this stage is insufficient, and the coordination and unity of urban renewal projects with surrounding buildings should be considered, as well as understanding residents' needs for the street environment and services, and the role of local governments.

There are limitations to this study. Firstly, the study sites were not very large, resulting in an inadequate number of questionnaires. Further research could increase the choice of study sites—for example, by conducting comparative analyses of multiple study sites—to obtain more accurate findings. Secondly, although this study used a combination of AHP and entropy weighting, the results of the residents' questionnaires were subjective and further research could include experts with expertise and experience related to specific indicator categories of the street project (e.g., material, environmental and ecological, economic, social, etc.) and could allow residents and experts to work together to calculate the AHP weights and then weight them with entropy weights to obtain more accurate data results.

Although this study is only an experiment to evaluate the effectiveness of an engineering quality improvement facility in Shuanggang Street, Hefei, a summary of the literature and a systematic approach to what works in engineering facilities paves the way for the subsequent exploration of the topic. The model proposed in this paper can help rating system developers to design a generic research framework to address the problems encountered in the implementation of sustainable road rating systems. In the future, by evaluating actual data from different cities or regions, we can provide insights into how to translate sustainability goals into concrete and feasible strategies to achieve higher quality of life for people. This is the point highlighted in this paper.

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References

1. Marshall, S. *Streets and Patterns*; Routledge: London, UK, 2005; ISBN 9780415317504.
2. Sun, G.; Zhou, X.; Zhou, W.; Li, C.Q.; Chen, J. Joint local-whole evaluation of commercial street quality using multi-source data. *Remote Sens. Inf.* **2021**, *36*, 135–143. Available online: https://kns.cnki.net/kcms/detail/detail.aspx?FileName=YGXX202103019&DbName=CJFQ2021 (accessed on 5 July 2022).

3. *The Routledge Companion to Urban Regeneration*; Routledge: London, UK, 2013.
4. Wu, M. "Organic renewal" in old city redevelopment. *Beijing Plan. Constr.* **1995**, *3*, 16–19. Available online: https://kns.cnki.net/kcms/detail/detail.aspx?FileName=GHJS503.006&DbName=CJFQ1995 (accessed on 23 June 2022).
5. Gao, S.; Wu, X.; Zhang, Y. Systematic urban regeneration and implementation pathways-based on complex adaptive systems theory. *Urban Dev. Stud.* **2020**, *27*, 62–68. Available online: https://kns.cnki.net/kcms/detail/detail.aspx?FileName=CSFY202002009&DbName=CJFQ2020 (accessed on 1 July 2022).
6. Wang, M.; Yang, J. Sustainable Renewal of Historical Urban Areas: A Demand–Potential–Constraint Model for Identifying the Renewal Type of Residential Buildings. *Buildings* **2022**, *12*, 1210. Available online: https://www.mdpi.com/2075-5309/12/8/1210 (accessed on 15 August 2022). [CrossRef]
7. Chen, F.; Chen, Y. Urban Metabolism and Spontaneous Architectural Growth: A Sustainable Strategy Featuring Participatory Co-Construction by Multiple Stakeholders. *Buildings* **2022**, *12*, 352. Available online: https://www.mdpi.com/2075-5309/12/3/352 (accessed on 3 September 2022). [CrossRef]
8. Barthelemy, M.; Bordin, P.; Berestycki, H.; Gribaudi, M. Self-organization versus top-down planning in the evolution of a city. *Sci. Rep.* **2013**, *3*, 2153. [CrossRef]
9. Paolo Masucci, A.; Molinero, C. Robustness and closeness centrality for self-organized and planned cities. *Eur. Phys. J. B* **2016**, *89*, 53. [CrossRef]
10. Rui, Y.; Ban, Y.; Wang, J.; Haas, J. Exploring the patterns and evolution of self-organized urban street networks through modeling. *Eur. Phys. J. B* **2013**, *86*, 74. [CrossRef]
11. Chen, Z.; Xu, J.; Jiang, H. A study on multi-scale spatial analysis of historical districts based on spatial syntax—An example of Fuzhou Sanfang Qi Xiang historical district. *Urban Plan.* **2009**, *33*, 92–96. Available online: https://kns.cnki.net/kcms/detail/detail.aspx?FileName=CSGH200908024&DbName=CJFQ2009 (accessed on 12 May 2021).
12. Fu, G.; Hou, L. Application of spatial syntax in the evolution of street networks—An example from the old city of Wuxi. *J. Surv. Mapp. Sci. Technol.* **2019**, *36*, 430–435. Available online: https://kns.cnki.net/kcms/detail/41.1385.p.20191227.1353.036.html (accessed on 5 May 2022).
13. Zhou, L.; Tian, L.; Zhang, Z.; Li, W. Evolution of street networks in the old city of Beijing since the Republic of China based on a spatial syntactic perspective. *J. Geogr.* **2018**, *73*, 1433–1448. Available online: https://kns.cnki.net/kcms/detail/11.1856.P.20180727.1651.008.html (accessed on 6 May 2021).
14. Soares, F.; Silva, E.; Pereira, F.; Silva, C.; Sousa, E.; Freitas, E. The Influence of Noise Emitted by Vehicles on Pedestrian Crossing Decision-Making: A Study in a Virtual Environment. *Appl. Sci.* **2020**, *10*, 2913. Available online: https://www.mdpi.com/2076-3417/10/8/2913 (accessed on 8 June 2022). [CrossRef]
15. Sun, R.; Wang, Y. Study on the construction of a spatial quality evaluation system for urban streets. *Anhui Archit.* **2021**, *28*, 16–17.
16. Gerike, R.; Koszowski, C.; Schröter, B.; Buehler, R.; Schepers, P.; Weber, J.; Wittwer, R.; Jones, P. Built Environment Determinants of Pedestrian Activities and Their Consideration in Urban Street Design. *Sustainability* **2021**, *13*, 9362. Available online: https://www.mdpi.com/2071-1050/13/16/9362 (accessed on 12 July 2022). [CrossRef]
17. Li, L.; Zou, Z.; Zhou, T.; Zhou, X.; Li, Q. Simulation and Analysis of Influencing Factors of Pavement Thermal Environments in Guangzhou. *Sustainability* **2022**, *14*, 7251. Available online: https://www.mdpi.com/2071-1050/14/12/7251 (accessed on 15 September 2022). [CrossRef]
18. Lee, J.; Kim, D.; Park, J. A Machine Learning and Computer Vision Study of the Environmental Characteristics of Streetscapes That Affect Pedestrian Satisfaction. *Sustainability* **2022**, *14*, 5730. Available online: https://www.mdpi.com/2071-1050/14/9/5730 (accessed on 20 September 2022). [CrossRef]
19. Sheikh-Mohammad-Zadeh, A.; Saunier, N.; Waygood, E.O.D. Developing an Objective Framework to Evaluate Street Functions. *Sustainability* **2022**, *14*, 7184. Available online: https://www.mdpi.com/2071-1050/14/12/7184 (accessed on 13 September 2022). [CrossRef]
20. Zumelzu, A.; Estrada, M.; Moya, M.; Troppa, J. Experiencing Public Spaces in Southern Chile: Analysing the Effects of the Built Environment on Walking Perceptions. *Int. J. Environ. Res. Public Health* **2022**, *19*, 12577. Available online: https://www.mdpi.com/1660-4601/19/19/12577 (accessed on 18 September 2022). [CrossRef] [PubMed]
21. Shao, Y.; Xu, X.; Jiang, L.; Crastes dit Sourd, R. Economic Valuation of the Renewal of Urban Streets: A Choice Experiment. *Sustainability* **2020**, *12*, 4808. Available online: https://www.mdpi.com/2071-1050/12/12/4808 (accessed on 14 September 2022.). [CrossRef]
22. Qiu, W.; Li, W.; Liu, X.; Huang, X. Subjectively Measured Streetscape Perceptions to Inform Urban Design Strategies for Shanghai. *ISPRS Int. J. Geo-Inf.* **2021**, *10*, 493. Available online: https://www.mdpi.com/2220-9964/10/8/493 (accessed on 18 September 2022). [CrossRef]
23. Cheng, L.; Chu, S.; Zong, W.; Li, S.; Wu, J.; Li, M. Use of Tencent Street View Imagery for Visual Perception of Streets. *ISPRS Int. J. Geo-Inf.* **2017**, *6*, 265. Available online: https://www.mdpi.com/2220-9964/6/9/265 (accessed on 23 May 2020). [CrossRef]
24. Rebecchi, A.; Buffoli, M.; Dettori, M.; Appolloni, L.; Azara, A.; Castiglia, P.; D'Alessandro, D.; Capolongo, S. Walkable Environments and Healthy Urban Moves: Urban Context Features Assessment Framework Experienced in Milan. *Sustainability* **2019**, *11*, 2778. Available online: https://www.mdpi.com/2071-1050/11/10/2778 (accessed on 14 July 2022). [CrossRef]

25. Yin, Y.; Thwaites, K.; Shao, Y. Balancing Street Functionality and Restorative Benefit: Developing an Expectation—Current Approach to Street Design. *Sustainability* **2022**, *14*, 5736. Available online: https://www.mdpi.com/2071-1050/14/9/5736 (accessed on 16 September 2022). [CrossRef]
26. Hu, F.; Liu, W.; Lu, J.; Song, C.; Meng, Y.; Wang, J.; Xing, H. Urban Function as a New Perspective for Adaptive Street Quality Assessment. *Sustainability* **2020**, *12*, 1296. Available online: https://www.mdpi.com/2071-1050/12/4/1296 (accessed on 13 September 2022.). [CrossRef]
27. Meng, L.; Wen, K.-H.; Zeng, Z.; Brewin, R.; Fan, X.; Wu, Q. The Impact of Street Space Perception Factors on Elderly Health in High-Density Cities in Macau—Analysis Based on Street View Images and Deep Learning Technology. *Sustainability* **2020**, *12*, 1799. Available online: https://www.mdpi.com/2071-1050/12/5/1799 (accessed on 14 August 2022). [CrossRef]
28. Sun, Y.; Lu, W.; Sun, P. Optimization of Walk Score Based on Street Greening—A Case Study of Zhongshan Road in Qingdao. *Int. J. Environ. Res. Public Health* **2021**, *18*, 1277. Available online: https://www.mdpi.com/1660-4601/18/3/1277 (accessed on 12 September 2022). [CrossRef]
29. Huang, S.; Zhu, J.; Zhai, K.; Wang, Y.; Wei, H.; Xu, Z.; Gu, X. Do Emotional Perceptions of Visible Greeneries Rely on the Largeness of Green Space? A Verification in Nanchang, China. *Forests* **2022**, *13*, 1192. Available online: https://www.mdpi.com/1999-4907/13/8/1192 (accessed on 9 October 2022). [CrossRef]
30. Novack, T.; Wang, Z.; Zipf, A. A System for Generating Customized Pleasant Pedestrian Routes Based on OpenStreetMap Data. *Sensors* **2018**, *18*, 3794. Available online: https://www.mdpi.com/1424-8220/18/11/3794 (accessed on 11 October 2022). [CrossRef]
31. Szczepańska, A.; Pietrzyk, K. An Evaluation of Public Spaces with the Use of Direct and Remote Methods. *Land* **2020**, *9*, 419. Available online: https://www.mdpi.com/2073-445X/9/11/419 (accessed on 12 October 2022). [CrossRef]
32. Dai, Z.; Hua, C. Refinement of streetscape based spatial quality measurement method and example study. *Planners* **2019**, *35*, 57–63. Available online: https://kns.cnki.net/kcms/detail/detail.aspx?FileName=GHSI201909011&DbName=CJFQ2019 (accessed on 16 July 2021).
33. Saaty, R.W. The analytic hierarchy process—What it is and how it is used. *Math. Model.* **1987**, *9*, 161–176. [CrossRef]
34. Forman, E.; Peniwati, K. Aggregating individual judgments and priorities with the analytic hierarchy process. *Eur. J. Oper. Res.* **1998**, *108*, 165–169. [CrossRef]
35. Darko, A.; Chan, A.P.C.; Ameyaw, E.E.; Owusu, E.K.; Pärn, E.; Edwards, D.J. Review of application of analytic hierarchy process (AHP) in construction. *Int. J. Constr. Manag.* **2019**, *19*, 436–452. [CrossRef]
36. Yin, P.; Cheng, J.; Peng, M. Analyzing the Passenger Flow of Urban Rail Transit Stations by Using Entropy Weight-Grey Correlation Model: A Case Study of Shanghai in China. *Mathematics* **2022**, *10*, 3506. Available online: https://www.mdpi.com/2227-7390/10/19/3506 (accessed on 16 October 2022). [CrossRef]
37. Chen, C.-H. A Novel Multi-Criteria Decision-Making Model for Building Material Supplier Selection Based on Entropy-AHP Weighted TOPSIS. *Entropy* **2020**, *22*, 259. Available online: https://www.mdpi.com/1099-4300/22/2/259 (accessed on 12 October 2022). [CrossRef] [PubMed]
38. Wu, G.; Duan, K.; Zuo, J.; Zhao, X.; Tang, D. Integrated Sustainability Assessment of Public Rental Housing Community Based on a Hybrid Method of AHP-Entropy Weight and Cloud Model. *Sustainability* **2017**, *9*, 603.
39. Xu, L.; Kang, Q. The influence of spatial and interfacial characteristics of commercial streets on pedestrians' dwell activities—A case study of Nanjing West Road, Shanghai. *J. Urban Plan.* **2014**, *3*, 104–111. Available online: https://kns.cnki.net/kcms/detail/detail.aspx?FileName=CXGH201403014&DbName=CJFQ2014 (accessed on 18 July 2021).
40. Hamidi, S.; Moazzeni, S. Examining the Relationship between Urban Design Qualities and Walking Behavior: Empirical Evidence from Dallas, TX. *Sustainability* **2019**, *11*, 2720. Available online: https://www.mdpi.com/2071-1050/11/10/2720 (accessed on 11 August 2021). [CrossRef]
41. Lu, Y.; Sun, G.; Sarkar, C.; Gou, Z.; Xiao, Y. Commuting Mode Choice in a High-Density City: Do Land-Use Density and Diversity Matter in Hong Kong? *Int. J. Environ. Res. Public Health* **2018**, *15*, 920. Available online: https://www.mdpi.com/1660-4601/15/5/920 (accessed on 17 July 2021). [CrossRef]
42. Dai, J.; Gu, Y. OSO-YOLOv5: Automatic Extraction Method of Store Signboards in Street View Images Based on Multi-Dimensional Analysis. *ISPRS Int. J. Geo-Inf.* **2022**, *11*, 462. Available online: https://www.mdpi.com/2220-9964/11/9/462 (accessed on 15 October 2022). [CrossRef]
43. Lee, I. Development of Pedestrian Path-Choice Model in Urban Residential Area—Comparison of Importance, Satisfaction, and Environmental Tradeoff Models. *J. Urban Des. Inst. Korea Urban Des.* **2000**, *1*, 63–78.
44. Han, H.; Nguyen, T.V.T.; Sahito, N. Sidewalk Zoom-In: A Spatial–Temporal Negotiation and Self-Organization within a Sociable Space. *Sustainability* **2019**, *11*, 6241. Available online: https://www.mdpi.com/2071-1050/11/22/6241 (accessed on 11 October 2022). [CrossRef]
45. Wen, L.; Kenworthy, J.; Marinova, D. Higher Density Environments and the Critical Role of City Streets as Public Open Spaces. *Sustainability* **2020**, *12*, 8896. Available online: https://www.mdpi.com/2071-1050/12/21/8896 (accessed on 13 October 2022). [CrossRef]
46. Nemcsics, A.; Nógrádi, M. *Colour Dynamics: Environmental Colour Design*; Prentice Hall: Hoboken, NJ, USA, 1993.
47. Mahnke, F.H. *Color, Environment, and Human Response: An Interdisciplinary Understanding of Color and Its Use As a Beneficial Element in the Design of the Architectural Environment*; John Wiley & Sons: Hoboken, NJ, USA, 1996.

48. Fonseca, F.; Papageorgiou, G.; Tondelli, S.; Ribeiro, P.; Conticelli, E.; Jabbari, M.; Ramos, R. Perceived Walkability and Respective Urban Determinants: Insights from Bologna and Porto. *Sustainability* **2022**, *14*, 9089. Available online: https://www.mdpi.com/2071-1050/14/15/9089 (accessed on 16 October 2022). [CrossRef]
49. Tran, N.H.; Yang, S.-H.; Tsai, C.Y.; Yang, N.C.; Chang, C.-M. Developing Transportation Livability-Related Indicators for Green Urban Road Rating System in Taiwan. *Sustainability* **2021**, *13*, 14016. Available online: https://www.mdpi.com/2071-1050/13/24/14016 (accessed on 14 October 2022). [CrossRef]
50. Sosa-Cordobés, E.; García-Padilla, F.M.; Ortega-Galán, Á.M.; Sánchez-Alcón, M.; Garrido-Fernández, A.; Ramos-Pichardo, J.D. Psychometric Properties of the Emotional Eater Questionnaire in University Students. *Int. J. Environ. Res. Public Health* **2022**, *19*, 10965. Available online: https://www.mdpi.com/1660-4601/19/17/10965 (accessed on 12 October 2022). [CrossRef]
51. Alcantara-Luna, S.; Ruiz-Villaverde, R.; Domínguez-Cruz, J.; Galán-Gutiérrez, M.; Navarro-Triviño, F.; Pereyra-Rodriguez, J.-J.; Armario-Hita, J.-C. Validation of a Questionnaire to Assess the Perception of Women with Atopic Dermatitis in Family Planning. *Int. J. Environ. Res. Public Health* **2022**, *19*, 10753. Available online: https://www.mdpi.com/1660-4601/19/17/10753 (accessed on 16 October 2022). [CrossRef]
52. Thurecht, R.L.; Pelly, F.E.; Burkhart, S. Reliability of the Athlete Food Choice Questionnaire in Diverse Settings. *Int. J. Environ. Res. Public Health* **2022**, *19*, 9981. Available online: https://www.mdpi.com/1660-4601/19/16/9981 (accessed on 14 October 2022). [CrossRef]
53. Park, D.S.; Park, H.Y. Development of Leisure Valuation Assessment Tool for the Elderly. *Int. J. Environ. Res. Public Health* **2022**, *19*, 6678. Available online: https://www.mdpi.com/1660-4601/19/11/6678 (accessed on 14 October 2022). [CrossRef] [PubMed]
54. Garrido-Fernández, A.; García-Padilla, F.M.; Ramos-Pichardo, J.D.; Romero-Martín, M.; Sosa-Cordobés, E.; Sánchez-Alcón, M. Attitude towards the Promotion of Healthy Eating among Secondary School Teachers—Construction and Validation of a Questionnaire. *Nutrients* **2022**, *14*, 2271. Available online: https://www.mdpi.com/2072-6643/14/11/2271 (accessed on 12 October 2022). [CrossRef]