

Article

Tourists' Perception of Macau's City Image: Based on the Analysis of User-Generated Content (UGC) Text Data

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Abstract: City image reflects urban culture and communication and influences tourists' travel behavior. However, based on field investigations, it was found that Macau's city space currently faces issues such as an imbalance in practical use efficiency, an overload of historical urban areas, and a mismatch between tourist numbers and spatial capacity. To further understand tourists' travel experiences and influencing factors in Macau, this study uses user-generated content (UGC) textual data and takes the Macau Special Administrative Region in China as a case study. The ROST CM6.0 software and grounded theory analysis method are utilized to analyze the perceptual content and underlying influencing mechanisms of city image from the perspective of tourists. The research results show that: 1. Tourists' perception of Macau's city image mainly stays at the intuitive and superficial level, represented by individual landscapes such as the "Ruins of St. Paul's", "Grand Lisboa", and "Galaxy". 2. Tourists' perception of Macau's city image can be summarized into four main dimensions: architectural and landscape image, cultural and historical image, economic and commercial image, and spatial governance and public service image. 3. Negative aspects of tourists' perception of Macau's city image include infrastructure perception, tourism service perception, urban experience perception, and urban safety perception, with spatial scale perception being the most influential factor. Finally, this study proposes effective measures to optimize urban spatial resource allocation, improve urban infrastructure, enhance the spatial environment of the old city, strengthen the promotion of historical culture, improve urban transportation convenience, and enhance urban safety to provide references for enriching the theory of city image perception research and the development of urban tourism in Macau.

Keywords: user-generated content (UGC) data; Macau; city image; tourist perception; ROST CM 6.0 software; urban culture



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1. Introduction

City image represents the impressions, ideas, concepts, and perceptions that tourists have about a city [1]. It signifies the associated thoughts and fragments of information about the city, reflecting its culture and communication [2]. Furthermore, it serves as a crucial reference for tourists before, during, and after their travel experiences, making the analysis of tourists' perceptions vital in the study of city image [3,4].

Since 2002, multiple industries such as exhibitions, cultural leisure, and dining have become priority sectors in Macau's diversified economic development strategy [5]. In 2005, Macau successfully made it onto the UNESCO World Heritage List as a historic and cultural city [6]. As a result, tourism is the pillar industry of Macau [7]. According to the Statistical and Census Service of the Macao SAR Government's "Analysis Report on the Statistical Indicators System for Moderately Diversified Economic Development in Macau in 2021",

there were 39.46 million inbound tourists in 2019, with Mainland China tourists being the largest source, accounting for over 70% of the total in 2018–2019. In 2021, shopping consumption accounted for 67.9% of the total. During the COVID-19 pandemic, the Macau SAR Government implemented strict containment measures, resulting in a significant decline in tourist volume [8]. However, in January 2023, the Health Bureau of Macau SAR announced that no proof of COVID-19 testing is required for individuals entering the region. This marks a new opportunity for the development of Macau's tourism industry as the number of inbound tourists gradually increases. The draft of the Macau SAR City Master Plan (2020–2040) proposes to transform Macau into a world tourism and leisure center, attracting more and more tourists in the future. Therefore, exploring the city image of Macau from the perspective of tourists is a highly valuable topic.

Research on city image has always been a hot topic in the fields of urban construction and tourism [9]. In terms of research content, it mainly focuses on concepts [10–12], composition [13–16], formation mechanisms [17,18], urban management [19,20], influencing factors [21,22], tourist perception, etc. Among them, in terms of tourist perception, domestic and foreign scholars have also paid attention to research on tourist evaluation factors [23] and satisfaction surveys [24], influencing factors of city image [25], and theoretical mechanisms [26] based on network data. Quantitative analysis methods such as machine learning [27], semantic analysis [28], the fuzzy measurement evaluation method [29], word frequency analysis [30], importance-performance analysis [31], and structural equation models [32] have been used. At the same time, qualitative research [33] is also an important research method. Scholars unanimously believe that the information data of tourist evaluations is an important factor affecting the formation of a city's image [34–36] and shaping the city's image plays an equally important role in tourists' travel decisions and tourism loyalty [37,38]. Optimizing the construction of the city's image is a necessary means to enhance the quality and tourism competitiveness of the city [39]. The research literature on the city image of Macau points out that activities such as the Macau Food Festival [40], Macau Promotion Week [41], and iconic sports events [42] are important measures to enhance the city image of Macau, and they are also effective paths for studying the relationship between city image and destination loyalty. Research can predict or perceive the city image of Macau by analyzing tourism-related network information resources [43] and mobile signaling [44]. By comparing user-generated content data from different time periods, researchers can discover the temporal changes in city image [45].

However, from the feedback of tourists with rich travel experiences, there are still shortcomings in the construction of urban public facilities, ecological plants, transportation hubs, signage systems, spatial quality, and scenic area management in Macau. Based on this, this study discusses the following issues: (1) What is the current tourism experience of tourists in Macau? (2) What factors will affect tourists' perception of their experience? (3) What is the attractiveness of Macau's city image?

With the comprehensive penetration of internet data into the lives of the public [46], potential data such as user-generated content (UGC) represented by social media, online reviews, and film and television images have become references for tourists' travel decisions and provide first-hand data sources for researchers [47]. Based on the discussion of the above issues, this study selects the Macau Special Administrative Region of China as the research object and, using Python tools, collects network comment text data from Weibo and adopts high-frequency word analysis, network semantic analysis, and grounded theory research methods to explore the perceived content of Macau's city image and the role mechanism of influencing factors. This can effectively enhance the tourism management and city image of Macau, which are of great significance to the construction of Macau and its future economic development.

2. Research Design

2.1. Research Subjects

Macau is one of the Special Administrative Regions of the People's Republic of China (Figure 1), located on the northern coast of the South China Sea and to the west of the Pearl River Estuary [48]. Macau became part of the territory of the Qin Dynasty after Emperor Qin Shi Huang's three expeditions to Lingnan. In 1557, Macau was leased to the Kingdom of Portugal, and on 20 December 1999, the political sovereignty of Macau was returned to China. This historical journey has spanned over four hundred years [49]. On 15 July 2005, 22 buildings, 8 squares, and piazzas in the historical city of Macau were inscribed on the UNESCO World Heritage List [50]. Macau has a unique historical background, bringing together cultures from China, Portugal, India, Africa, Southeast Asia, and more, creating a rare fusion of Eastern and Western cuisine, architecture, and cultural landscapes.



Figure 1. Geographical location (adapted from the draft Macao Urban Master Plan).

The gambling and tourism industries have always been the two main pillars of Macau. In 2006, the total revenue of Macau's casinos surpassed that of Las Vegas, making it the world's number one gambling city, known as the "Monte Carlo of the East" [51]. According to data from the Statistics and Census Service of the Macau SAR Government (Figure 2), the gross revenue from gambling reached 360.75 billion MOP during the peak period in 2013. In 2019, the total number of inbound tourists reached 39.406 million, with over 90% of tourists coming from mainland China, Hong Kong, and Taiwan. According to data from the Cartography and Cadaster Bureau of Macau, the total land area of Macau in 2023 is 33.3 square kilometers, with a population of approximately 680,000, making it one of the most densely populated cities in the world.

The Urban Master Plan of the Macau SAR (2020–2040) explicitly supports the development of Macau as a world tourism and leisure center, promoting moderate, diversified, and sustainable economic development. However, through on-site investigations, it was found that during holidays, with the continuous increase in the number of tourists, the actual effectiveness of urban space utilization in Macau became imbalanced, and the historical city areas were overloaded. Problems such as mismatches between the number of tourists and

spatial capacity have emerged (Figure 3). Therefore, in-depth research on the perceptions of urban space users is of great practical significance.

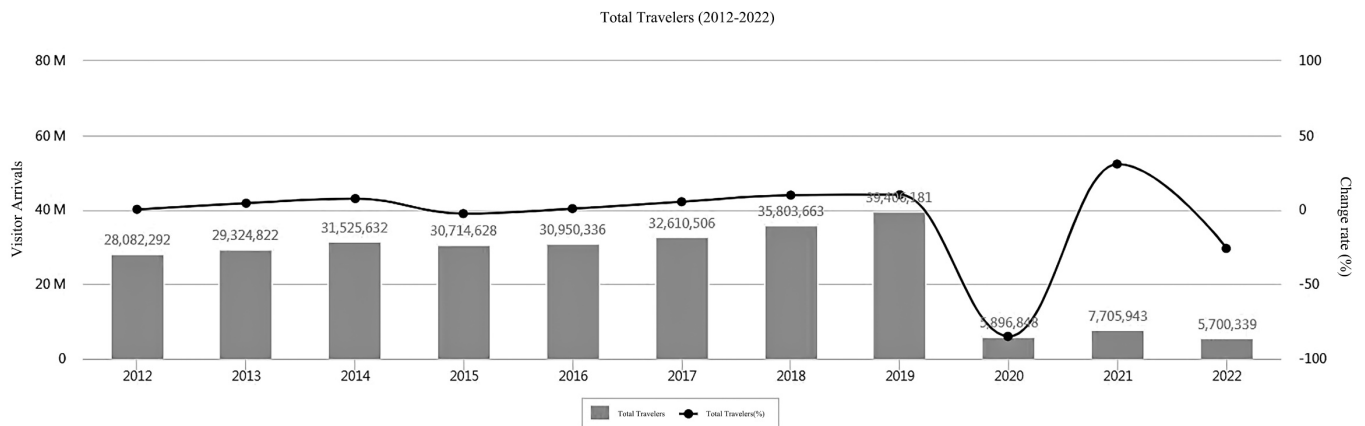


Figure 2. Trends in the number of inbound tourists (adapted from the official website of the Macau Statistics and Census Service).



Figure 3. Scenes of tourists in the urban space of Macau.

2.2. Data Acquisition

UGC refers to any form of text, images, and audio or video content that is typically created by ordinary users rather than professional media organizations or individuals [52]. Weibo, one of the largest social media platforms in China, has a massive user base and content [53], including reviews of tourist attractions, travel guides, and travel photos. These contents provide insights into users' attitudes, preferences, and behaviors towards tourist destinations, making Weibo one of the main channels for obtaining travel information and sharing experiences [54,55]. The timeliness of Weibo data enables it to promptly reflect the latest trends and changes in the tourism market, which is crucial for decision-making, management in the tourism industry, and urban development.

In this study, we utilized Weibo-user-generated comments as the primary data source. We conducted a search on the Weibo platform using the keyword “Macau travel” and employed Python web scraping software to collect comments during the peak period of tourist activity in Macau after the impact of the COVID-19 pandemic. To ensure data quality, accuracy, and influence, we applied the following selection criteria: comments posted between 9 January and 20 May 2023, with over 1000 likes, over 100 comments, and over 100 shares. The comments should provide comprehensive descriptions of Macau tourism and exhibit emotional expression. Comments with high repetition, commercial promotion, and advertising were excluded.

After the selection process, a total of 94 comments meeting the criteria were obtained. Additionally, we collected 494 valid comments, categorized as 319 (64.57%) positive emo-

tions, 115 (23.28%) moderate emotions, and 60 (12.15%) negative emotions (Table 1). In this study, the 94 selected online comments and 60 negative comments obtained through text data processing were used as the primary data sources.

Table 1. Statistical table of tourist online comments sentiment analysis.

Sentiment Analysis of Tourists' Online Comments				
Emotional Category	Number of Articles	Proportion%	Emotional Segmentation Statistics	Proportion%
Positive Emotions	319	64.57	General (0–10)	20.65
			Moderate (10–20)	10.73
			High (20+)	33.20
Moderate Emotions	115	23.28		
Negative Emotions	60	12.15	General (−10–0)	8.30
			Moderate (−20–−10)	2.23
			High (20−)	0.81
Total	494	100		

Emotional segmentation statistics use 0 as the cutoff value, with values above 0 representing the percentage of positive emotions and values below 0 representing the percentage of negative emotions.

2.3. Research Methods

2.3.1. Text Analysis Method

Text analysis is a method of inductive analysis, and quantitative research of text content that can objectively reveal hidden information behind the text data [47]. In this study, ROST CM 6.0, a piece of content-mining and analysis software developed by Professor Shen Yang's team at Wuhan University, was used to analyze user-generated content (UGC) text data. This software has functions such as word frequency analysis, traffic analysis, sentiment analysis, and semantic network analysis. In this study, 494 text data on tourists' perceptions of Macau city, obtained through Python tools, were organized and saved as TXT documents, which were then imported into ROST CM 6.0 software for high-frequency vocabulary analysis and network semantic analysis.

2.3.2. Grounded Theory

Grounded theory is a research method proposed by Glaser and Strauss in their 1967 book "The Discovery of Grounded Theory: Strategies for Qualitative Research" [56]. Grounded theory requires researchers to start with first-hand data and continuously extract and induce concepts through field investigations, data collection, analysis, and organization in order to obtain universal theoretical hypotheses. It is a method of constructing substantive theories from top to bottom. In this study, grounded theory was used to conceptualize and code the factors of city image, establish connections between different categories, explore the general laws, internal logic, and mechanisms of the relationship between tourists and city image perception factors, and propose theoretical categories.

3. Results

3.1. Analysis of High-Frequency Words

First, import the TXT files of the 94 online review texts into the ROST CM 6.0 software for tokenization. Remove high-frequency vocabulary that is irrelevant to the image of Macau city. Merge words with the same meaning but different expressions, such as "New Lisboa", "New Putin", "Lisboa Hotel", and "Old Lisboa", which are collectively referred to as "Lisboa". "Ruins of St. Paul's", "St. Paul's", and "St. Paul's Cathedral" are collectively referred to as "Ruins of St. Paul's". "Old City" and "Historical City Area" are collectively referred to as "Historical City Area". "Semedo Square", "Square", and "Open Space" are collectively referred to as "Semedo Square". "Rose Hall", "St. Joseph", and "Bishop's Hill Cathedral" are collectively referred to as "Cathedral". "Travel" and "Tourism" are

collectively referred to as “Tourism”. “Wynn Palace” and “Wynn Hotel” are collectively referred to as “Wynn”. Finally, select the top 50 high-frequency words that represent the perception of the image of Macau city (Table 2).

Table 2. Frequently used words in web texts about Macau tourism.

Macau City Image Perception High-Frequency Words (Top 50)							
Ranking Order	High Frequency Words	Frequency/Time	Properties	Ranking Order	High Frequency Words	Frequency/Time	Properties
1	Macau	724	Noun	26	Portuguese	22	Noun
2	Lisboa	193	Noun	27	Authentic	21	Adjectives
3	Hotels	174	Noun	28	Romantic	20	Adjectives
4	St. Paul’s	124	Noun	29	Love	20	Noun
5	Galaxy	86	Noun	30	Chaotic	19	Adjectives
6	Cuisine	76	Noun	31	Crowded	19	Adjectives
7	Heritage	63	Noun	32	Friends	18	Noun
8	Visit	62	Noun	33	Dim Sum	18	Noun
9	Historic District	62	Noun	34	Delicious	17	Adjectives
10	Racing	54	Noun	35	Michelin	17	Noun
11	Travel	48	Noun	36	Luxurious	17	Adjectives
12	Semedo Square	45	Noun	37	Unforgettable	16	Adjectives
13	Parisian	39	Noun	38	Convenient	16	Adjectives
14	Vacation	34	Verbs	39	Concerts	16	Noun
15	Londoner	34	Noun	40	Paradise	16	Noun
16	Big Battery	33	Noun	41	Super	16	Adjectives
17	Gambling	32	Noun	42	Vacation	16	Noun
18	Culture	29	Noun	43	Beef	15	Noun
19	Netflix	38	Noun	44	Ceremony	15	Noun
20	Venice	25	Noun	45	Services	15	Noun
21	Taking photos	25	Verbs	46	Research	15	Verbs
22	Museum	24	Noun	47	Performing	15	Verbs
23	Architecture	24	Noun	48	Festivals	14	Noun
24	Wynn	24	Noun	49	Enjoy	14	Adjectives
25	Church	23	Noun	50	Experience	14	Verbs

Usually, in online comments, tourists’ descriptions that contain the most impressions and have the highest frequency of occurrence tend to have a stronger perception of the city’s image [57]. In this study, high-frequency vocabulary was extracted based on word attributes, including nouns, verbs, and adjectives. Nouns mainly refer to city locations, attractions, time, and abstract concepts. Apart from “Macau” and other words indicating city locations, the high-frequency words that appear are “hotels”, “cuisine”, “heritage”, “racing”, “tourism”, and “gambling”. These six groups of words reflect tourists’ deep understanding and concise summarization of Macau’s city image. Verbs reflect a series of actions and changes that tourists experience during their city tour, such as “visiting”, “vacationing”, “taking photos”, “researching”, “performing”, and “experiencing”. Among these verbs, it is found that Macau’s city image has a certain appeal based on their frequency of occurrence. Most tourists choose to visit Macau for sightseeing, vacationing, and checking in to experience different city landscapes. Adjectives mainly describe tourists’ perceptions of the city’s state, characteristics, and attributes, such as “authentic”, “romantic”, “chaotic”, “crowded”, “delicious”, and “luxurious”. Most adjectives represent positive descriptions and intuitive feelings about Macau’s overall image. However, it is not difficult to find negative and negative emotions, such as “chaotic” and “luxurious”, which, respectively, represent the features of the historical city area and the entertainment city on Taipa Island, indicating the contrast and uniqueness of Macau’s city image.

Based on the word frequency statistics of UGC text data, this study categorizes the perception of Macau’s city image into four dimensions: architectural and landscape image, cultural and historical image, economic and commercial image, and spatial governance and public service image. Among them, the architectural and landscape images include vocabulary such as “Grand Lisboa”, “Ruins of St. Paul’s”, “Galaxy Macau”, “The Parisian”, etc. The cultural and historical image includes vocabulary such as “heritage”, “historical

city area", "museums", "Portuguese language", etc. The economic and commercial image includes vocabulary such as "cuisine", "gambling", "racing", "concerts", etc. The spatial governance and public service image includes vocabulary such as "chaotic", "crowded", "luxurious", "ceremonies", etc.

3.2. Semantic Network Analysis of High-Frequency Words

The analysis of high-frequency words in tourists' perception of images reveals their focal points and preferences in city perception. Semantic network analysis of high-frequency words, visualized through a graph, further reveals the semantic relationships, conceptual relevance, and centrality among these words, providing a multi-dimensional understanding of their characteristics and semantic structure. Therefore, the 94 network comment texts in TXT format were imported into ROST CM 6.0 software for semantic network analysis, resulting in the generation of a semantic network graph of tourists' perceptions of Macau's city image (Figure 4). In the graph, lines connect the nodes, and the more lines connecting two nodes, the stronger their association. The distance between a node and the center indicates its centrality, with a shorter distance representing higher centrality and vice versa. It can be observed that the high-frequency words mainly point to words such as "Macau", "historic district", "heritage", "shopping", and "Grand Lisboa", forming a layout with "Macau" as the main center and "historic district", "heritage", "shopping", and "Grand Lisboa" as secondary centers. This indicates that tourists' perception of Macau's city image mainly revolves around their understanding of historical culture and tourism consumption. In addition, words such as "Ruins of St. Paul's", "Galaxy", "Parisian", "hotels", "culture", and "church" have a strong association with the central node, suggesting that tourists have a deep perception of certain representative landscapes in Macau's city image.

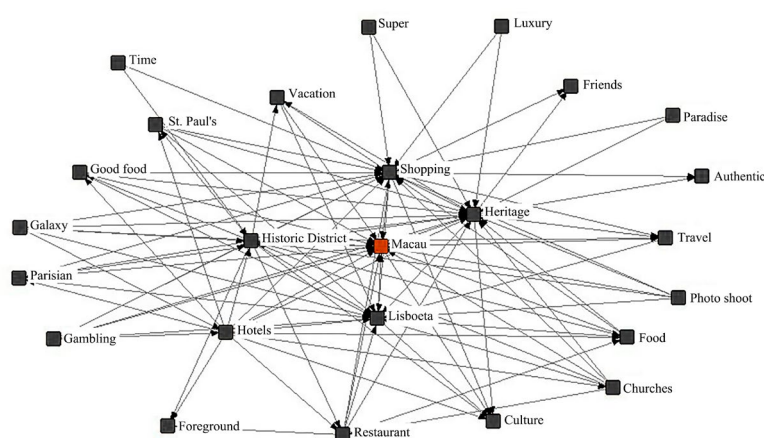


Figure 4. Semantic network analysis mapping.

In conclusion, based on the analysis of Table 2 and Figure 4, it can be inferred that tourists' perception of Macau's city image is intuitive and superficial, focusing on aspects such as "gambling", "heritage", "food", and "Portuguese language". Their perception of the specific city image of Macau is not deep enough, often limited to individual landscapes represented by "Ruins of St. Paul's", "Grand Lisboa", "Galaxy", and "Parisian", with a relatively low perception of the hidden cultural connotations behind the city's landscapes.

3.3. Class Analysis of Negative Perception Factors

Negative perceptions of tourists towards the image of Macau, as reflected in the negative comments in the original text, to some extent hinder the city's development. However, these negative comments can also serve as a direct basis for improving the city's image. Therefore, analyzing the negative emotions of tourists is of great value. In this regard, a study was conducted to analyze 60 negative comments obtained from the

processed textual data using the “three-step” approach of Grounded Theory, aiming to explore effective paths for enhancing the city’s image.

The study employed the “three-step” approach of Grounded Theory to conceptually and abstractly analyze the 60 negative comments in the UGC text data. Through the process of primary coding (open coding), secondary coding (axial coding), and tertiary coding (core coding), four core categories and eight subcategories were identified (Table 3). The core categories are the perception of infrastructure, the perception of tourism services, the perception of the city experience, and the perception of city safety. The subcategories are city transportation, facilities, tourism management, public services, city prices, city features, tour experiences, and personal safety.

Table 3. Hierarchical coding process for negative comments on Macau tourism.

Three Steps of Grounded Theory		
Primary Coding (Open Coding)	Secondary Coding (Axial Coding)	Tertiary Coding (Core Coding)
Crowded space (28), Streets too winding (4), Narrow streets in the old city (15)	City Transportation (26.86%)	Infrastructure Perception (38.86%)
Too few public toilets (5), Not enough seats for rest (8), Inaccurate Baidu maps (2), Inconvenient cell phone communication (1), Not good wireless signal (1), Not enough infrastructure implementation in the historic city (4)	Supporting Facilities (12.00%)	
Hotel price increased ten times (9), Inconvenient to take a cab (5), Inconvenient to use Macau currency (1), Poor Street hygiene (3), Poor understanding of traditional Chinese characters (1), Cab price not based on exchange rate (1), Insufficient information on attractions (1)	Tourism Management (12.00%)	Tourism Service Perception (16.00%)
Restaurants open too late (3), Buses do not stop waving (1), Cab drivers have a bad attitude (1), Businesses have a bad attitude (2)	Public Services (4.00%)	
Hotel prices are expensive (8), Prices are high (3), Restaurant prices are high (6)	City Prices (9.71%)	City Experience Perception (42.85%)
The environment of the old city is dilapidated (2), Many places in the historic city are overgrown with weeds (1), Individual buildings are built in the style of foreign buildings (1), Individual groups of buildings are fancy (2), Architectural styles are disorderly (5), Too little greenery (2), The signage system is not obvious (2)	City Features (8.57%)	
Difficult to make reservations at restaurants (12), Food is not fresh (1), Not worth eating (1), Constant flow of traffic (9), Language communication barrier (4), Attractions are not far away but not close (5), Shopping centers are the same (8), Teahouse hygiene is not clean (3)	Touring Experience (24.57%)	
Travelers had an argument (3), Hotel death (1)	Personal Safety (2.29%)	City Safety Perception (2.29%)

In negative perceptions of Macau's city image, the highest proportion is attributed to issues related to city experiences, accounting for 42.85% of the total. This core category includes three sub-factors: city prices (9.71%), city features (8.57%), and tourist experiences (24.57%). Among them, tourists expressed dissatisfaction with the following aspects: 1. Restaurant reservation services. For example, many tourists collect information about famous restaurants in Macau in advance, leading to overcrowding and difficulties in making reservations. Even with advanced reservations, they still must wait upon arrival. 2. Crowd size. During visits to historical areas, tourists can clearly feel the overcrowding of city streets, especially during holidays when there is a surge in visitors to iconic city landmarks such as the Macau Lisboa, A-Ma Temple Square, and Semedo Square. 3. Hotel prices. Hotels such as the Sheraton Macao Hotel, the Grand Hyatt Macau, Studio City Macau, and the Morpheus Hotel have prices ranging from 800 to 6000 CNY, which is ten times higher compared to 2020–2021. 4. Homogeneity of shopping centers. Large shopping centers in Macau, such as The Venetian Macao, The Londoner Macao, and The Parisian Macao, have unique architectural designs and visual features, but their internal functionality and consumer experiences are quite similar. These four aspects are prominent issues within city prices, city features, and tourist experiences.

In negative perceptions of Macau's city image, the second highest factor is infrastructure, accounting for 38.86% of the total. This core category includes two sub-factors: urban transportation (26.86%) and supporting facilities (12.00%). Among them, the most frequently mentioned issues are overcrowded spaces and narrow streets. Additionally, there is a lack of resting seats and public toilets in public spaces, which fails to meet the daily needs of tourists, indicating inadequate supporting facilities.

In negative perceptions of Macau's city image, the third highest factor is tourism services, accounting for 16.00% of the total. This core category includes two sub-factors: tourism management (12.00%) and public services (4.00%). Firstly, tourists have the most complaints about the increasing hotel prices. Secondly, tourists have concerns about taxi services in Macau, as regular four-seater taxis and public buses require payment in Macau currency. However, six-seater taxis accept Alipay payments but require a mobile phone reservation. This payment method is inconvenient for first-time visitors to Macau. Lastly, many restaurants have late afternoon opening hours, with most of them starting business at 18:00.

The final negative perception factor is city safety. Macau is a very safe tourist city, but some safety issues are inevitable. The main problems are personal safety and property security, such as conflicts between tourists and businesses as well as disputes among tourists themselves. These conflicts may involve factors such as racial differences, national identity, language use, commodity prices, and gambling entertainment.

4. Analysis of City Image Enhancement Path

Based on the results of the previous analysis, this study proposes several paths to enhance the city image of Macau, including optimizing the allocation of urban spatial resources, improving the construction of urban public infrastructure, renovating the old city's spatial environment, strengthening the promotion of historical and cultural depth, enhancing the convenience of urban transportation, and strengthening urban management and security. By comprehensively implementing these measures, more tourists can be attracted, mitigating the negative impact on the city's image and establishing a positive image as a world tourism center.

Optimization of urban spatial resource allocation. The historical area of Macau is overcrowded, leading to a decrease in the intuitive experience of tourists regarding the city's image. However, the outlying islands have ample space and sparse crowds. By attracting more tourist groups to the outlying island areas, the flow and use of public spaces can be adjusted, achieving the goal of space diversion and promoting the rational allocation of tourist resources in space. This is an important path for the sustainable future development of Macau.

Improvement of urban public infrastructure construction. Creating a multi-level transportation system in densely populated urban areas, such as underground transportation systems, can alleviate the problem of land shortages on the surface and improve road utilization efficiency. Building elevated pedestrian systems and establishing multi-story parking lots can also help allocate pedestrian and vehicular traffic routes more reasonably, as well as optimizing network signals, increasing the number and coverage of base stations, improving base station layout and equipment, and ensuring the effectiveness of information transmission.

Renovation of the old city's spatial environment. Firstly, strengthen the reuse of urban spaces by organizing cultural activities, community exhibitions, opening community handicraft experience stores, creating art installations, and providing places for communication between tourists and residents. Secondly, enhance the maintenance and repair of old buildings, improving the visual appearance of the old city. For example, the government encourages owners to renovate and repair old buildings by providing relevant financial and tax support, establishing dedicated committees to coordinate private property issues, and promoting the historical and practical value of buildings through media, exhibitions, lectures, newspapers, etc., increasing public awareness and attention.

Strengthening the promotion of historical and cultural depth. It is necessary to enhance the interpretation and promotion of the cultural value of heritage landscapes and improve the interpretation and promotion of attractions to quickly and accurately convey the cultural value of heritage landscapes to tourists during their short visits. Firstly, expand the content display area of attractions, organize cultural activities, and provide free interpretation or audio guide functions at attractions. Secondly, use modern technology to create more interactive and interesting interpretation methods. Thirdly, increase the introduction of historical and cultural aspects of attractions on various professional tourism platforms. Finally, introduce professional marketing planning and promotion plans and develop targeted and innovative promotional activities.

Enhancing the convenience of urban transportation. Macau's urban public transportation consists of buses and taxis. Taking a bus requires MOP 6 or using the Macau Pass card. However, it is inconvenient for first-time tourists to prepare MOP 6 or purchase a Macau Pass card. Taking a four-seat taxi requires cash payment or equivalent payment through WeChat (Online payment platform of Tencent, Shenzhen, China) or Alipay (Online payment platform of China's Alibaba Inc., Hangzhou, China), while taking a six-seat taxi requires a phone reservation through a Macau telephone, which brings great inconvenience to tourists. Macau can popularize the use of online payment methods such as WeChat and Alipay in urban transportation.

Strengthening urban management and security. Firstly, establish a sound tourism safety management system and emergency response plan, strengthen the management and supervision of tourist attractions, tourism enterprises, and tourism practitioners, and be able to respond to emergencies in a timely and effective manner. Secondly, strengthen the construction of the tourist police force and tourism safety joint prevention and control, establish a tourism safety information sharing platform, and improve the quality and capabilities of the tourism police. Finally, strengthen tourism safety publicity and education, improve the safety awareness and self-protection abilities of tourists, and reduce the occurrence of tourism safety accidents.

5. Conclusions

5.1. Discussion

This section discusses the consistency and differences between the research findings and existing studies, as well as the practical significance for the image of Macau as a city.

Based on the analysis of user-generated content (UGC) textual data, this study examines the factors and underlying mechanisms influencing the perception of Macau's city image from the perspective of tourists and compares them with the existing literature and knowledge systems. In previous studies on the city image of Macau, scholars have

discussed the importance of organizing cultural events for enhancing the city's image from the perspective of urban cultural communication [40–42]. For example, food festivals, promotional weeks, and major sports events. This is like the conclusions drawn from the high-frequency word analysis in this study. However, this study specifically sorts the most frequently mentioned words by tourists and proposes a targeted path for shaping the city image of Macau, which complements the shortcomings of existing research. At the same time, the research results also indicate that organizing cultural events is one effective way to enhance the city image of Macau.

Furthermore, this study also reveals some results that differ from existing research. For example, some scholars have analyzed textual information from travel websites and network data such as mobile signaling [43,44] to identify the representative words that depict Macau's city image, such as "architecture", "casinos", and "Grand Lisboa", and compared the changes in Macau's city image from 2014 to 2018 [45]. These findings are consistent with previous research and the results of this study, which also identified high-frequency words such as "Ruins of St. Paul's", "Grand Lisboa", and "casinos". However, this study delves into the hidden meanings behind these words and their relationships and, based on negative evaluations from tourists, summarizes the reasons for negative emotions among tourists. On the other hand, this study also reveals new aspects to enhance the city image of Macau, such as optimizing the allocation of tourism resources in urban spaces. Existing studies have paid less attention to the coordination of tourism and urban spatial resources. This suggestion provides new perspectives and strategies for the perceived experience of Macau's city image.

From a practical perspective, the results of this study are of great significance for shaping and promoting the image of Macau as a city. These evaluation data can not only guide the development of Macau's tourism industry and provide recommendations for improving services and facilities but also explore paths to enhance the city's image. Positive evaluations from tourists will help enhance Macau's reputation and attract more visitors, while negative evaluations provide opportunities for improvement to increase tourist satisfaction and loyalty. This will assist Macau's tourism industry in formulating targeted strategic planning and marketing strategies to further enhance the image of Macau as a city tourist destination.

5.2. Conclusions and Limitations

In recent years, there has been rapid development in new-generation information technologies such as big data and artificial intelligence. Urban studies have the potential to intersect with various fields, incorporating knowledge from disciplines such as geography, anthropology, and data science to explore the research of urban image from diverse perspectives.

This research, based on data science and in conjunction with theories from urban architecture and social anthropology, aims to uncover the perceived content and underlying influencing mechanisms of Macau's city image from the perspective of tourists by analyzing user-generated content (UGC) text data using ROST CM6.0 software and grounded theory analysis. This study utilizes techniques such as high-frequency word analysis, network semantic analysis, and categorization analysis of negative perception factors. The results indicate that tourists' perception of Macau's city image is primarily intuitive and superficial, with the most prominent impressions often centered around individual landmarks such as "Ruins of St. Paul's", "Grand Lisboa", "Galaxy", and "The Parisian". The architectural landscape, historical culture, commercial economy, and social space governance of Macau all have an impact on tourists' perceptions. Factors such as urban transportation, supporting facilities, tourism management, public services, urban prices, city characteristics, travel experiences, and personal safety are particularly influential. These findings provide valuable insights for the development of tourism in Macau and the enhancement of its city image.

However, there are inherent limitations to this study. Compared to traditional anthropologists' qualitative research conducted in the field, the research scope enabled by big data is broad but lacks depth. Firstly, this study is limited to samples from Weibo data, and the original data are not sufficiently comprehensive. Secondly, as Macau is an international tourist city, it would be beneficial to compare the perception of Macau's urban image between Chinese tourists and tourists from other countries. In the future, we can gather data from multiple social media platforms to conduct comparative analyses. Field interviews may also be necessary as supplementary research. Additionally, user-generated content (UGC) encompasses various forms of data, including text, images, and videos. Further research is needed to explore the methods of effectively integrating these diverse data types.

Author Contributions: J.Y. and J.F. were responsible for designing the study methodology, participating in data collection, analyzing the data, and writing the original manuscript. R.W. contributed to data visualization and provided verbal corrections. M.J. guided the study design, supervised the writing process, and participated in the manuscript revision. All authors have read and agreed to the published version of the manuscript.

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