

Article

IPA Analysis of Tourists' Evaluation of Tourist Toilets in Lanzhou City, China: A Gender-Based Comparison

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Abstract: Tourist toilet is an essential infrastructure of scenic spots and an organic part of the overall tourism ecology. The reality of tourism development has proved that the more basic tourism facilities at home and abroad, the more they can reflect the hard strength of a region's tourism. Taking 12 representative tourist toilets in 3 districts and 1 county of Lanzhou City, China, as the research object, the importance and performance perception of tourist toilet evaluation indicators were analyzed and compared by male and female tourists using the IPA method. The results shows that: (1) Men have high importance and high satisfaction perception for some toilet environment and organization management, women have higher satisfaction and importance perception for some layout design and organization management, and men are more inclined to travel toilets are free, There are special personnel to clean, and the requirements for the interior decoration and cultural connotation of tourist toilets are relatively low, so the perception of these aspects of organization and management is relatively good. Women are more inclined to hope that the lighting and lighting of tourist toilets are good, but male and female tourists do not show the same in terms of layout design and good perception of toilet environment. (2) Men hope that tourist toilets can be more complete in terms of additional facilities and services, and pay more attention to the convenience of toilet facilities, such as hand sanitizer, toilet paper, hand dryer, etc., while women pay more attention to safety-related toilet functions, such as emergency Lights, safety grips, emergency callers, etc. (3) Men have low importance and low satisfaction perception of part layout design and organizational management. Among them, men's perceptions of safety grips, emergency callers, and indication signs are not important and are not satisfied women have low importance and low satisfaction perception on some aspects of toilet environment and organizational management. (4) Women have high requirements for toilet hygiene, basic toilet services and supplies such as hand sanitizer and toilet paper, or do not match their own needs. Especially for toilet paper and other sanitary products, they are basically self-sufficient. Service perception is both unimportant and dissatisfying. This survey helps tourists better establish tourism decisions according to their personal preferences, provides decision-making basis for Lanzhou tourism public service providers to more accurately grasp the subjective feelings and perceptions of different groups on tourism toilets, and improves the construction and management efficiency of tourism toilets in Lanzhou scenic spots, so as to enhance the city image.

Keywords: Tourist toilet; IPA method; Importance perception; Performance perception; Toilet revolution

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1. Introduction

At first, UNICEF proposed the "Toilet Revolution" for developing countries. The term revolution is not normally associated with toilets, but in this case, it is entirely fitting, toilet provision has even been called the barometer of civilization [1]. Toilet revolution comes down to the definition that "toilet revolution is a step-wise campaign which tries to ensure hygienic separation of human excreta from human contact, to provide sanitary and comfort space for users, to prevent human excreta from pollution of environment,

and to realize the resource recycling" [2]. Especially in tourism, it is the most essential infrastructure.

Meanwhile, many countries have revolutionized toilets to improve public health status and state image in the eyes of other citizens who visit both on vacation, watching matches, attending education or other purposes [3]. Subsequently, other international organizations gradually paid attention to the "toilet revolution" and began to solve the increasingly serious public health problems, such as the United Nations, the World Toilet Association (WTA) and the World Health Organization (WHO). For China, from 2015, the National Tourism Administration plans to start and promote the tourism toilet revolution in three years. As a major action for the construction and management of tourism toilets launched nationwide, the toilet revolution is a starting point. It should form a point to area trend and build a chain of all elements of tourism services, so that tourists can feel the joy and beauty of tourism in the whole process of tourism.

Devi and Yasa [4] proposed the concept of customer satisfaction, which laid the foundation for subsequent satisfaction evaluation and related research. With the explosive growth of tourism in China, the problems existing in tourism toilets affect the tourism experience of tourists. Tourist satisfaction surveys over the years show that tourist toilets in scenic spots have always been the focus of tourists' complaints.

1.1. Objectives

This study analyzes the image dimension of tourism toilets in Lanzhou by investigating tourists' perception of the importance and satisfaction of tourism toilets in Lanzhou. In addition, people of different ages, occupations and incomes have significantly different needs and perceived evaluation of tourist toilets, especially male tourists and female tourists. Therefore, it is objectively necessary and practical to evaluate and understand the different preferences, satisfaction and important sensuality of different groups, including men and women.

1.2. Research Questions

Gender theory holds that the differences between men and women are not only natural and biological, but also social and cultural. Affected by this, the behavior of tourists of different genders often differs. In tourism behavior research, gender differences are an important variable explored by scholars. Grasping the behavioral differences of tourists of different genders is of great significance for improving tourists' satisfaction.

1.3. Theoretical Framework

After obtaining the first-hand questionnaire of tourists' satisfaction and importance to the tourist toilet, the analysis and research of the tourist toilet questionnaire is carried out from four aspects. Firstly, the correctness of the questionnaire is tested through the reliability and validity of the sample, and then the exploratory factor analysis is used to verify whether the extraction of the main factor can effectively represent the content covered by the overall evaluation index, Focus on the comparative analysis of the importance and satisfaction of tourist toilets by gender. Finally, according to the I-P evaluation and analysis method, investigate the perceived differences of tourist toilets between male and female tourists, draw corresponding conclusions and insufficient management of tourist toilets, and provide relevant improvement suggestions. The specific theoretical framework is shown in figure 1.

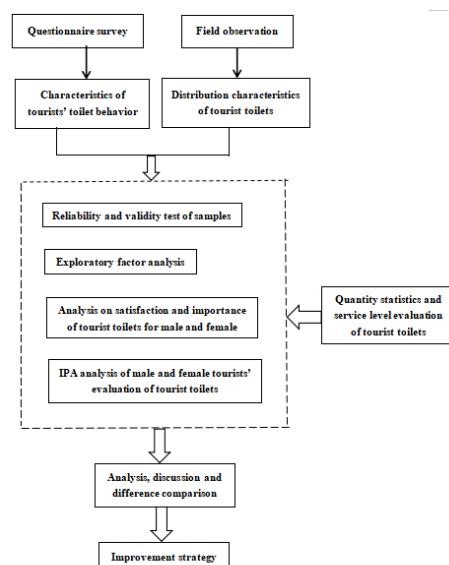


Figure 1. Research Questionnaire Analysis Theoretical Framework

Source: drew by the author

2. Literature Review and Theory

2.1. Literature Review

Scholars study the problem of public toilets more from the perspective of public facilities, which is reflected in a public service function of the government, and tourism toilets (tourist toilets) are also included in public toilets. Some scholars have studied the environmental protection and sustainable development of tourism public toilets, and proposed the construction of compost toilets, zero emission toilets and ecological toilets, so as to improve the environment and facilities of public toilets, so as to increase the social benefits of tourism toilets. For example, Anand and Apul [5] believe that in the United States, water and wastewater infrastructure is insufficient.

Some scholars have found that tourist toilets have an impact on attracting tourists and tourists' satisfaction. For example, Saxton et al [6]. believe that water resources are scarce in urban slums in India. However, water is a prerequisite for maintaining the cleanliness of public toilets. The experiment of flushing public toilets by low-cost water storage can change the original behavior and habits, and improve the maintenance and user satisfaction of public toilets in urban slums. When studying tourist toilets or public toilets, a few scholars have considered the needs of special interest groups such as the disabled and women. For example, Tales et al [7]. believed that simple and clear public toilet signs should not only serve special people with dementia, but should be available to all users, and suggested relevant professionals to raise awareness and take corrective measures in time.

In the provision of tourist toilets and corresponding facilities in major scenic spots, the toilet needs of special groups are not effectively met, such as the disabled, the elderly, female and opposite-sex parents, parents and opposite-sex children, mothers and infants, women, etc. With the increasing demand of special people for tourism toilets with special functions and humanized design, its provision is gradually getting the attention of relevant scholars. For example, a survey of Yangzhou based on its current population and infrastructure found that barrier-free toilet facilities cannot meet the growing needs of citizens and tourists year by year, and that problems arise in the process of use and management, such as low frequency of use, unscientific design, and a lack of supervision and maintenance management.

Many scholars began to think about how to improve the importance and satisfaction of tourist toilets from the perspective of tourists' needs and perception. For example,

drawing on sampling survey data on national tourism and leisure, one study used the IPA method to analyze and compare differences in the importance and performance perception of tourist toilets between male and female tourists at four scenic spots in Shandong Province.

The condition of tourist toilets is directly related to tourist' impression and evaluation of tourist cities. The blowout development of local tourist attractions is in sharp contrast to the insufficient and lagging construction of tourist toilets in scenic spots. There are many loopholes in the design, construction and management of tourist toilets in scenic spots, which has attracted the attention of many scholars. The necessity of a "toilet revolution" in tourism cities has also been discussed in combination with the key points of tourist toilet landscape design, so as to provide a useful reference for the cause of the "toilet revolution" in tourism cities in China.

2.2. Theory

An encompassing approach to the understanding of tourist satisfaction and its outcome can be found in Sirgy's proposed theory of evaluative congruity [8-10]. Evaluative congruity is defined as the tourist cognitive processing directed to assess and interpret the stimulus object or destination [11]. Evaluative congruity theory suggests a theoretical position related to tourist satisfaction in terms of discrepancies between perceived and actual performance levels. Based on the theory, satisfaction is a function of evaluative congruity, which is a cognitive matching process in which perceived value is compared to a cognitive experience (e.g., service performance) for the purpose of evaluating a stimulus action of travelling [8]. The cognitive process in evaluative congruity theory is postulated to generate an emotional state (i.e., satisfaction) that prompts the tourists to formulate overall post-visit image to ignore minor unpleasant state and/or to enhance destination loyalty.

To sum up, according to the existing relevant research, most scholars' research stays at the level of general descriptive analysis, and the research depth is still insufficient. The research on tourist toilets has been paid more and more attention by researchers. This paper uses an empirical research method to investigate the importance and performance perception of male and female tourists on the evaluation indicators of tourist toilets, in order to promote the further development of this research field. Methodology.

3. Methodology

The questionnaire for this study consists of two parts. The first part consists of items that measure the demographic characteristics of the respondents, including gender, age, educational level, occupation, and monthly income.

The second part is about the perception of tourists' importance and satisfaction level, including 37 items. For the measurement of related items, this study mainly uses a 5-point Likert scale, in which the measurement of importance perception includes five levels: very unimportant, unimportant, generally important, important, and very important; The measurement includes five levels: very dissatisfied, dissatisfied, generally satisfied, satisfied, and very satisfied. At the same time, the measurement of the two variables is assigned 1, 2, 3, 4, and 5 points in sequence from low to high, allowing tourists to evaluate the importance and satisfaction of each factor of the tourist toilet according to their actual perception.

3.1. Measuring Tools

The initial items of the second part refer to the promulgated by the National Tourism Administration of China "Classification and Assessment of Quality Levels of Tourist Toilets" (GB/T18973-2003), the evaluation clauses were designed and formed, covering four aspects including organization management, layout design, toilet environment, basic skills.

3.2. Data Collection

In order to ensure the smooth conduct of the research work, the investigators are 5 freshmen and sophomore college students majoring in tourism management of Lanzhou Vocational and Technical College. For the impact of the survey, pre-investigation and pre-training will be carried out for relevant investigators.

This study asked experts and scholars in the field of tourism research, and combined with the actual situation of the interviews, moderately modified and perfected the setting of related topics. The specific time began in October 2017, and successively interviewed the staff of the tourist reception centers of some scenic spots in Lanzhou City and the managers of relevant departments of the Lanzhou Tourism Bureau. In addition, this study also consulted the suggestions of many tourism professors, and modified the corresponding wording. On this basis, the questionnaire was amended and supplemented to form 36 evaluation indicators in the formal questionnaire (one item was removed when the formal questionnaire was determined), and a relatively complete questionnaire of importance and satisfaction was extracted.

This survey adopts the method of on-site interception, and selects tourists and citizens who have used tourist toilets in the above 12 selected scenic spots, as well as managers and service personnel of tourist toilets to distribute and collect questionnaires, and number the completed questionnaires. For tourists who are willing to fill in the questionnaire, the investigators will distribute the questionnaire to them on the spot to fill in, and then carefully check the filled items, and return the questionnaire as soon as possible after confirming that it is correct. During the survey process, first explain the purpose of the survey to tourists, and explain that the questionnaire has a large number of questions, and ask tourists whether they have enough time to fill in, so as to ensure the recovery rate of the questionnaire and the reliability of the answer results. When taking the questionnaire, the investigators will patiently explain it at any time, and immediately check whether there are any missing answers in the questionnaire when returning it, and ask tourists to fill it in completely if there are any. A total of 207 questionnaires were distributed in this survey, of which 115 people participated in the questionnaire star platform, 115 questionnaires were recovered, and 1 invalid paper was eliminated; 92 questionnaires were distributed on the spot, 92 questionnaires were recovered, and 12 invalid papers were eliminated. Questionnaires that only fill in part of the degree of importance and satisfaction are considered invalid. The online and offline survey methods finally obtained 194 valid questionnaires, with a recovery rate of 93.72%.

3.3. Research Methods

This study uses Importance Performance Analysis (IPA) to analyze the tourist toilet satisfaction of male and female tourists. This method considers that satisfaction is not only affected by the importance of evaluation indicators, but also by the performance of these indicators. Taking importance and performance as the vertical axis and horizontal axis respectively, and taking the overall average of the importance perception and performance perception scores of each evaluation index as the intersection point to draw horizontal and vertical lines respectively, a grid diagram including four quadrants can be constructed: The first quadrant is the area of high importance and high performance. The indicators in this area are both very important and perform well. Poor, the corresponding countermeasures are focused attention; the third quadrant is the area of low importance and low performance, the indicators in this area are not of high importance and performance is not good, and there is no need to give priority to these indicators when improving customer satisfaction; the fourth quadrant It is a low importance and high performance area. The indicators in this area are not important but perform well. It is recommended not to make excessive efforts on these indicators to avoid excessive use of resources.

3.4. Data Analysis

The effective questionnaire data collected in the field survey was entered into the database using Excel software, and the data was imported into IBM SPSS22.0 statistical software for processing and analysis. First, the male sub-samples (n=82) and female sub-

samples (n=112) in the total sample (n=194) were used for reliability analysis of the demographic characteristics of the two sub-samples using descriptive analysis, and the reliability of the obtained data was analyzed. Secondly, the frequency and frequency statistics and analysis of the variables in the tourist toilets are carried out, and the mean and standard deviation are used to measure the importance and satisfaction of the respondents on the various influencing factors of the tourist toilets in various scenic spots in Lanzhou City, female tourists to the relationship between the evaluation indicators of Lanzhou tourist toilets, and then carry out the sample T test. Finally, the satisfaction and importance of all influencing factors are mapped to the IPA model matrix in the form of coordinates, the IPA model is analyzed, and countermeasures and suggestions are put forward for improving the satisfaction of male and female tourists in tourist toilets.

4. Results

After statistics, the sample characteristics are summarized as follows: The female group is more than the male group (57.89% female, 42.11% male). The age group is mainly 19-34 years old (44.74%), most of them have University (College/undergraduate) degrees (79.82%), most of the respondents are enterprise employees (38.60%), most of the tourists' monthly income is 3,501-5,000 yuan (32.46%), and most of the tourists are local residents living in Lanzhou (63.16%).

4.1. Comparison between Male and Female Tourists' Perceptions of Importance and Satisfaction of Tourist Toilets

By using IBM SPSS 22.0 software and excel and other software, this study calculates the importance and satisfaction perception of male and female tourists on the evaluation indicators of tourist toilets in Lanzhou, adopts independent sample T-test analysis, and ranks them from high to low according to the average value. The analysis results are shown in Table 2-2 and Table 2-3.

4.1.1. Important Perceptions of Male and Female Tourists on the Evaluation Indicators of Tourist Toilets

It can be seen from Table 2-2 that the average value of male tourists' important perceptions of the indicators in the tourism toilet questionnaire is between 4.79 and 3.85, and the average value of female tourists' important perceptions of the indicators in the tourism toilet questionnaire is between 4.88 and 3.62, both of which are higher than the general level of 3 points, indicating that both male and female tourists have high expectations and requirements.

From the standard deviation of the scores of the evaluation indicators of each item in the tourist toilet questionnaire, the standard deviation of the importance scores of male tourists is between 1.579 and 0.683, and the standard deviation of the importance scores of female tourists is between 1.634 and 0.541, and the maximum value is greater than 1.5, indicating that whether male tourists or female tourists, there are significant differences in the perception of the importance of the evaluation indicators of these questionnaires.

The test results of independent sample t show that there are significant differences in the mean value and ranking of male and female tourists' perceptions of the importance of the indicators in the questionnaire, except for the three evaluation indicators of "X3. clean and sanitary ground of tourist toilets" (T=1.500, P=0.019), "X4. clean and tidy decoration of tourist toilets" (T=2.792, P=0.030) and "X37. consistent or longer opening hours of tourist toilets and business" (T=1.500, P=0.019), There was no significant difference in other items.

Both male and female tourists have high requirements on "X1. disinfection of tourist toilets" and think it is very important, ranking first. Male and female tourists have the same perception of "X18. men's toilet and women's toilet have eye-catching signs and are easy to identify", ranking sixth. Male tourists and female tourists have the same perception of "X32. tourism toilets have background music" and both think it is not important. They rank last, ranking 36th (As shown in Table 1).

Table 1. Average and Ranking of Male and Female Tourists' Perceptions of the Importance of Tourist Toilets

Factor term	Evaluation index	Male tourists			Female tourists			T value	Significance
		Mean	Order	Standard deviation	Mean	Order	Standard deviation		
Factor 1	Toilet environment								
X1	Disinfect tourist toilets	4.79	1	0.683	4.88	1	0.541	-0.76	0.164
X2	The tourist toilet is well ventilated without peculiar smell	4.65	2	0.863	4.55	4	0.931	0.586	0.406
X3	The floor of tourist toilet is clean and sanitary	4.65	3	0.897	4.23	26	1.345	1.500	0.019
X4	Clean wall decoration of tourist toilet	4.50	8	0.875	3.91	34	1.262	2.792	0.030
X5	Tourist toilets have hooks / shelves	4.48	10	0.967	4.41	16	0.911	0.395	0.973
X6	Urinal has automatic flushing system	4.60	5	0.869	4.53	7	0.915	0.435	0.443
X7	The toilet is equipped with unmanned indicating device and the door lock is firm	4.44	11	1.253	4.32	21	1.326	0.485	0.389
Factor 2	Layout design								
X11	Easy operation of faucet	4.29	24	1.288	4.18	27	1.467	0.415	0.582
X12	Reasonable queuing time in tourist toilets	4.27	26	1.395	4.52	9	1.085	-1.052	0.088
X13	Reasonable number of tourist toilets	4.44	12	1.335	4.42	14	1.382	0.051	0.857
X14	Tourist toilets are prominently marked on the tourist guide map of the scenic spot	4.27	27	1.608	4.48	12	1.373	-0.764	0.248
X15	There are eye-catching tourist toilet guide signs on the tourist trail	4.42	14	1.285	4.55	5	1.139	-0.564	0.397
X16	The tourist toilet signboard indicates the distance between the tourist toilet and the toilet in meters	4.29	25	1.320	4.42	15	1.164	-0.567	0.445
X17	Tourist toilet buildings are easy to identify and find	4.35	20	1.313	4.52	10	1.113	-0.707	0.216
X18	Men's and women's toilets have eye-catching signs, which are easy to identify	4.56	6	1.219	4.55	6	1.060	-0.416	0.492
X19	Two kinds of squatting toilets for tourist toilet design	4.33	21	1.294	4.02	32	1.387	1.244	0.217
X21	The road leading to the tourist toilet is flat without steps	4.27	28	1.317	4.33	20	1.219	-0.261	0.989
Factor 3	Basic function								
X8	Toilet compartment with safety handrail and emergency call	4.37	19	1.347	4.14	31	1.164	-0.209	0.466
X9	The tap is supplied with hot and cold water	4.19	33	1.315	4.29	22	1.424	0.195	0.913

X10	Hand sanitizer, hand dryer, toilet paper, etc. are complete	4.44	13	1.287	4.18	28	1.212	0.634	0.807
X22	There is a third toilet (mother and baby room, children's toilet, etc.)	4.40	15	1.284	4.29	23	1.262	0.448	0.769
X23	Special access for the disabled	4.33	22	1.562	4.56	2	1.139	0.899	0.160
X24	There are toilet seats and handrails for the disabled	4.40	16	1.300	4.53	8	1.193	0.572	0.521
Factor 4	Organizational Management								
X25	Tourist toilets are equipped with face mirrors	4.23	30	1.341	4.39	17	1.188	-0.692	0.413
X26	The tourist toilet has good daylighting	4.12	35	1.579	4.18	29	1.227	-0.216	0.501
X27	Tourist toilets are well illuminated	4.33	23	1.243	4.38	18	1.250	-0.192	0.728
X28	Tourist toilets are equipped with emergency lights at night	4.27	29	1.395	4.47	13	1.243	-0.801	0.308
X29	Tourist toilets are free of mosquitoes, flies, cockroaches and other insects	4.50	9	1.238	4.56	3	1.349	-0.245	0.931
X30	Tourist toilets are decorated with green plants	4.19	34	1.283	3.91	35	1.634	0.981	0.350
X31	Tourist toilets have decorations to promote civilized toilet use	4.23	31	1.356	3.98	33	1.452	0.912	0.993
X32	The tourist toilet has background music	3.85	36	1.384	3.62	36	1.379	0.889	0.966
X33	The tourist toilet is free	4.52	7	1.255	4.38	19	1.586	0.514	0.359
X34	Tourist toilets have administrators	4.40	17	1.284	4.14	30	1.477	0.978	0.480
X35	The interior design of the tourist toilet reflects the culture	4.21	32	1.304	4.25	25	1.193	0.241	0.760
X36	The surrounding environment of the tourist toilet is clean and sanitary	4.38	18	1.282	4.52	11	1.126	-0.619	0.511
X37	Tourist toilets have the same or longer opening hours as the operation	4.62	4	0.841	4.26	24	1.582	1.465	0.041

4.1.2. Male and Female Tourists' Satisfaction Perception on the Evaluation Indicators of Tourist Toilets

From the standard deviation of evaluation index scores, the standard deviation of male tourists' satisfaction scores is between 1.783 and 1.237, and the standard deviation of female tourists' satisfaction scores is between 1.496 and 1.027. The maximum value of male tourists' satisfaction is greater than 1.5, and the maximum value of female tourists' satisfaction is less than 1.5, indicating that male tourists' perception of the importance of these questionnaire indicators is quite different from their expectation, while female tourists have a small difference, See Table 2-3.

According to the T-test results of two independent samples, in the average and ranking table of male and female tourists' satisfaction with the evaluation indicators of tourist toilets, except "X4. the tourist toilets are well decorated" ($T=0.254$, $P=0.043$), "X7. the toilets are equipped with unmanned indicating devices, and the door locks are firm" ($T=0.305$, $P=0.013$), "X10. hand sanitizer, dryer, toilet paper, etc. are complete" ($T=-0.313$, $P=0.039$) "X28. there is a significant difference among the four evaluation indicators that the tourist toilets are equipped with night emergency lights ($T=0.065$, $P=0.029$)".

Both male and female tourists have high satisfaction perception in "X18. men's toilet and women's toilet have eye-catching signs and are easy to identify". Male tourists' satisfaction ranking is the second and female tourists' satisfaction ranking is the first. Both male and female tourists have high satisfaction perception in "X27. tourism toilet lighting is good". Male tourists' satisfaction ranking is the sixth and female tourists' satisfaction ranking is the seventh. Male tourists have higher satisfaction perception than female tourists in "X6. urinals have automatic flushing system", "X31. tourist toilets have decorations to promote civilized toilet use", "X33. tourist toilets are free", "X34. tourist toilets have Administrators" and "X37. tourist toilets have the same or longer operating hours". Female tourists have higher satisfaction perception than male tourists in "X14. tourist toilets are prominently marked on the tourist attraction map", "X15. tourist trails are prominently marked with tourist toilets", "X21. the road leading to tourist toilets is flat without steps", "X36. the surrounding environment of tourist toilets is clean and sanitary". Male and female tourists have almost the same satisfaction on "X11. easy operation of faucet", "X28. night emergency light in tourist toilet" and "X35. cultural design in tourist toilet". Male and female tourists have low satisfaction with "X3. the ground of the tourist toilet is clean and sanitary", "X8. the toilet compartment is provided with safety handrails and emergency pagers", "X9. the faucet is provided with hot and cold water supply", "X10. the hand sanitizer, hand dryer, toilet paper, etc. are complete", "X24. there are special toilet seats and handrails for the disabled", "X29. the tourist toilet is free of mosquitoes, flies, cockroaches and other insects" and "X32. the tourist toilet has background music". Female tourists have the lowest satisfaction with "X22. having a third bathroom (mother and baby room, children's toilet, etc.)", ranking the last, ranking 36th (As shown in Table 2).

Table 2. Average and Ranking of Male and Female Tourists' Satisfaction with the Evaluation Indicators of Tourist Toilets

Factor term	Evaluation index	Male tourists						Female tourists		T value	Significance
		Mean value	Order	Standard deviation	Mean value	Order	Standard deviation				
Factor 1	Toilet environment										
X1	Disinfect tourist toilets	2.63	35	1.409	2.73	31	1.319	-0.397	0.381		
X2	The tourist toilet is well ventilated without peculiar smell	2.81	31	1.593	2.88	26	1.319	-0.243	0.157		
X3	The floor of tourist toilet is clean and sanitary	2.96	26	1.304	2.89	25	1.254	0.266	0.619		
X4	Clean wall decoration of tourist toilet	3.00	21	1.414	2.94	23	1.135	0.254	0.043		
X5	Tourist toilets have hooks / shelves	3.00	22	1.459	2.85	27	1.428	0.554	0.702		
X6	Urinal has automatic flushing system	3.31	4	1.532	3.08	15	1.46	0.837	0.571		
X7	The toilet is equipped with unmanned indicating device and the door lock is firm	3.15	13	1.750	3.06	17	1.239	0.305	0.013		
Factor 2	Layout design										
X11	Easy operation of faucet	3.24	10	1.464	3.24	11	1.177	-0.306	0.481		
X12	Reasonable queuing time in tourist toilets	3.13	15	1.468	3.00	22	1.324	0.475	0.270		
X13	Reasonable number of tourist toilets	3.06	18	1.405	3.09	14	1.224	-0.115	0.737		
X14	Tourist toilets are prominently marked on the tourist guide map of the scenic spot	3.00	23	1.425	3.48	3	1.153	-0.368	0.444		
X15	There are eye-catching tourist toilet guide signs on the tourist trail	3.17	12	1.506	3.45	4	1.139	-1.162	0.239		

	The tourist toilet signboard indicates the distance between the tourist toilet and the toilet in meters	X16	3.04	20	1.443	3.06	18	1.380	-0.071	0.905
	Tourist toilet buildings are easy to identify and find	X17	3.19	11	1.299	3.41	6	1.136	-0.968	0.740
	Men's and women's toilets have eye-catching signs, which are easy to identify	X18	3.58	2	1.442	3.91	1	1.286	-1.269	0.247
	Two kinds of squatting toilets for tourist toilet design	X19	3.10	16	1.418	3.30	8	1.15	-0.826	0.430
	The road leading to the tourist toilet is flat without steps	X21	3.25	9	1.345	3.50	2	1.027	-1.126	0.438
Factor 3	Basic function									
	Toilet compartment with safety handrail and emergency call	X8	2.71	33	1.738	2.74	34	1.339	-0.118	0.051
	The tap is supplied with hot and cold water	X9	2.75	32	1.564	2.77	30	1.401	-0.081	0.481
	Hand sanitizer, hand dryer, toilet paper, etc. are complete	X10	2.60	36	1.783	2.70	35	1.381	-0.313	0.039
	There is a third toilet (mother and baby room, children's toilet, etc.)	X22	2.90	30	1.547	2.62	36	1.496	0.954	0.801
	Special access for the disabled	X23	3.00	24	1.444	3.02	21	1.318	-0.058	0.904
	There are toilet seats and handrails for the disabled	X24	3.00	25	1.516	2.91	24	1.367	0.335	0.917
Factor 4	Organizational Management									
	Tourist toilets are equipped with face mirrors	X25	3.27	7	1.484	3.27	9	1.158	-0.008	0.144
	The tourist toilet has good daylighting	X26	3.27	8	1.554	3.27	10	1.171	-0.007	0.345
	Tourist toilets are well illuminated	X27	3.29	6	1.398	3.38	7	1.092	-0.373	0.229
	Tourist toilets are equipped with emergency lights at night	X28	3.06	19	1.668	3.05	20	1.143	0.065	0.029
	Tourist toilets are free of mosquitoes, flies, cockroaches and other insects	X29	2.96	27	1.557	2.80	28	1.395	0.559	0.328
	Tourist toilets are decorated with green plants	X30	2.96	28	1.473	2.76	32	1.489	0.714	0.861
	Tourist toilets have decorations to promote civilized toilet use	X31	3.15	14	1.516	2.80	29	1.480	1.209	0.802
	The tourist toilet has background music	X32	2.71	34	1.336	2.76	33	1.426	-0.187	0.517
	The tourist toilet is free	X33	3.63	1	1.378	3.44	5	1.479	0.681	0.285
	Tourist toilets have administrators	X34	3.31	5	1.386	3.20	12	1.280	0.998	0.999
	The interior design of the tourist toilet reflects the culture	X35	3.10	17	1.477	3.08	16	1.326	0.234	0.234
	The surrounding environment of the tourist toilet is clean and sanitary	X36	2.96	29	1.762	3.06	19	1.334	0.009	0.099
	Tourist toilets have the same or longer opening hours as the operation	X37	3.54	3	1.237	3.15	13	1.406	0.883	0.883

4.2. IPA Analysis of Male and Female Tourists' Evaluation on Tourist Toilets

Taking tourist satisfaction of tourist toilets as the horizontal axis and importance as the vertical axis, drawing horizontal and vertical lines based on the intersection of the

overall mean of satisfaction scores of various items and the overall mean of importance scores, the IPA quadrants of the evaluation indicators of tourist toilet services provided by the scenic spot from the perspective of male and female tourists are drawn respectively, as shown in Table 3. The specific analysis is as follows:

Table 3. IPA Block Diagram of Male and Female Tourists' Perception of Tourist Toilets.

Importance	HIGH	Quadrant II		Quadrant I	
		X2, X9, X10 X11, X13, X19 X32	X1, X8, X12 X16, X23, X24 X28, X29, X36	X3, X4, X5 X6, X7, X22 X30, X31, X33 X34, X35, X37	X14, X15, X17 X18, X21, X26 X27
Low		Quadrant III		Quadrant IV	
		X1, X8, X14 X15, X16, X17 X18, X21, X23 X27, X28, X36	X3, X5, X6 X7, X9, X10 X11, X13, X22 X30, X31, X32 X33, X34, X35 X37	X12, X24, X25 X26, X29	X2, X4, X19
		Low		High	
Satisfaction					

Note: the blue area in the figure represents men and the green area represents women. The horizontal red solid line represents the overall mean value of the importance evaluation of relevant indicators of tourists; The vertical red solid line represents the overall mean value of the satisfaction evaluation of tourist related indicators.

4.2.1. Quadrant I: "Icing on the Cake"

It can be seen from quadrant I of Figure 2-1 that male tourists are "X3. the ground of the tourist toilet is clean and sanitary", "X4. the wall of the tourist toilet is well decorated", "X5. the tourist toilet is equipped with a hook/shelf", "X6. the urinal is equipped with an automatic flushing system", "X7. the toilet position is equipped with an unattended indicator and the door is firmly locked", "X22. there is a third toilet (mother and baby room, children's toilet, etc.)", and "X30. the tourist toilet is decorated with green plants" "X31. the tourist toilet has decorations to promote civilized toilet use", "X33. the tourist toilet is free", "X34. the tourist toilet has Administrators", "X35. the internal design of the tourist toilet reflects culture" and "X37. the tourist toilet has the same or longer opening hours as the operation". It can be found that men have a high sense of importance and satisfaction with some aspects of toilet environment and organizational management. Among them, men's perception of the "third toilet" (mother and baby room, children's toilet, etc.) exceeded their expectations. The possible reason is that, compared with women, men pay more attention to the provision of this kind of tourist toilet when they bring children of the opposite sex to the scenic spot to avoid the embarrassment of toilet use, which also reflects a culture of male chauvinism.

Female tourists are shown in "X14. tourist toilets are prominently marked in the scenic area guide map", "X15. tourist toilets are prominently marked on the tourist trail", "X17. tourist toilets are easy to identify and find", "X18. men's toilets and women's toilets are prominently marked and easy to identify", "X21. the road leading to tourist toilets is flat and without steps", "X26. tourist toilets have good lighting" The perception score of "X27. the tourist toilet is well illuminated" is high. It can be seen that women are more

satisfied with some layout designs and organizational management and have a higher sense of importance.

To sum up, both male and female tourists have good perception in terms of organization and management, but their specific management service needs are different. In detail, men prefer that the tourist toilets are free and cleaned by specially assigned personnel. They have low requirements for the internal decoration and cultural connotation of the tourist toilets, so they have a better perception of these aspects of organization and management. Women prefer to hope that the lighting and lighting of the tourist toilet are good. However, male and female tourists do not show consistency in layout design and good perception of the toilet environment. Therefore, the scenic spot managers should continue to provide high-quality services in terms of indicators of good perception of male and female tourists, so as to improve the popularity of tourist attractions.

4.2.2. Quadrant II: "Do Your Best"

As can be seen from quadrant II of Figure 2-1, male tourists scored high on the important perception of "X2. good ventilation and no odor in the tourist toilet", "X9. hot and cold water supply in the faucet", "X10. complete hand sanitizer, hand dryer, toilet paper", etc., "X11. simple faucet operation", "X13. reasonable number of tourist toilets", "X19. two kinds of squatting toilets in the tourist toilet design", "X32. background music in the tourist toilet". It can be found that men have high importance and low satisfaction perception of some basic functions and layout design. This is because men usually carry less articles for toilet use, so they prefer the toilet to provide these articles compared with women; At the same time, men are more rational and pay attention to the hardware facilities and layout design of toilets, rather than the perceived needs of safety.

Female tourists are requested to "X1. disinfect the tourist toilet", "X8. the toilet compartment is equipped with a safety grab and an emergency pager", "X12. the queue time for using the tourist toilet is reasonable", "X16. the tourist toilet signboard indicates the distance between the toilet and the toilet", "X23. there is a special passage for the disabled", "X24. there is a special toilet seat and handrail for the disabled", "X28. the tourist toilet is equipped with night emergency lights" "X29. the tourist toilet is free of mosquitoes, flies, cockroaches and other insects" and "X36. the surrounding environment of the tourist toilet is clean and hygienic" have a high perception score. It can be seen that women have high importance and low satisfaction perception of some basic functions and organizational management. It can be seen that women have high awareness of the importance of safety and special facilities, but low satisfaction, which reflects their higher standards of safety needs and more concern for the needs of vulnerable groups.

To sum up, both male and female tourists have good sense of importance and low satisfaction in terms of basic functions, but there are differences in organizational management. Specifically, men prefer to improve the service of additional facilities in the tourist toilet, and pay more attention to the convenience provided by toilet facilities, such as hand sanitizer, toilet paper, hand dryer, etc., while women pay more attention to the toilet functions related to safety, such as emergency light, safety grab, emergency pager, etc. This also reflects that there are more rational elements in the process of men's behavior, and women's behavior characteristics reflect strong perceptual characteristics. Therefore, women pay more attention to whether the tourist toilets are disinfected, clean and sanitary, and have higher requirements for them. Therefore, managers should try their best to provide basic toileting supplies, provide more toileting facilities to protect women's safety, and further improve the level of health management.

4.2.3. Quadrant III: "Step by Step"

It can be seen from Quadrant III of Figure 2-1 that male tourists are respectively in "X1. disinfection of tourist toilets", "X8. toilet compartments are equipped with safety grips and emergency pagers", "X14. tourist toilets are prominently marked on the tourist map", "X15. tourist toilets are prominently marked on the tourist walkways", "X16. tourist toilets are marked with meters away from the toilets", "X17. tourist toilet buildings are easy to

identify and find" "X18. the men's and women's toilets have eye-catching signs and are easy to identify", "X21. the road leading to the tourist toilet is flat and without steps", "X23. there is a special passage for the disabled", "X27. the tourist toilet is well illuminated", "X28. the tourist toilet is equipped with night emergency lights", "X36. the surrounding environment of the tourist toilet is clean and hygienic" and other aspects have low perception scores. It can be found that men have low importance and low satisfaction perception of some layout design and organizational management. Among them, men are not important or satisfied with the perception of safety grab, emergency pager and indication signs. The possible reason is that men pay more attention to practical functions and tend to be overly arrogant in safety cognition. Therefore, male tourists think that the provision of these facilities is neither important nor recognized.

Female tourists have made the following comments respectively: "X3. the ground of the tourist toilet is clean and sanitary", "X5. the tourist toilet is equipped with a hook/shelf", "X6. the urinal is equipped with an automatic flushing system", "X7. the toilet seat is equipped with an unmanned indicator device and the door is firmly locked", "X9. the faucet is provided with hot and cold water supply", "X10. the hand sanitizer, hand dryer, toilet paper, etc. are complete", "X11. the faucet is easy to operate", "X13. the number of tourist toilets is reasonable" "X22. there is a third toilet (mother and baby room, children's toilet, etc.)", "X30. the tourist toilet is decorated with green plants", "X31. the tourist toilet is decorated with decorations to promote civilized toilet use", "X32. the tourist toilet has background music", "X33. the tourist toilet is free", "X34. the tourist toilet has Administrators", "X35. the internal design of the tourist toilet reflects culture", "X37. the opening time of the tourist toilet is the same as or longer than that of the business". It can be seen that women have low importance and low satisfaction perception of some toilet environment and organizational management. Among them, women have high requirements for toilet hygiene, hand sanitizer, toilet paper and other basic toilet services and supplies, or do not match their own needs, especially for toilet paper and other sanitary supplies, which are basically self-sufficient. Therefore, their perception of these goods or services provided by the toilet is neither important nor satisfied.

To sum up, male and female tourists have low importance and low satisfaction in some aspects of organization management, toilet environment and layout design, but they are different. For men, they tend to be arrogant in their own safety. Therefore, tourism managers should strengthen the safety tips and publicity for male tourists and provide more high-quality sanitary products for female tourists. At the same time, continuously strengthen the improvement and promotion of toilet hygiene.

4.2.4. Quadrant IV: "Decrease or Increase"

It can be seen from quadrant IV of Figure 2-1 that male tourists are "X12. the queue time for using the tourist toilet is reasonable", "X24. there are special toilet seats and handrails for the disabled", "X25. the tourist toilet is equipped with face mirrors", "X26. the tourist toilet has good lighting" and "X29. the tourist toilet is free of mosquitoes, flies, cockroaches and other insects". It can be found that men have low importance and high satisfaction perception of some aspects of organizational management. For men, they don't pay much attention to toilet use, such as face mirror, daylighting and whether there are insects, but the implementation or services provided by tourist toilets exceed their expectations.

Female tourists have "X2. good ventilation and no odor in the tourist toilet", "X4. clean wall decoration in the tourist toilet" and "X19. squatting toilets designed in the tourist toilet". It can be seen that women have low importance and high satisfaction perception of some toilet environment and layout design.

To sum up, tourism managers should continue to maintain the management of toilet environment such as face mirror, day lighting, ventilation and wall decoration. At the same time, they should devote more energy and resources to the improvement of other aspects of tourism toilets.

5. Conclusion and Recommendations

As a part of the tourism environment, the tourist toilet is one of the necessary infrastructure in the scenic spot. Based on the questionnaire survey, this study empirically analyzes the tourist satisfaction level of tourist toilets in Lanzhou scenic spots. It is found that the factors affecting tourist satisfaction of tourist toilets in Lanzhou mainly include organization and management, layout design, toilet environment and basic functions. At the same time, based on gender differences, this study uses IPA method to explore the differences between male and female tourists' perceptions of tourist toilets in the scenic spot. The results show that male and female tourists have significant differences in the above four aspects, but some also show some similarities. Therefore, the following aspects should be paid attention to in the management of tourist toilets in scenic spots.

5.1. Improve the Cultural Attributes of Tourist Toilets and Continue to Improve Safety and Other Management Services

At present, the management service of tourist toilets in Lanzhou scenic spots is relatively perfect, but the cultural attributes and safety services of toilets need to be further improved. First of all, we should enrich the cultural connotation of tourist toilets, and we can increase the service content of toilet culture in a targeted way, such as playing background music with northwest characteristics or appropriately adding some posters and slogans in the toilets to publicize northwest tourist attractions. Secondly, we should further improve the safety standards of tourist toilets, especially continue to increase the safety guarantee measures for women's toilets to prevent their privacy and personal safety from being threatened. For men, safety warnings should also be appropriately increased to prevent the safety of their personal privacy, property and other items.

5.2. Promote the Construction of Smart Tourism and Reasonably Plan the Layout of Toilets

With the combination of "Internet+" and many traditional industries, it provides consumers with a lot of convenience, improves efficiency and improves services. Recently, the tourism industry has also taken the initiative to embrace the Internet. Smart tourism has become an important measure for scenic spots to improve the service quality of tourists. Therefore, the traditional tourist toilet signs and signs are difficult to attract tourists' interest and attention. Although these basic layout designs have provided convenience for tourists' travel in history, they are also suffering from service bottlenecks. Therefore, the Internet transformation of traditional tourist toilets has become an inevitable trend in the development of scenic spots. First of all, the scenic spot should create its own app services, and actively combine with those map apps to provide tourists with more accurate tourist toilet routes and reduce the time spent searching for tourist toilets. Secondly, the number of toilets in the scenic spot should be set reasonably to reduce the queuing time of tourists, especially the ratio of toilet seats in the women's toilet.

5.3. Strengthen Toilet Civilization Education and Cultivate Tourists' Awareness of Environmental Protection

The sanitary environment of tourist toilets needs the continuous maintenance of scenic spot personnel and the cooperation of tourists. In order to keep the clean and tidy image of the toilet environment for a long time, we should further strengthen the toilet civilization education for tourists. Firstly, visitors can be reminded to pay attention to maintaining the toilet environment through the posting of signs, repeated playing of promotional videos, voice prompts after toilet use, etc. Secondly, in view of the resource constraints in the northwest region, environmental protection concepts such as water conservation can be publicized, so that every tourist can realize the importance of water conservation and participate in the construction of environmental protection.

5.4. Constantly Improve the Functions of Tourist Toilets and Consider the Needs of Special Groups

With the economic development, special groups have also joined the tourism army. Therefore, the construction of tourism toilets pays more attention to the needs of special groups, such as the disabled, children and the elderly. Then, the functions of traditional

tourist toilets can no longer meet the needs of tourists, which requires toilet managers to increase corresponding service facilities. First of all, with the arrival of the wave of aging in China, the number of travel of the elderly will continue to rise. Therefore, special attention should be paid to increasing the facilities related to the toilet habits of the elderly, such as handrails, emergency pagers, etc. Secondly, children's toilet needs need special attention, and facilities such as the third toilet, children's washing table, children's urinal, mother and baby room can be appropriately added.

5.5. Limitations

Based on the questionnaire survey method, this study conducted an empirical analysis on the satisfaction of visitors to tourist toilets in Lanzhou, which has the following limitations: first, this study collected 207 questionnaires, of which 13 did not meet the filling criteria, and the remaining 194 were valid questionnaires, and the sample size is still small; Secondly, the tourism image of Lanzhou has been improving in recent years. This study failed to study this dynamic change, but only focused on the tourists' perception at that time. Therefore, in the future research, we should increase the sample size, or choose second-hand data for large sample empirical research; At the same time, we should dynamically investigate the changes of tourists' perception, and provide more appropriate policy suggestions for the improvement of tourism toilet services.

References

1. R. Stanwell-Smith, "Public toilets down the drain? Why privies are a public health concern," *Public Health*, vol. 124, no. 11, pp. 613–616, 2010.
2. S. Cheng, Z. Li, S. M. N. Uddin, H.-P. Mang, X. Zhou, J. Zhang, et al., "Toilet revolution in China," *J. Environ. Manage.*, vol. 216, pp. 347–356, 2018.
3. I. W. Sunarsa and N. D. Andiani, "Tourism perception of general toilet hygiene in objects and tourist attractions in Bali," *Int. J. Soc. Sci. Bus.*, vol. 3, no. 1, pp. 36–41, 2019.
4. A. A. D. T. Devi and N. N. K. Yasa, "The role of customer satisfaction in mediating the influence of service quality and perceived value on brand loyalty," *Int. Res. J. Manage. IT Soc. Sci.*, vol. 8, no. 3, pp. 315–328, 2021.
5. C. K. Anand and D. S. Apul, "Composting toilets as a sustainable alternative to urban sanitation—A review," *Waste Manage.*, vol. 34, no. 2, pp. 329–343, 2014.
6. R. E. Saxton, F. Yeasmin, M. U. Alam, A. Al-Masud, N. C. Dutta, D. Yeasmin, et al., "If I do not have enough water, then how could I bring additional water for toilet cleaning?! Addressing water scarcity to promote hygienic use of shared toilets in Dhaka, Bangladesh," *Trop. Med. Int. Health*, vol. 22, no. 9, pp. 1099–1111, 2017.
7. A. Tales, V. Burholt, P. Nash, J.-A. Bichard, and A. Clayton-Turner, "Dementia-friendly public toilets," *Lancet*, vol. 390, no. 10094, pp. 552–553, 2017.
8. K.-S. Chon and M. D. Olsen, "Functional and symbolic congruity approaches to consumer satisfaction/dissatisfaction in consumerism," *J. Int. Acad. Hosp. Res.*, no. 3, 1991.
9. M. J. Sirgy, *Social Cognition and Consumer Behavior*. Greenwood, 1983.
10. M. J. Sirgy and P. K. Tyagi, "An attempt toward an integrated theory of consumer psychology and decision-making," *Syst. Res.*, vol. 3, no. 3, pp. 161–175, 1986.
11. M. J. Sirgy, "A social cognition model of consumer problem recognition," *J. Acad. Mark. Sci.*, vol. 15, no. 4, pp. 53–61, 1987.

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