ISSN 2616-7433 Vol. 2, Issue 2: 71-76, DOI: 10.25236/FSST.2020.020217

Satisfaction Analysis of Public Transport Facilities by Citizens -- Taking Changchun as an Example

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ABSTRACT. *Since the reform and opening up, China's social economy has developed rapidly. However, with the continuous acceleration of urbanization process and the continuous growth of population and means of transportation, China's public transport system is facing a severe test. At present, the academic satisfaction survey on transportation system is limited to all kinds of vehicles. This study mainly studies the satisfaction of Changchun citizens from the aspect of public transport facilities. According to the different modes of travel, the research mainly focuses on the relevant infrastructure such as bus, light rail, subway, bicycle, overpass, underpass, urban road, etc. After understanding the satisfaction status of public transport facilities, this paper analyzes the problems and causes of public transport facilities in Changchun City, and puts forward relevant countermeasures and suggestions.*

KEYWORDS: *Public transport facilities; Satisfaction*

1. Introduction

After 40 years of reform and opening up, China's economic strength has been increasing, and the urbanization process has been further deepened. In this process, the existing urban public transport infrastructure can not meet the needs of urban development due to the large increase of population and the use of means of transport. People's travel satisfaction is greatly reduced, and the economic development of the city is also limited. In this context, it is urgent to study how to improve the urban public transport infrastructure and improve the travel satisfaction of citizens.

The public transport facilities mentioned in this paper refer to the fixed engineering facilities provided by the government or other social organizations to the public in order to facilitate the daily travel of residents or the transportation of products. In order to ensure the normal, safe, orderly and operation of bus and trolley bus, rail transit, automobile, bicycle, pedestrian and other transportation systems. Auxiliary traffic facilities in road facilities, station facilities, station facilities, waiting facilities and parking facilities have been built.

2. Satisfaction Analysis of Public Transport Facilities in Changchun

In order to speed up and improve the construction of urban public transport infrastructure, this paper analyzes the current situation of Changchun public transport facilities based on the satisfaction data of residents in the questionnaire. In this chapter, public transport facilities are divided into bus and trolley bus, rail transit, automobile, bicycle and pedestrian according to different travel modes.

The proportion of men and women in 103 residents who participated in the survey was relatively balanced. The age distribution between 20-50 years old accounted for 97.09% of the total. 95.15% of the residents lived in Changchun for more than two years, and 49.51% lived in Changchun for more than six years. This shows that the citizens participating in the survey have a high understanding of the traffic situation in Chengdu. A large proportion of the total number of people live outside the second ring road and within the Fourth Ring Road. The number of people who ride bicycles is relatively small, and the number of people who ride buses is relatively large, accounting for 58.25% of the total.

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large, accounting for 58.25% of the total.

Table 1 Basic Information of Residents in Satisfaction Survey

Index		Sub total	Proportion	Index		Subtotal	Proportion
Sex	Male	56	54.37%	Place of Residence	Within the Second Ring Road	14	13.59%
	Female	47	45.63%		Within the Second Ring Road	42	40.78%
Age	Under 20 years old	2	1.94%		Within the Second Ring Road	30	29.13%
	20-35 years old		75.73%		Outside the Fourth Ring Line	17	16.50%
	35-50 years old		21.36%	Daily travel mode	Bicycle of electric Vehicle	10	9.71%
	Over 50 years old		0.97%		Bus	60	58.25%
Living time in Changchun	Less than 2 years		4.85%		Linght fail	51	49.51%
	2-4 years		33.98%		Metro	38	36.89%
	4-6 years		11.65%		Private car	46	44.66%
	More than 6 years	51	49.51%		Taxi/online car Hailing	39	29.13%
Total number of participants		103 person			Walk	30	29.13%

2.1 Bus and Trolley Bus

In recent years, in order to promote energy conservation and emission reduction, and promote green travel, Changchun vigorously promotes the use of electric buses. The improvement of supporting infrastructure is the operation guarantee of electric bus. This section mainly studies the public transport station facilities, public transport special passage, and public transport station settings.

Bus station facilities mainly include dedicated gas station, charging pile, initial and terminal station construction, dedicated parking lot, maintenance yard, dispatching room and repair shop. In the survey, the author found that the satisfaction of the relevant staff of bus and trolley bus station facilities is relatively high. However, there are still many problems, such as the total number of stations is insufficient, and the existing public transport station construction standards can not meet the current demand. There are also bus drivers who report that the number of bus maintenance yards is insufficient, and professional maintenance equipment and maintenance personnel are insufficient.

Changchun Transportation Bureau points out that there are two types of bus lanes in Changchun. One is the bus lane set in the auxiliary lane or the original non motor vehicle lane; the other is the bus reverse Lane set in the one-way street. According to the survey, the satisfaction degree of bus drivers to the bus lane setting in Changchun is quite different in suburban areas, but the overall recognition degree is relatively high. However, some citizens also reflect the lack of bus lanes.

Bus stop facilities mainly include bus stop infrastructure such as pole, stop sign, waiting booth, garbage can, etc. The regional difference of bus stop facilities in Changchun is very large. A large part of the stations near the Third Ring Road are only poles or signs. The waiting hall outside the first ring road and within the third ring road is semi sheltered, with only a simple ceiling, which will greatly reduce the travel experience of passengers in windy rainy and snowy weather. The station facilities within the first ring road are relatively complete. The electronic station board, station pole and driving route map are clear at a glance; the waiting hall has a wind shield, and the interior is equipped with a rest seat. According to the survey data, residents' satisfaction with bus stop facilities is as high as 90%. There are also a few citizens who are not satisfied with the bus stop facilities. Some citizens expect that the bus service can be more humanized and the station setting can be more reasonable.

Table 2 Bus Satisfaction Survey

Public rating of bus stop facilities		
Index	Subtotal	Proportion
5 points,extremely satisfied	13	21.67%
4 points satisfaction	19	31.67%
3 points normal	22	36.67%

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2 points,dissatisfied	4	6.67%
1point,very dissatisfied	2	3.33%

2.2 Rail Transit

The infrastructure of rail transit is mainly related supporting facilities to assist the safe and orderly operation of light rail and subway. Light rail belongs to ground rail transit, and its first operation time is 2002. The operation time of Metro is 2018. Up to now, Changchun rail transit has five operation lines, which are light rail line 3, line 4, line 8, Metro Line 1 and line 2. Table-3 shows the satisfaction of citizens with rail transit infrastructure.

Table 3 Survey of Citizens' Satisfaction with Rail Transit Infrastructure

	Linht rail			Merro		
	Index	Subotal	Proportion	Index	Subotal	Proportion
Station facilties	5 points very satisfiec	17	33.33%	5 points very satisfiec	16	42.11%
	4 points satisfaction	23	45.10%	4 points satisfaction	17	44.74%
	3 points normal	11	21.57%	3 points normal	5	13.76%
	2 points dissatisfied	0	0%	2 points dissatisfied	0	0%
	1 points very dissatisfied	0	0%	1 points very dissatisfied	0	0%
Waiting facilities	5 points very satisfiec	7	13.73%	5 points very satisfiec	12	31.58%
	4 points satisfaction	13	25.49%	4 points satisfaction	16	42.11%
	3 points normal	23	45.10%	3 points normal	7	18.42%
	2 points dissatisfied	5	9.8%	2 points dissatisfied	2	5.26%
	1 point very dissatisfied	3	5.88%	1 point very dissatisfied	1	2.63%

In station facilities of rail transit include ticket window, ticket check gate, escalator, barrier free facilities such as blind track anti-skid facilities, self-service, network interaction facilities, entrance guidance system such as signs and toilets. According to the survey, 78.43% of the citizens scored 4 or 5 points for the facilities in the light rail station, while 86.85% of the citizens scored 4 or 5 points for the facilities in the subway station. In the evaluation of light rail and subway station facilities by Changchun citizens, no one is dissatisfied or very dissatisfied. This shows that Changchun citizens have given great affirmation to the construction of the facilities in the rail transit station.

The waiting facilities of rail transit include waiting space, rest or leaning facilities, vehicle arrival information board, garbage can, safety warning line, etc. Because the light rail runs on the ground, while the subway runs on the ground, there are great differences in the waiting area facilities between the two. According to the survey results, 45.2% of the residents expressed general opinions on the light rail waiting hall facilities, 18.42% of the residents expressed general opinions on the subway waiting hall facilities, and 73.69% expressed satisfaction or very satisfaction. In the survey, some citizens proposed to extend the light rail cars; others proposed to change some of the tiles into non slip tiles. As the light rail runs on the ground, and the ice and snow period in the northeast is relatively long, so the waiting booth and other facilities need to be further improved.

2.3 Automobile Category

Automobile public transport facilities mainly refer to the supplementary facilities, road facilities, parking facilities and other auxiliary facilities to ensure the normal, safe and orderly operation of private cars, taxis, shared cars and network car Hailing. 57 of the 103 people in the survey have driving experience, and table-4 shows their satisfaction with automobile transportation infrastructure.

Table 4 Survey on the Satisfaction of Citizens with Automobile Transportation Infrastructure

A surver of citizen’s satisfaction with automobile transportation infrastructure								
Supply facility			Road facilities			Parking facilities		
Index	Subtotal	Proportion	Index	Subtotal	Proportion	Index	Subtotal	Proportion
5points	12	21.05%	5points	14	24.56%	5points	9	15.79%
4points	22	38.60%	4points	20	35.09%	4points	9	15.79%

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3points	16	28.07%	3points	15	26.32%	3points	20	35.09%
2points	2	3.51%	2points	3	5.26%	2points	11	19.30%
1points	5	8.77%	1points	5	8.77%	1points	8	14.04%

Supply facilities refer to the facilities that supply power and energy for social vehicles, such as charging station, gas station and gas station. According to the survey, 38.6% of the citizens with driving experience gave 4 points and gave a satisfactory evaluation of the public transport supply facilities in Changchun. However, 12.28% of the citizens with driving experience gave a score of 1 or 2, and they were not satisfied with the automobile energy supply facilities. Many people pointed out that new energy vehicles generally have problems such as less charging piles and inconvenient charging.

Public transport road facilities include traffic lights, safety monitoring system, road signs, road markings, barrier strips, lighting facilities, etc. The survey shows that 59.65% of the citizens have affirmed the public transport road facilities, but 8.77% of the citizens are very dissatisfied with the road facilities. Some citizens have reported that the roads in Changchun are too congested, some traffic lights are set unreasonably, and the road markings are not clear.

Parking facilities mainly include roadside parking spaces and parking lots. According to the survey data, only 31.57% of the citizens are satisfied with the public transport parking facilities, and the rest 68.43% are generally, dissatisfied and very dissatisfied with the public transport parking facilities. According to the survey, the main existing problems of parking facilities are that the urban underground parking lot, three-dimensional parking lot and other parking facilities are far from meeting the normal parking demand of the citizens, the roadside parking space is very limited, and the phenomenon of illegal parking is very common in commercial streets and downtown areas.

2.4 Bicycles Category

Bicycle type public transport facilities mainly refer to the facilities specially built to assist the safe travel of shared bicycles, public bicycles and electric vehicles. It mainly includes non motorway, public bicycle rental and parking station, bicycle parking place and other facilities. It belongs to slow traffic infrastructure. To some extent, this kind of traffic infrastructure is conducive to relieve traffic pressure, reduce traffic accidents and improve the urban traffic system. 60 of the 103 people in the survey have ridden shared bikes, public bikes or owned their own bikes. Table-5 shows their satisfaction with bicycle transportation infrastructure.

Table 5 Survey of Citizens' Satisfaction with Bicycle Transportation Infrastructure

Non motor vehicle lane			Rental parking		
Indes	Subtotal	Prportion	Indes	Subtotal	Proportion
5 points very satisfiec	9	15%	5 points very satisfiec	8	13.33%
4 points satisfaction	6	10%	4 points satisfaction	5	8.33%
3 points normal	21	35%	3 points normal	16	26.67%
2 points dissatisfied	13	21.67%	2 points dissatisfied	16	26.67%
1 point very dissatisfied	11	18.33%	1 point very dissatisfied	15	25%

With regard to non motorized lanes, the survey shows that 40% of the citizens are dissatisfied with and very dissatisfied with non motorized lanes. In addition, 35% of the citizens are average, and only 25% of the citizens are satisfied with non motorized lanes. At present, only a small part of the main roads in the center of Changchun City have set up non motorized lanes, and most of the roads in Changchun City have not planned bicycle lanes. Many bicycles travel in the motorway of the auxiliary road, which has a great potential safety hazard, to a large extent, affects the travel experience of private cars and bicycle drivers. Many citizens expect to add more non-motorized lanes.

Changchun's bicycle rental and parking sites are divided into two categories: one is the public bicycle rental station and car return point organized by the government, and the other is the shared bicycle and personal bicycle parking point. For bicycle rental and parking sites, 78.34% of the citizens expressed general, dissatisfied and very dissatisfied. The public bicycle is dominated by the government. Its management mode and operation mode are relatively traditional. There is a fixed rental parking place. After riding, the public bicycle must be placed in the parking pile of the designated place, and it must be used by swiping the card when riding, which is relatively

ISSN 2616-7433 Vol. 2, Issue 2: 71-76, DOI: 10.25236/FSST.2020.020217

cumbersome to store the value of the card. And shared bicycles can be ridden as long as the public can scan the code at any time with their mobile phones. Because there is no limit to the parking place, it can be parked near the entrance of the community. But this is also the management defect of shared bicycle, which brings inconvenience to urban management and greatly affects the city appearance.

2.5 Walking Class

In addition to all kinds of vehicles, pedestrians will also participate in public transport. Pedestrian public transport facilities mainly include pedestrian overpass and underpass. Of the 103 people who participated in the survey, 88 crossed the footbridge and 81 crossed the underpass. Table-6 shows their satisfaction with relevant transportation facilities.

Table 6 Survey on Satisfaction of Citizens with Pedestrian Transport Infrastructure

Footbridge			Underground passage		
Indes	Subtotal	Prportion	Indes	Subtotal	Proportion
5 points very satisfiec	18	20.45%	5 points very satisfiec	20	24.69%
4 points satisfaction	30	34.09%	4 points satisfaction	26	32.10%
3 points normal	32	36.36%	3 points normal	26	32.10%
2 points dissatisfied	7	7.95%	2 points dissatisfied	6	7.41%
1 point very dissatisfied	1	1.14%	1 point very dissatisfied	3	3.70%

The number of pedestrian overpasses in Changchun City has increased from seven in 2014 to twenty-three now, but a considerable part of them are not standard in accessibility facilities, lack of canopy, anti-skid pad, lighting equipment, etc. In the questionnaire, 90.9% of the respondents rated the infrastructure related to pedestrian overpass as general, satisfied and very satisfied. In the last open question, some people pointed out that in recent years, the number of pedestrian overpasses has been increasing, bringing great convenience, but it still needs to be built.

Compared with other provincial capitals, Changchun city lacks underpass in pedestrian intensive areas and main road intersections such as business district, school, hospital, etc. There are some problems in the underpasses of Changchun City, such as the entrance is not obvious, lack of road signs; the accessibility facilities such as elevators, blind ways and ramps are not perfect; the underpasses are also used as the underground commercial street, the interior is narrow and dark, and the lighting facilities are not perfect. However, in the questionnaire, the public's satisfaction with the infrastructure related to the underpass is still as high as 56.79%. Even most of the citizens come to the underpass to hang out. If the relevant administrative departments regulate the underground shops, the underground passage can play a dual role of driving the economy and relieving the traffic pressure.

3. Problems of Public Transport Facilities in Changchun

The main problems of public transport facilities are as follows. First, there is a great regional imbalance in the development of public transport infrastructure. However, the traffic infrastructure construction in some areas is still relatively insufficient. There are obvious differences in the level and level of public traffic infrastructure construction between the suburbs of Changchun City, and the short board of traffic infrastructure outside the Third Ring Road and the old urban area is obvious. Second, the construction of public transport infrastructure lacks financial support. There are many places where capital investment is needed for urban construction, and Changchun local government's financial capital pressure is too great, coupled with the government's lack of cooperation with social organizations and individuals, so it is inevitable that there will be insufficient capital supply, debt crisis expansion and unreasonable distribution. Public transport infrastructure belongs to public welfare construction, with a very low rate of return. Quite a number of projects have the situation of financing and debt construction. Third, there are management system problems in the field of transportation infrastructure. For example, the government level is still a decentralized multi management mode, with many management subjects, lack of cooperation and connection between management subjects, and each department shuffles each other. The laws and systems related to infrastructure management are not perfect, and there is no effective and scientific supervision and management mechanism. Fourth, the overall supply of urban rail transit is insufficient.

ISSN 2616-7433 Vol. 2, Issue 2: 71-76, DOI: 10.25236/FSST.2020.020217

The existing five rail transit systems are difficult to meet the travel needs of citizens, and residents have to rely on buses, private cars, taxis and other means of transportation to travel, resulting in the phenomenon of general traffic congestion. The rail transit under construction should also be stepped up. In addition, it is still necessary to build more subways to relieve the traffic pressure.

4. Countermeasures and Suggestions to Improve Citizens' Satisfaction with Public Transport Facilities

Based on the understanding of the status quo of public transport infrastructure in Changchun and the satisfaction survey of citizens, the author analyzes and studies the problems and causes of public transport infrastructure. In order to improve citizens' satisfaction with public transport infrastructure, the author gives the following countermeasures and suggestions. First, improve the level of informatization, intelligence and technicalization of public transport facilities, and enhance the adaptability and support for new forms of transport. Combine transportation infrastructure with communication technology and artificial intelligence. Relying on the Internet, artificial intelligence and other new scientific and technological undertakings, it is developing vigorously. Second, improve the management level of transportation infrastructure construction. Public transport infrastructure needs to develop rapidly. In addition to strengthening the government's attention and investing a lot of money, it is also a very important feasible measure to deepen the reform of household system, enhance the management ability and release the market vitality. Third, establish and improve the multi-dimensional infrastructure construction planning system, and strengthen the top-level design capacity. Optimize the management organization and clarify the responsibility of management theme. In terms of funds, it is necessary to raise construction funds through multiple channels, and strive to promote multiple entities to invest in transportation infrastructure construction. Fourth, strengthen the coordination and cooperation between the relevant government departments and the society, enterprises, the third sector and citizens. The cost of the construction, maintenance and management of public transport infrastructure mainly depends on the government's financial input, but at the same time, the government should actively encourage and guide social organizations, enterprises, the third sector and individuals to participate in the public transport infrastructure. At the same time, we should strengthen the sense of democracy and supervision of society and citizens, and form an efficient, honest and democratic supervision system. Fifth, improve the supply level of urban transport infrastructure, and promote the construction of urban static transport infrastructure and urban slow traffic infrastructure. The construction of urban slow traffic infrastructure, such as parking lot, non motor vehicle lane, sidewalk, underpass and overpass, not only responds to the call of the government to promote green, low-carbon and environmental protection, but also to a certain extent meets the needs of urban residents for healthy travel, and to a certain extent alleviates the traffic congestion.

Acknowledgement

In 2020, the scientific research planning project of Jilin Provincial Department of education “Research on the effect evaluation and path reconstruction of rural environmental governance in Jilin Province (Project No.: jjkh2020207sk)”; the doctor start project of Jilin Normal University of engineering and Technology (Project No.: bssk201902); the scientific research project of Jilin Normal University of engineering and Technology (Project No.: xyb201827).

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