# Analysis on The Decision-Making Characteristics of The Transportation Connection Modes Selection for Tourists in Railway Hubs During Short Holidays in The Post-Epidemic Era: Taking Chengdu East Railway Station as An Example

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**Abstract:** The tourism industry is gradually recovering in the post-epidemic era, but the impact of the epidemic on tourists' choice of connection modes in transportation hubs remains to be studied. Based on the field investigation during the "May Day" period of 2022 at the railway passenger transport hub of Chengdu East Railway Station, this paper analyzed the characteristics and influencing factors of the transportation connection modes selection for tourists, so as to support the improvement of railway hub transportation services for short-term tourists in the post-epidemic era. We first obtained data on 1,062 passengers through a questionnaire survey, of which 236 were for tourism purposes, and then used statistical software to analyze. According to the data of these 236 tourists (including 137 departing passengers and 99 arriving passengers) we found: First, tourists were mainly young and low-income people, generally within three people and carrying a small amount of luggage, whose destinations or starting points were mainly in the central urban area. Secondly, more than half of the tourists travelled by direct shuttle transportation, and more than 90% chose the simple travel chain scheme. Thirdly, nearly 70% of tourists chose public transportation as the backbone mode of transportation connection, and in the simple travel chain scheme, rail transit and conventional bus interchange are the core travel chain links. The results showed that the primacy factor of decision making is the operation speed of the connection mode, followed by the time reliability and price of the connection mode.

**Keywords:** Transportation connection; mode selection; decision-making characteristics; railway hub; post-epidemic; short holidays

## 1 INTRODUCTION

The new crown pneumonia epidemic has had a significant impact on China's tourism industry[1-3]. According to the data released by the Ministry of Culture and Tourism, the total number of

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domestic tourists in 2021 is 3.246 billion, a year-on-year increase of 12.8%; the domestic tourism revenue (total tourism consumption) is 2.92 trillion Yuan, a year-on-year increase of 31.0%[4]. It can be seen that with the normalization of epidemic prevention and control, the domestic tourism market has gradually recovered and exceeded the level before the epidemic. According to the statistics of the Ministry of Culture and Tourism, during the "May Day" holiday in 2022, 160 million domestic tourist trips will be made in the country, a year-on-year decrease of 30.2%, and it will recover to 66.8% of the same period before the epidemic on a comparable basis; the domestic tourism revenue was 64.68 billion Yuan, a year-on-year decrease of 42.9%, and recovered to 44.0% of the pre-epidemic period on a comparable basis[5].

In this process, the epidemic has already had a significant impact on the travel choices of urban residents[6-8], while the changing characteristics of tourists' travel choices in the post-epidemic era in the field of tourism transportation remain to be studied. Therefore, this paper took the tourists of the Chengdu East Railway Station during the "May Day" period in 2022 as the research object, investigated and analyzed the decision-making characteristics of the choice of transportation connection modes for tourists during short holidays in the railway hub in the post-epidemic era, in order to provide support to improve the railway tourism transportation connection service.

## 2 OVERVIEW OF CHENGDU EAST RAILWAY STATION

Chengdu East Railway Station Railway Passenger Transport Hub is located in the southeast of Chengdu. It is a major railway hub in China and one of the largest railway passenger stations in the central and western regions. It is designed to send 24,000 passengers during peak hours. According to the statistics of the railway department, during the "May Day" period in 2022, the passenger departure volume and passenger arrival volume of Chengdu East Station reached 595 thousand and 598 thousand respectively, and the average daily passenger departure volume and arrival volume would be 119,000 and 119,600 respectively.

There are two traffic connection squares on the plane of the railway hub of Chengdu East Railway Station, and the traffic transfer is carried out through the underground transfer hall connected with the railway exit. There are four floors vertically, from top to bottom are the waiting hall, railway platform, transfer hall and urban rail (Figure 1).


**Fig. 1** Cross-sectional view of the railway hub of Chengdu East Railway Station

Chengdu East Railway Station is a comprehensive transportation hub integrating railway, Chengdu Metro (urban rail), highway passenger transportation, public transportation and individual transportation. In terms of urban rail transit, Chengdu Metro Line 2 and Line 7 converge. In terms of highway passenger transportation, the East Hub Plaza is equipped with Chengdu Long-distance Bus East Station. In terms of conventional public transportation, there are 15 bus departure lines in the East and West Plaza. For individual transportation, there are social vehicle parking lots and 7 sets of taxi queuing facilities in the basement of the east and west squares.

# 3 THE CHARACTERISTICS OF TOURIST GROUPS

This paper conducts research based on the passenger transportation connection willingness survey conducted at Chengdu East Railway Station from May 1 to 3, 2022. The survey was conducted in the form of questionnaires in Chengdu East Railway Station, among which 555 passengers departing from the hub were surveyed in the waiting hall and 507 passengers arriving at the hub were surveyed in the transfer hall. A total of 1062 questionnaires were obtained, and 1035 valid questionnaires were obtained. From the sample population, there are 137 tourists in the waiting hall (referred to as "departing tourists") and 99 in the transfer hall (referred to as "arriving tourists"), with a total of 236 tourists, all of which are valid, accounting for the valid sample 22.8% of the total.

## 3.1 Natural attributes of tourists

(1) Gender

Among the tourists, 142 were male and 94 were female, accounting for 60% and 40% respectively. Among them, there were 78 males and 59 females among the departing tourists, accounting for 65% and 35% respectively; among the arriving tourists, 64 were males and 35 were females, accounting for 57% and 43% respectively. The male to female ratio of departing tourists is more balanced than that of arriving tourists.

(2) Age

Among tourists, 42% are under 22 years old, 33% are 23-35 years old, 19% are 36-50 years old, 6% are 51-65 years old, and 1% are over 65 years old. Among them, the proportion of arriving tourists in each age group was 34%, 38%, 21%, 5% and 1%, and the departing tourists were 47%, 29%, 17%, 6% and 1% respectively. It can be seen that the proportion of tourists under the age of 35 reaches 75%. In addition to the reason that young people are more likely to accept questionnaires, it can still indicate that young people are more inclined to travel.

(3) Income

Among all tourist income levels, 39% are below 3,000 Yuan, 34% are 3-6,000 Yuan, 16% are 6-9,000 Yuan, 4% are 9-12,000 Yuan, 4% are 12-15,000 Yuan, and 3% are more than 15,000 Yuan. Among them, the proportion of arriving tourists at each income level is 32%, 31%, 20%, 6%, 5% and 6% respectively, and the departing tourists are 43%, 36%, 12%, 3%, 3% and 3% respectively. It can be seen that the proportion of the income level below 6,000 Yuan has reached 73%. Therefore, we should pay full attention to the transportation connection needs of low-income tourists.

### 3.2 Tourist travel attributes

(1) Number of peers

The proportion of tourists traveling with 3 people reaches 76%, and the proportion of 3 to 5 people is about 14%, indicating that tourists have a high degree of freedom in choosing transportation modes, and various transportation modes need to fully consider the travel characteristics of tourists and need.

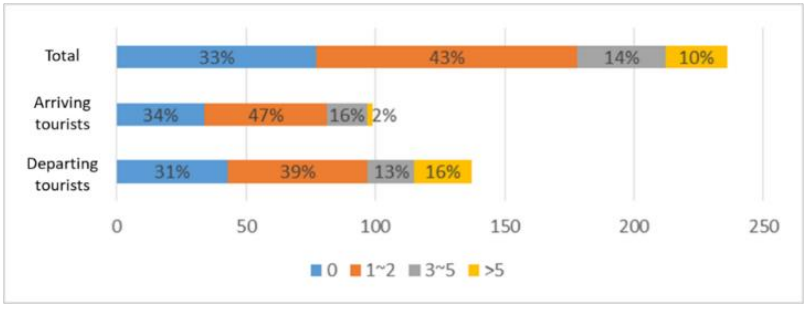



**Fig. 2** Level of Number of peers

(2) Passenger carry-on luggage

More than half of the tourists carry only one ordinary suitcase, and about 22% of the tourists carry a large suitcase or package and more luggage. Therefore, the transportation connection system should pay appropriate attention to the travel needs of tourists with large or multiple pieces of luggage.

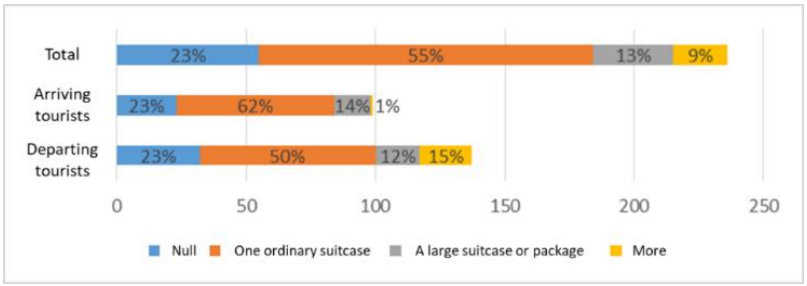



**Fig. 3** Level of Passenger carry-on luggage

(3) Travel origin and destination distribution

More than 60% of the final destination of arriving tourists and the starting point of departure of tourists are located in the central urban area, indicating that the key area for transportation connections is the central urban area. Therefore, the transfer with the transportation modes in the city will be the focus of the railway hub tourist transportation connection system.

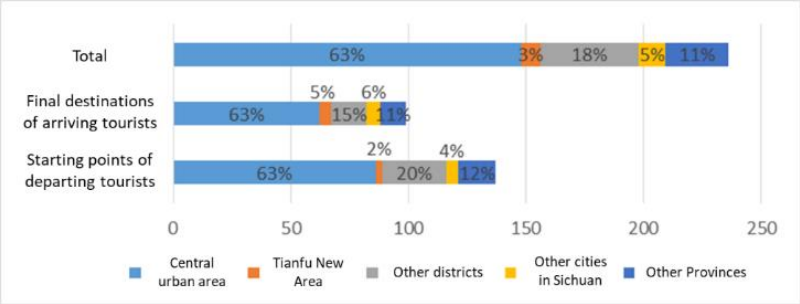



**Fig. 4** Travel origin and destination distribution

# 4 DECISION-MAKING ON THE CHOICE OF TRANSPORTATION CONNECTION MODES FOR TOURISTS

## 4.1 Feature analysis of connection modes selection

This survey divided the core traffic modes in transportation connections into seven categories: i) urban rail transit, ii) conventional bus, iii) taxi/online car-hailing, iv) private car/time-sharing car, v) shared bicycle/passenger tricycle, vi) intercity railway/ Long-distance passenger transport and vii) other means.

(1) Directivity feature

The directivity feature proportion distribution of connection modes selection was calculated based on the actual connection scheme of departing tourists arriving at the railway hub and the connection intention of arriving tourists leaving the railway hub. Among them, "directly" means that passengers can reach the destination by one single mode, "simple travel chain" means that passengers use two to three modes to connect and transfer to the destination, and "complex travel chain" means that passengers use four or more modes to complete the trip. It can be seen that: i) more than half of the tourists can reach Chengdu East Railway Station or their destinations by direct means; 2) more than 90% of the tourists can complete their trips by simple transfer.

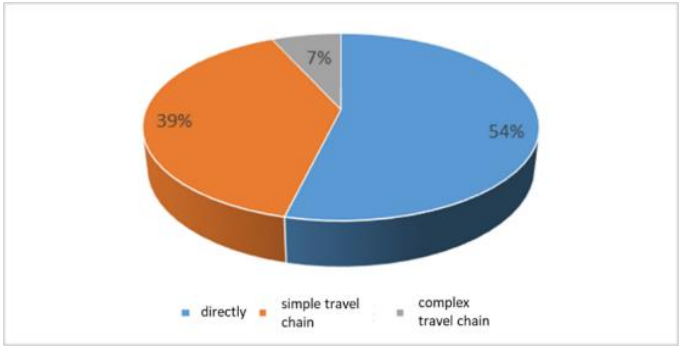



**Fig. 5** Directivity feature of transportation connection modes selection

(2) Backbone mode selection feature

In this paper, the main mode of transportation in tourists' connection scheme will be the backbone mode. According to statistics, the proportion of choosing public transportation as the backbone mode accounts for about 69% of the total, including about 80% of arriving tourists and 62% of departing tourists; the proportion of choosing individual transportation as the backbone mode accounts for about 26% of the total, including about 17% of arriving tourists and about 32% of departing tourists. That is, the proportion of arriving tourists who choose public transport connections is high, while the proportion of departing tourists who choose individual transportation connections is high.

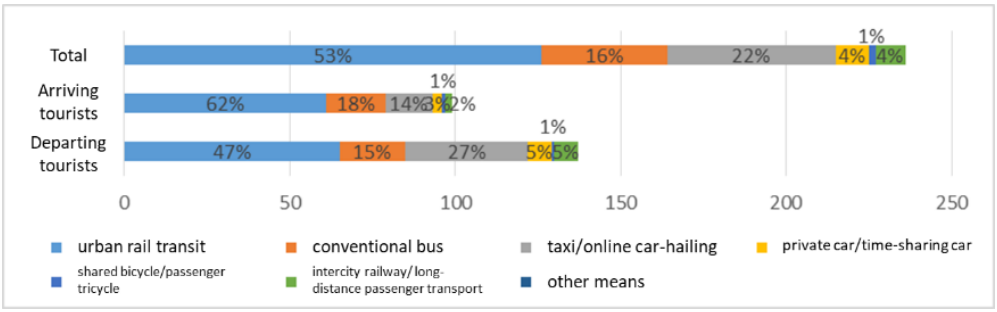



**Fig. 6** Backbone mode selection ratio

(3) Combination features of directivity and backbone mode selection

i) Departing tourists

The distribution statistics of the backbone modes in different types of connection schemes for departing tourists are shown in Table 1. With the increase in the number of transportation modes involved in the travel chain, the proportion of rail transit as the backbone mode continues to increase and becomes the only backbone mode in complex travel chain schemes. Regular bus and taxi/hailing are selected as the backbone modes in the direct and simple travel chain schemes, while other transport modes are selected as the backbone modes only in the direct scheme.

**Tab. 1** Distribution of backbone modes of different types of connection schemes for departing tourists

| Number of connection modes | urban rail transit | conventional bus | taxi/hailing | private car/time-sharing car | shared bicycle/passenger tricycle | intercity railway/long-distance transport | other means | Number of samples |
|---|---|---|---|---|---|---|---|---|
| 1 | 18 | 8 | 34 | 7 | 1 | 7 | 0 | 75 |
| 2 | 24 | 8 | 3 | 0 | 0 | 0 | 0 | 35 |
| 3 | 16 | 4 | 0 | 0 | 0 | 0 | 0 | 20 |
| 4 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 6 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Total | 65 | 20 | 37 | 7 | 1 | 7 | 0 | 137 |

In the direct plan, the individual motorized transportation mode has become the main direct connection method due to its flexibility, reaching 54% of the proportion; the public

transportation mode is limited by the station distribution conditions and can only provide direct services for tourists along the route, so its backbone mode selection ratio is only 35%.

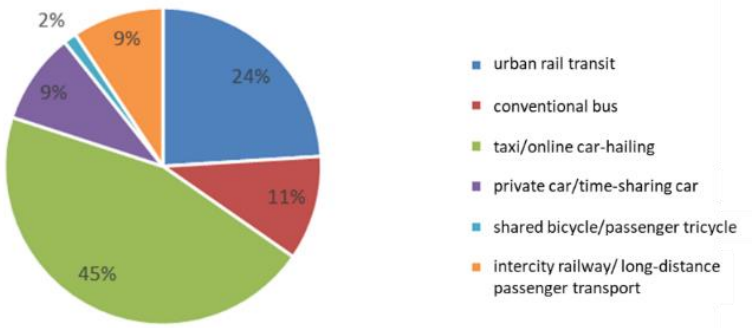



**Fig. 7** Distribution of backbone modes of departing tourists' direct scheme

In the two modes travel chain scheme, nearly 70% of tourists could enter the urban rail system through one connection, and then went directly to the Chengdu East Railway Station. Among them, 54% of tourists entered the urban rail system by conventional buses, and 29% by taxis/online car-hailing.

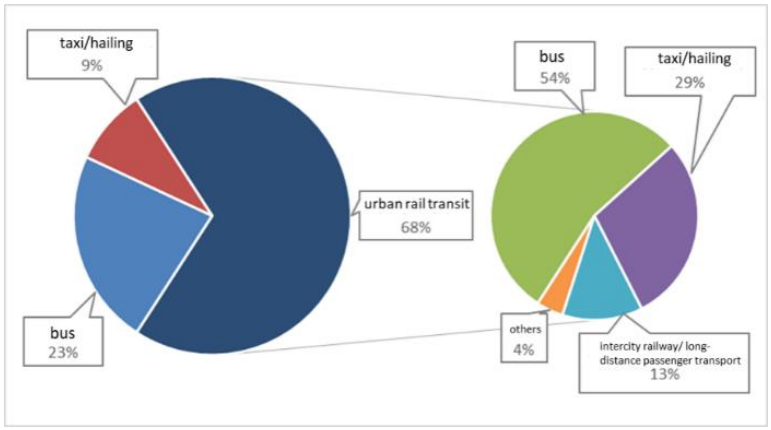



**Fig. 8** Distribution of backbone modes of departing tourists' 2 modes travel chain scheme

The distribution of backbone modes of departing tourists' other travel chain schemes is relatively simple and will not be repeated here.

ii) Arriving tourists

The distribution statistics of the backbone modes in different types of connection plans for arriving tourists are shown in Table 2. With the increase in the number of connecting transportation modes, the proportion of urban rail transit being selected as the backbone mode continues to increase and becomes the only backbone mode in complex travel chain schemes. Regular bus and taxi/hailing are selected as the backbone modes in the direct and simple travel

chain schemes, while other transport modes are selected as the backbone modes only in the direct scheme.

**Tab. 2** Distribution of backbone modes of different types of connection plans for arriving tourists

| Number of connection modes | urban rail transit | conventional bus | taxi/ hailing | private car/time-sharing car | shared bicycle/passenger tricycle | intercity railway/ long-distance transport | other means | Number of samples |
|---|---|---|---|---|---|---|---|---|
| 1 | 24 | 10 | 12 | 3 | 1 | 2 | 0 | 52 |
| 2 | 17 | 6 | 1 | 0 | 0 | 0 | 0 | 24 |
| 3 | 11 | 2 | 1 | 0 | 0 | 0 | 0 | 14 |
| 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 5 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| Total | 61 | 18 | 14 | 3 | 1 | 2 | 0 | 99 |

In the direct plan, the situation of arriving tourists is significantly different from the departing tourists. The proportion of arriving tourists who chose public transportation as the backbone method is as high as 65%, while the proportion of individual transportation is only 29%.

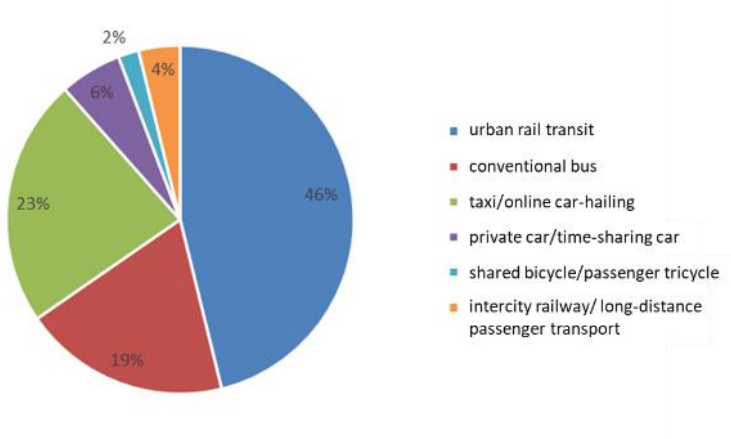



**Fig. 9** Distribution of backbone modes of arriving tourists' direct scheme

In the two modes travel chain plans, 71% of tourists could reach their destinations through the urban rail system and after a transfer, among which 82% of tourists by taxi/online car-hailing, 82% of them by conventional public transport. 12%, and others by private cars/time-share rental cars.

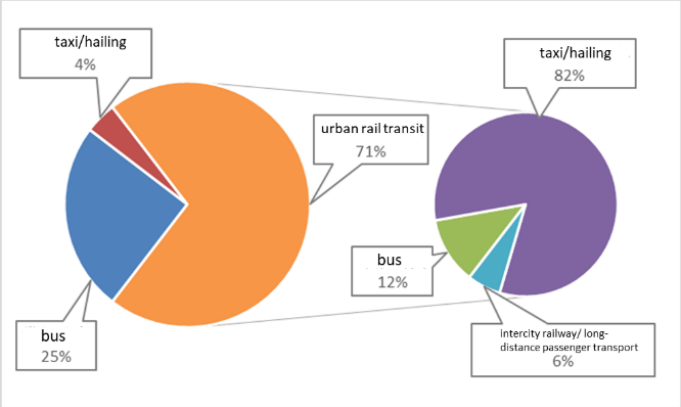


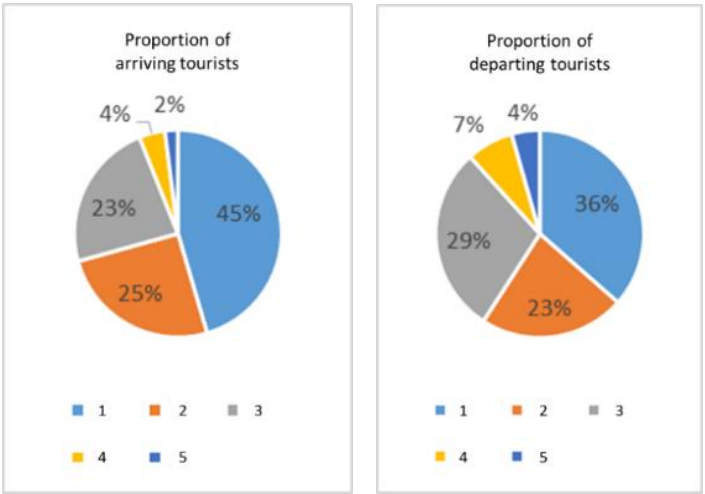

**Fig. 10** Distribution of backbone modes of departing tourists' 2 modes travel chain scheme

### 4.2 Analysis of decision-making influencing factors

This survey provided tourists with the following six factors that influenced the choice of connection modes: i) price, ii) time reliability, iii) running speed, iv) walking distance within the station, v) number of transfers and vi) other reasons.

(1) Quantitative analysis of influencing factors

According to statistics, the proportion of arriving passengers who only consider one factor when choosing a connection method is 45%, and the proportion that considers no more than two factors is 70%; while the proportion of departing passengers who only consider one factor is 36%, and the proportion that considers no more than two factors is 59%. It can be seen that the arriving passengers consider less influencing factors when choosing the connection method, that is, it is easier to complete the decision.



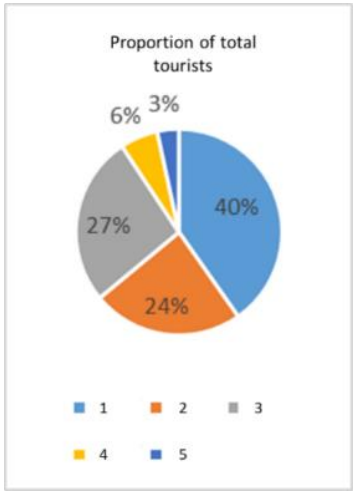



**Fig. 11** Quantity distribution of factors to be considered in connection method selection

(2) Factor importance

This article refers to the most important factor in tourists' decision-making as the primacy factor. From the overall analysis of the sample, it can be seen that the primacy factor in tourists' decision-making is the operation speed of the connection mode. Specifically, the primacy factor in the decision-making of arriving tourists is the operation speed, and the primacy factor in the decision-making of departing tourists is time reliability. Therefore, it can be inferred that the departing tourists pay more attention to the time reliability of the connecting mode to ensure that they will not miss the departure train, while the arriving tourists are eager to reach the destination and pay more attention to the speed of the connecting mode.

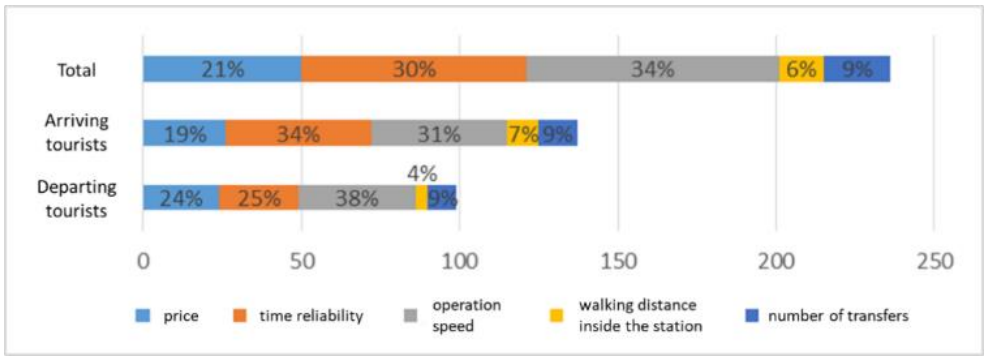



**Fig. 12** Distribution of primacy factor

## 5 CONCLUSION AND DISCUSSION

Based on the survey on the transportation connection modes selection for tourists during the "May 1st" short-term holiday in 2022 at the railway hub of Chengdu East Railway Station, this

paper analyzed the characteristics and influencing factors of the choice of transportation connection modes for short-term tourists in the post-epidemic era. The main conclusions include:

i) The tourists received by the Chengdu East Railway Station hub were mainly young and low-income people, generally within three people and carrying a small amount of luggage. The destination of arriving tourists and the starting point of departing tourists were mainly in the central urban area of Chengdu;

ii) More than half of the tourists travelled by direct shuttle transportation, and more than 90% chose the simple travel chain scheme;

iii) Nearly 70% of tourists chose public transportation as the backbone mode of transportation connection, and in the simple travel chain scheme, rail transit and conventional bus interchange are the core travel chain links;

iv) When tourists were making the transportation connection modes selection decision, the primacy factor is the operation speed of the connection mode, followed by the time reliability and price of the connection mode.

We suggest that in order to improve the service experience of tourists in the post-epidemic era, the railway passenger transport hub represented by Chengdu East Railway Station should fully consider the construction of a tourist transportation connection service system centered on rail transit, and collaborate to build a one-stop tourism transportation connection service platform, which should be able to fully consider the characteristics and needs of tourist groups.

In the transfer space of the hub, priority should be given to the provision of facilities and equipment for the transportation connection mode with fast operation speed and strong time reliability, instead of excessively pursuing the goal of balancing the transfer distance of various modes of transportation and reducing the number of passenger transfers.

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