Railway Passenger Service Mode on "Internet+"

Tao Chen[1,2,3], Zhen-ning Zhou[4], Jie-ru Zhang[1,2,3], and Shao-quan Ni[1,2,3(✉)]

[1] School of Transportation and Logistics, Southwest Jiaotong University, Chengdu 610031, Sichuan, China
nishaoquan@126.com
[2] National Railway Train Diagram Research and Training Center, Southwest Jiaotong University, Chengdu 610031, Sichuan, China
[3] National United Engineering Laboratory of Integrated and Intelligent Transportation, Chengdu 610031, Sichuan, China
[4] Yue-hai Railway Limited Liability Company, Hankou 570125, Hainan, China

Abstract. The development of "Internet+" railway passenger service mode has important significance under the new situation of economic development. At first, this paper uses the service chain theory to analyze railway passenger service demand, content and elements comprehensively. Then, the existing railway passenger service mode of the content, characteristics and existing problems are discussed. At last, for realizing the goals for providing a full range of passengers services, extension services, advanced services, an new railway passenger service mode based on "Internet+" is proposed, and railway passenger service information platform technology architecture is put forward based on cloud computing. Thus, a reference for the railway passenger service to achieve "Internet+" can be proposed.

Keywords: "Internet+" · Railway passenger service · Mode · Service chain · Cloud computing

1 Introduction

The "Internet+" was first proposed by contemporary ecological thinker Mr. Zhang Ronghuan in 2007. It refers to the application of Internet thinking and Internet technology to various traditional industries. And we should give full play to the optimization and integration of the Internet in the allocation of traditional industry resources, improve the innovation and productivity of traditional industries based on

the Internet platform. Since 2015, the "Internet+" action plan has been promoted to the national strategic height, and all industries have become increasingly pay attention to internet [1].

Under this circumstance, the "Internet+" also has gradually been applied on railway passenger service, and the building of 12306 domestic passenger service website is more outstanding. This website has improved the convenience and satisfaction of the passenger ticket purchase, and obtained better benefits. But in general, the Internet of passenger service is still not high. In terms of passenger product development, promotion of passenger service mode, improvement of passenger service quality, passenger service business development and other aspects, there is still a large gap between passengers' expectations. A complete Internet passenger service system has not yet been established. And the development of railway passenger service based on "Internet+" has been proved to be the innovation and upgrading of traditional passenger service mode. At the same time, as the internal demand to improve its own competitiveness, its development model needs to be further studied.

This paper focuses on the goal of the Internet of passenger travel service. Firstly, the service chain theory is used to study the content, scope and mechanism of passenger service. Then, this paper combines the "Internet+" technology with the railway passenger service chain, and puts forward the system, content and mode of "Internet+" railway passenger service mode, to promote the railway passenger service implementation "Internet+" for reference.

2   Railway Passenger Service Chain Model

Traditional passenger travel chain demand analysis, customer relationship analysis and other methods mainly focus on customer demand as the center to promote and optimize the product structure and production mode of passenger service enterprises. Because of the focus on the passenger service enterprise itself, it is not conducive to the expansion of the service depth and breadth of passenger service.

The service chain aims to maximize the overall and optimal service of the passengers, and organize various agencies or elements related to the service to form a complete network chain structure [2]. The service chain is essentially the complete service of all service organizations participating in the travel of passengers. Due to the focus on other service organizations and elements including core passenger service enterprises, therefore, it is easier to explore and develop active services, full-service services, extension services and advance services on the basis of integrating all service resources, and more suitable to play the characteristics of "Internet+".

Analyze the relationship between passenger demand, passenger service and service elements by constructing a service chain model, the model construction method proposed by Ref. [3] was established, and the railway passenger service chain was constructed as shown in Fig. 1. Railway passenger service can be divided into pre-service, interim service and post-service. Pre-service refers to the services that passengers need before the bus, including information consultation, policy consultation, travel planning, booking tickets, insurance and other services. The interim service refers to the services that passengers need during their trip, including short haul, station service, train

service, business services, etc. Post-service refers to the service required by the passenger after the end of the ride, including the service evaluation, service remediation, etc. The railway enterprise is the core service provider in this service chain, including government supervision departments, public transport departments, intermediary agents, insurance companies, bank credit, business services enterprises and other service agencies. These service agencies cooperate with each other to provide complete travel services for passengers.
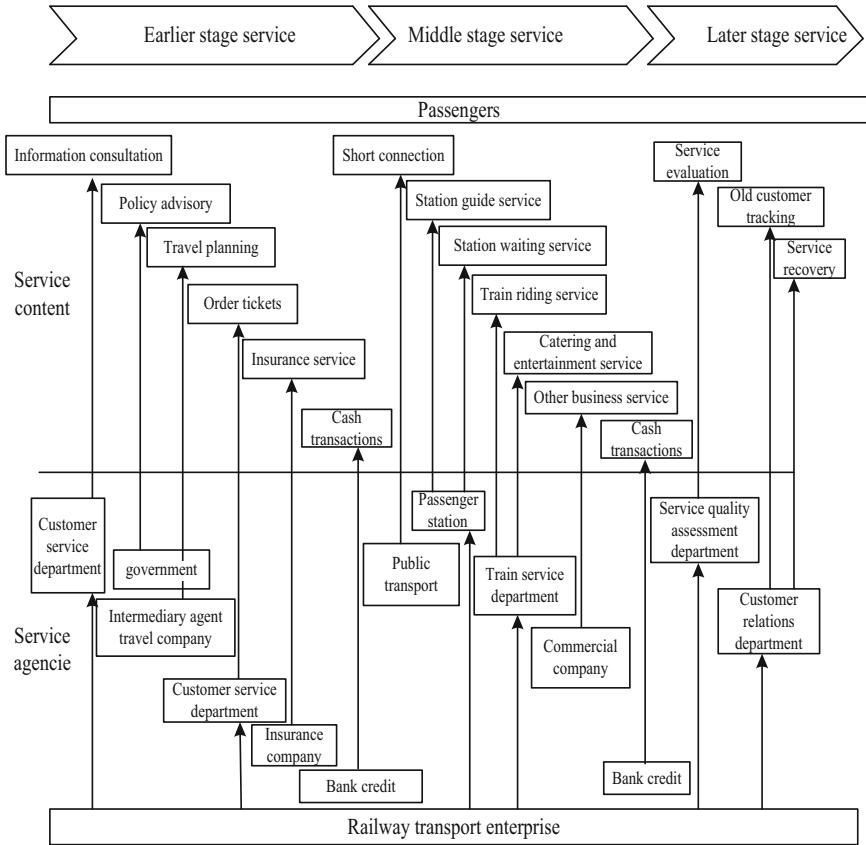
Fig. 1. Rrailway passenger service chain model

3   "Internet+" Railway Passenger Service Mode

3.1   Current Railway Passenger Service Model Analysis

The current railway passenger service model has the following problems: (1) The railway passenger service scope is still limited to the traditional services such as the order ticket service, station service and train service, and other extension services. (2) Despite the introduction of 12306 online booking system, the railway passenger

service mode is mainly based on human services and equipment guidance. The degree of automation and autonomation of passenger service need to be further improved. (3) There is a lack of personalized service for travelers. (4) The business model of the free business model mainly lacks the overall planning and connection. The traditional passenger railway passenger service model is shown in Fig. 2.

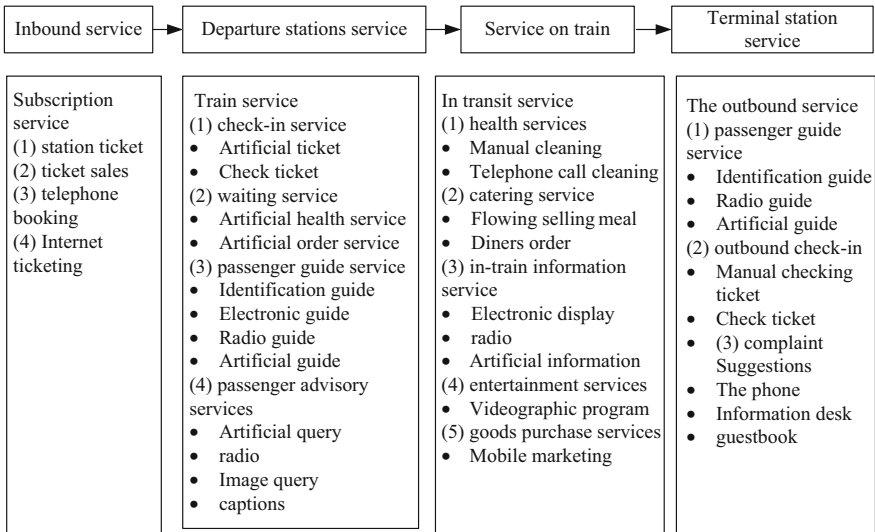| Inbound service	Departure stations service	Service on train	Terminal station service
Subscription service (1) station ticket (2) ticket sales (3) telephone booking (4) Internet ticketing	Train service (1) check-in service • Artificial ticket • Check ticket (2) waiting service • Artificial health service • Artificial order service (3) passenger guide service • Identification guide • Electronic guide • Radio guide • Artificial guide (4) passenger advisory services • Artificial query • radio • Image query • captions	In transit service (1) health services • Manual cleaning • Telephone call cleaning (2) catering service • Flowing selling meal • Diners order (3) in-train information service • Electronic display • radio • Artificial information (4) entertainment services • Videographic program (5) goods purchase services • Mobile marketing	The outbound service (1) passenger guide service • Identification guide • Radio guide • Artificial guide (2) outbound check-in • Manual checking ticket • Check ticket • (3) complaint Suggestions • The phone • Information desk • guestbook

Fig. 2. Current railway passenger service mode

3.2 "Internet+" Railway Passenger Service Model Characteristics

The railway passenger service chain model shows the full demand of the passenger, and also shows the network connection between the service providers. "Internet" technology and platform can support and realize the construction of railway passenger service chain. The railway passenger service model under "Internet+" shall include the following characteristics:

(1) Cross-border integration. The "Internet+" can remodel the different areas and industries in the railway passenger service chain, and the cross-border integration will make the railway passenger service base more solid. Integration can also refer to the integration of identity, the passenger even turn into the designer of the service.

(2) Reshape the structure. Information revolution, economic globalization, Internet and other technologies are constantly improving the original industrial structure. As a new kind of innovative thinking and technology, "Internet+" will also reshape the traditional railway passenger service structure.

(3) Respect human nature. The starting point of the "Internet+" model should be respect for human nature. Only in this way, Internet technology can truly promote the innovation and progress of railway passenger service. The "Internet+" railway

passenger service model can utilize cloud computing and big data mining to find and meet the personalized needs of passengers.

(4) Connect everything. The "Internet+" model makes it easier to connect people, people and things, greatly reducing the cost of communication. The "Internet+" railway passenger service model should also make full use of Internet platforms and Internet of things technology to enhance the connectivity of passengers and services.

3.3   Design of "Internet+" Railway Passenger Service Model

Relying on the Internet platform, cloud computing, big data mining, Internet of things technology, etc., aiming at the shortcomings of the traditional model of railway passenger service, based on the passenger service chain, design "Internet+" railway passenger service mode.

(1) Pre-trip service

① Create customized products for passenger traffic service and passenger service Using passenger service platform and large data analysis technology, analyze different travelers' favorite tourism products, customize personalized railway tourism products for tourists, and make travel plans for every passenger. Travelers can choose their favorite travel plans based on their own preferences. The following activities are jointly arranged by railway companies and tour companies, hotels, and short-haul operators, including hotel accommodation, scenic spot tickets, round-trip tickets and so on. Carry out the railway online tourism business and make full use of the internal resources of the railway, including railway passenger transport products, railway hotel resources and tourism resources. At the same time, it combines external resources to create special railway travel products and expand passenger service content.

② Introduce a variety of purchase scheme base on market
According to market demand and passenger demand data, a variety of passenger ticket forms such as annual ticket, monthly ticket, special discount ticket and membership ticket are introduced at any time to enhance the attraction of railway travel. In order to facilitate the journey of the passengers, carry out the joint tickets with public transport, and travel companies. Enhance the passenger ticket service level through online selection of seats.

③ Provide customized passenger service according to passenger demand
Booking catering online means that passengers can book their meals online while booking tickets online. Travelers can also choose not to order catering services, and only choose to order online during the trip. Besides, hotel booking service, entry and exit taxi rental can be booked online. According to the passengers' demand, special passengers like minors, old people, sick passengers and so on will be escorted. Passengers can compare online and buy insurance at any time.

(2) Station and train service in passenger travel

① Using Internet of things technology to build smart station [4]
Make full use of Internet technology to build digital smart station. Use perception, navigation, positioning and other wireless Internet technologies to upgrade the station's facilities and improve the quality of passenger service. When the passengers arrived at the station, simple layout of the station should be pushed to passengers' mobile phone. This will allow passengers to easily understand the location of the waiting room, the entrance passage, the ticket office, the shopping area, the toilet, etc. It is easy to find the location of the ticket office or waiting room through the navigation of the mobile phone, and convenient for passengers. Advertise station client inside, outside the station and on the train. Or post WeChat qr codes in bold locations, and scan the qr code to download the client. By paying attention to these things, travelers can use their mobile phones to quickly query the information of the car and the delay time of the trip.

② Use a smart ticket to assist travelers throughout the journey
The intelligent identification chip is installed in the passenger ticket, and each passenger ticket will temporarily store the information of the passengers' ride. The read-write recognition device can be placed in the various areas of the station and train, passengers can easily enter the station by placing the ticket on the sensor area for identification. Passengers will receive all kinds of prompt guidance information, train information and problem solving at the same time. Tickets will automatically show the seats or seats reserved for passengers when they get on the train. The client will send the station name and the delay time according to the train ride to passengers, and then push the destination information accordingly. When the passengers get to their destination, the tickets will send a notice of impending arrival to give travelers a rough idea of where they will arrive. When the passengers arrive, collect the tickets and empty the passengers' data.

③ o2o business services
The railway can develop the convenience store function of the APP, which can be operated on the Internet or on the mobile phone client according to the need, and browse or order the goods on the station or train. After that, the service personnel will directly send the items to the passengers, and the passengers can choose to pay for the goods online or on delivery. The business around the station can also integrated into the railway online shopping mall. Passengers can order online, consume or take within the station.

(3) Passenger later period service

① Push the customer service evaluation list through mobile phone client to set up rewards or gifts. Regularly visit regular customers and give gifts. According to the customers' return visit data, the passenger products are analyzed and evaluated, and provide data support for train operation plan and passenger service products.
② Set up 24 h of online consultation service and accept service dispute. Push service disputes to customer service department leaders, and quickly develop service recovery plan for passengers. Supervise the progress of service disputes.

③ Regularly push changing travel schedule, ticket price information, service information, travel recommendation information, etc.

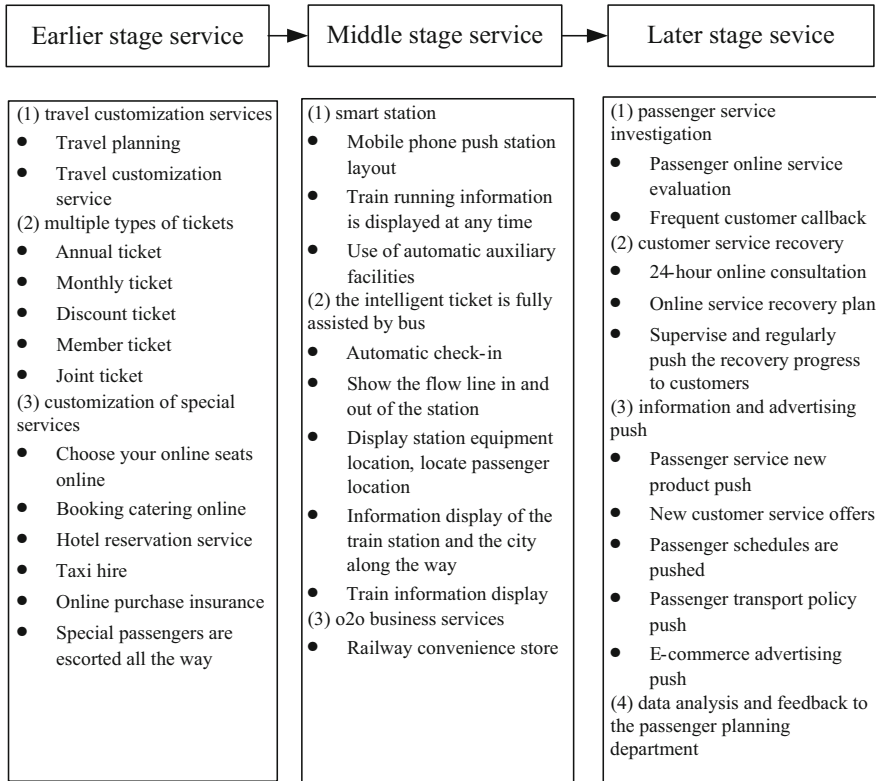The "Internet+" railway passenger service model is shown in Fig. 3.

Earlier stage service	Middle stage service	Later stage sevice

| (1) travel customization services
• Travel planning
• Travel customization service
(2) multiple types of tickets
• Annual ticket
• Monthly ticket
• Discount ticket
• Member ticket
• Joint ticket
(3) customization of special services
• Choose your online seats online
• Booking catering online
• Hotel reservation service
• Taxi hire
• Online purchase insurance
• Special passengers are escorted all the way | (1) smart station
• Mobile phone push station layout
• Train running information is displayed at any time
• Use of automatic auxiliary facilities
(2) the intelligent ticket is fully assisted by bus
• Automatic check-in
• Show the flow line in and out of the station
• Display station equipment location, locate passenger location
• Information display of the train station and the city along the way
• Train information display
(3) o2o business services
• Railway convenience store | (1) passenger service investigation
• Passenger online service evaluation
• Frequent customer callback
(2) customer service recovery
• 24-hour online consultation
• Online service recovery plan
• Supervise and regularly push the recovery progress to customers
(3) information and advertising push
• Passenger service new product push
• New customer service offers
• Passenger schedules are pushed
• Passenger transport policy push
• E-commerce advertising push
(4) data analysis and feedback to the passenger planning department |

Fig. 3. "Internet+" railway passenger service mode

3.4 The Overall Technical Framework of the "Internet+" Railway Passenger Service

The cloud computes a huge computing processor over the network and hands it over to multiple servers and returns the results back to the user. It can calculate the large amount of data that the user sends out in a short time, the computation speed and the stability have very good performance. In addition, the SOA architecture system in cloud computing can easily combine loosely coupled services to provide better and faster responses. The number of railway service passengers is large, and the number of data that demands response at the same time is large, besides, the service chain involves many enterprises and institutions. Therefore, it is fast and convenient to use cloud computing to frame railway passenger service information platform.

According to the "Internet+" railway passenger service model, a railway passenger service information platform based on public cloud is established as the core system of various business joint operation. And develop various passenger service application systems (order tickets, travel plans, quality feedback, etc.) on this information platform. Railway passenger service information platform provide a unified public business interface for big business, supply chain (such as tourism, hotels, catering companies, etc.) The third party business system of the bank government agency to cost savings by renting railway passenger service platform application system. The other information systems in the railway connect to the railway service information platform through the interface and exchange data with the information platform. The overall technical architecture of the cloud-based railway passenger service platform is shown in Fig. 4.
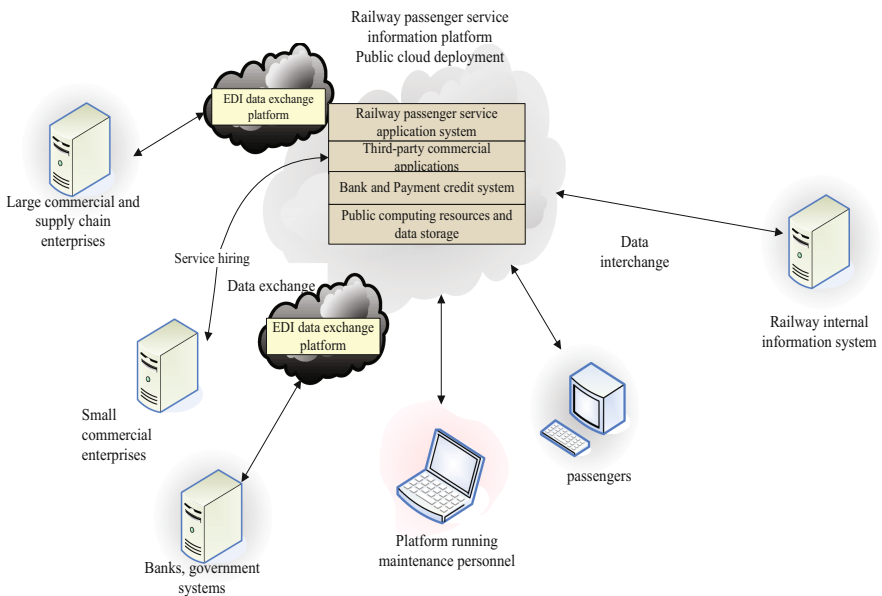

Fig. 4. The overall technical framework of the cloud-based rail passenger service platform

4   Conclusion

The development of "Internet+" railway passenger service model is of great significance for the railway to adapt to the economic development under the new situation. This paper analyzes the demand, content and constituting elements of railway passenger service by using the theory of service chain, and discusses the characteristics and shortcomings of the existing railway passenger service model. In order to provide passenger service, extension service and advance service, this paper proposes a new model of railway passenger service based on Internet technology and the realization of technical architecture. It provides reference for the realization of "Internet+" of railway passenger service.

References

1. The State Council: National Issue (2015) 40, Guidance notes on actively promoting "Internet+" action. The State Council, Beijing (2015)
2. Liu, Q., Yin, H.: Construction and implementation of service chain model. Technol. Prog. Countermeasures **03**, 23–26 (2011)
3. Hu, Z., Ning, X.: Concept, model and application of service chain. Bus. Res. **07**, 111–114 (2003)
4. Shan, X., Wang, F., Li, F., Li, P.: The research and design of railway "Internet+" passenger service. Railway Comput. Appl. **11**, 5–8 (2015)