



Architecture Design of Public Transportation Travel Information Service Platform in Hub Area

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Abstract. In the context of the information age, it is of great significance to consider the change of traveler's acquiring information habits and methods, and provide various traffic information for public transportation travelers in the hub area by using travel information service platform, and then realize the rapid distribution of passengers in the hub area, which is crucial for improving the operational efficiency of the whole road network. Based on the analysis of the traffic data in the hub area and the information needs of different types of platform users at each travel stage, the functional modules of the public transportation travel information service platform in the hub area are selected, some databases of the platform are designed and the main processes of the platform are visualized. By establishing the model of public transportation travel information service platform in the hub area, Chongqingdong Railway Station is applied as an example to realize the platform function module interface and display the operation effect of the platform. The proposed plan for the public transportation travel information service platform in the hub area has had a positive effect on the smart travel of platform users.

Keywords: Integrated Transportation; Smart Mobility; Mobility as a Service; Travel Information Needs

1 Introduction

With the rapid development of social economy, people travel more and more frequently, travelling traffic is growing rapidly. Economic development and the construction of travel information service platforms in hub regions are interdependent and mutually reinforcing. On the one hand, economic development has led to frequent inter-city business and tourism activities, and the scale of people's mobility has increased, which puts forward efficient requirements for the hub travel service and promotes the construction of travel information service platform. On the other hand, Hub economy, as a new economic form derived from hub areas, has become a key pillar for the high-quality development of regional economies and is actively promoting the construction of a unified national technology market [1]. In information age, people have put forward higher requirements for the individuation and intelligence of the travel process, and the habits of people's access to information are also changing.

Therefore, the construction of the travel information service platform is of great significance in providing more convenient and real-time services for people's travel.

The US initiated research on the electronic path guidance system in the late 1960s and started building the "511 Traffic Information System" in 2000. This system offers traffic and travel information via websites and 511 telephone service desks, covering 90% of the population in most US regions.[2]. Deutsche Bahn AG is committed to providing "door-to-door" travel services. In the "railway +" public transport services, it realizes the connection between railway and other public transport modes by developing various through-trip and intermodal transport products [3].

Dong, Z. et al. utilize the latent class SEM to analyze the impact mechanism of Smart Travel Service attributes on intercity travel satisfaction and the influence of group heterogeneity and the research propose measures to improve service quality and satisfaction[4].Cruz, C. O. et al. studied the impact of "mobility as a Service" (MaaS) platform on the sustainability of transportation system, analyzes the trend of urban transportation, the concept definition and solutions of MaaS, and provides theoretical and practical reference for understanding and promoting the development of MaaS [5]. Zhu, L. et al. addressed the application, challenges and future development direction of big data in the field of transportation, the travel information service platform with the help of big data analytics can better process and analyse the massive travel data, so as to provide users with more accurate and personalized travel information services [6]. Wang, W. et al. studied the overall design and key technologies of the railway digital service platform. By analyzing the industry trends and the current status of railway infrastructure platforms, it clarifies the platform's positioning, architecture, functions, and interactive collaboration relationships, and proposes key technologies to ensure the secure transmission of information, aiming to promote the digital construction of the railway [7].

In addition the means of information perception are more comprehensive and diverse, the degree of information sharing construction is increasing, and technologies such as big data, Internet of Things, and face recognition are gradually applied in travel information services [8-9].

2 Demand Analysis of Travel Information Service Platform in Hub Area

In order to meet the needs of passengers, research is conducted on the main travel scenarios of passengers' travel, and then personalised travel services and diversified value-added services are provided to each passenger for the different characteristics of the whole travel chain.

The public transportation travel information service platform in the hub area covers the following main scenarios: before travelling, entering the station, during the ride, leaving the station and after travelling [10]. The requirements of the platform are shown in Figure 1. The service types of the platform can be divided into three categories, basic information service for travel, real-time traffic information service and convenient information service. Basic information service refers to the service content

that must be provided to all types of passengers, which is the basis of the passenger intelligent travel information service, and the information provided is mostly basic static information. In addition, passengers also have a demand for real-time travelling mode operation information (such as vehicle running position, arrival time and other information) in the process of travelling. Convenient information for the convenience of the public refers to non-traffic-related information including weather information and scenic spot recommendation information that facilitates passengers' travelling.

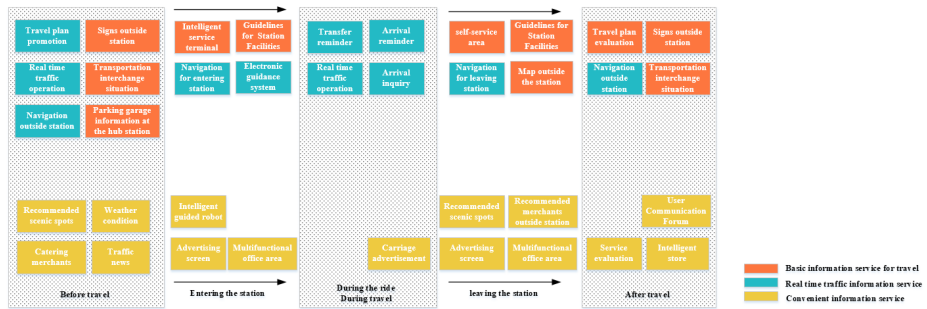


Fig. 1. Analysis of travelers destined for hub areas at different stages

3 Architecture of Travel Information Service Platform in Hub Area

3.1 Overall Architecture Design

Architecture Design of Public Transportation Travel Information Service Platform is shown in Figure 2, which is composed of 5 parts: Data Collection layer, Communication Network Layer, Data Resource Layer, Information Application Layer. The data layer serves as the support of the system, transmitting data through the Transmission Network Layer to the Data Resource Layer for storage. And the Information Application Layer is established on the Data Resource Layer to carry out realistic application of the data in the Data Layer. The results of the application layer will be displayed in the output layer, which includes online APP, website, VMS, broadcasting, intelligent terminals and so on.

Data Collection Layer. Data Collection Layer contains all kinds of passenger data and road network status data collected through road site sensor, GPS, smart card, etc. It is the foundation of the travel information service platform and supports the generation of service information.

Communication Network Layer. The Communication Network Layer is the means of information transmission at all levels, guaranteeing the efficient and stable transmission of data. It is the link connecting each layer, ensuring the smooth transmission of information between different devices and systems.

Data Resource Layer. This layer is mainly responsible for storing and managing the various data required by the system. It includes basic database, business database

and theme database. It provides data support for the operation of the system, organizes and manages data.

Information application layer. The information application layer is the layer directly facing the users, presenting the functions of the system, such as travel planning service, traffic information service, hub area road information service, etc.

Information service layer. The information service layer serves as the interface between the system and the users, providing information to the users through various channels. It includes ways to communicate with users, such as media platforms (TV broadcasting), infrastructure (variable message signs) and the Internet (mobile APP, traffic information websites) to disseminate traffic information.

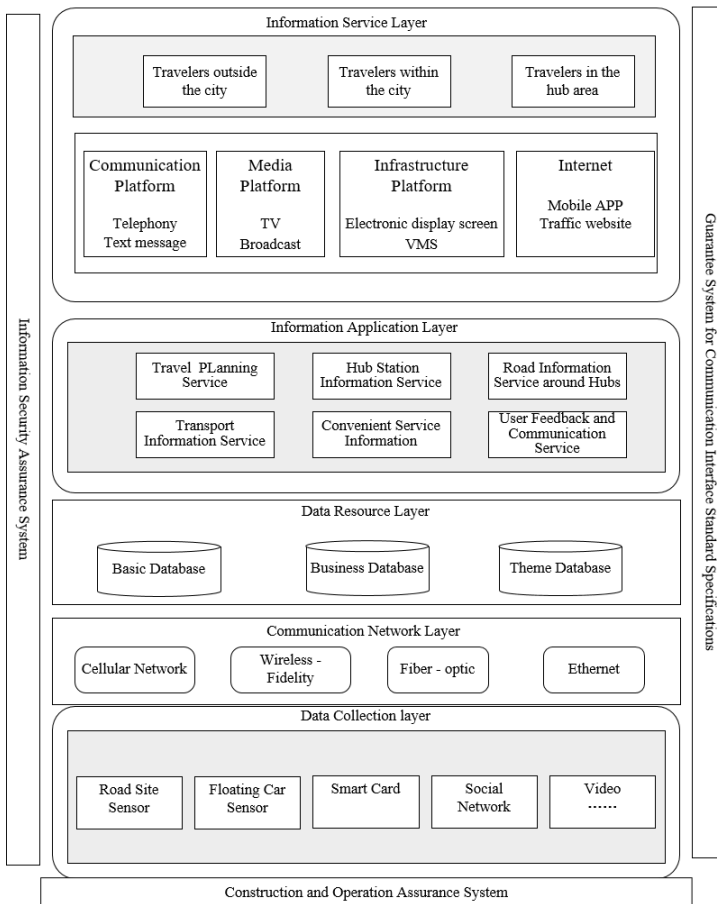


Fig. 2. Overall framework of travel information service platform

3.2 Use Case Diagram and Main Business Process Diagram Design

The use case diagram of platform is used to describe the functionality that the system should have, and it is used to list the use cases and participants in the system and to

visualise the involvement of the participants in the execution of the use cases. Where a use case is a unit of functionality in the system that can be described as a single interaction between a participant of the system and the system. The use case diagram designed in this article is shown in Figure 3 below.

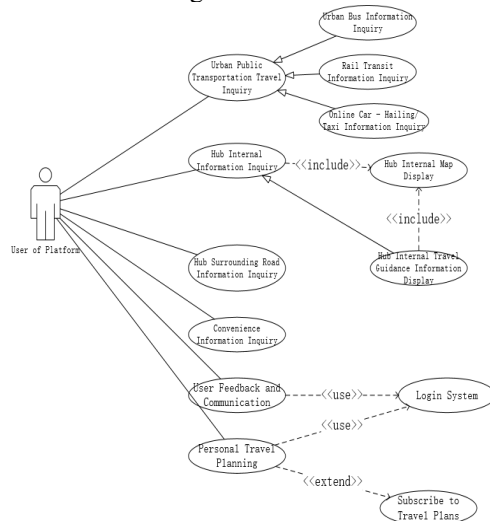


Fig. 3. Use case diagram of platform users

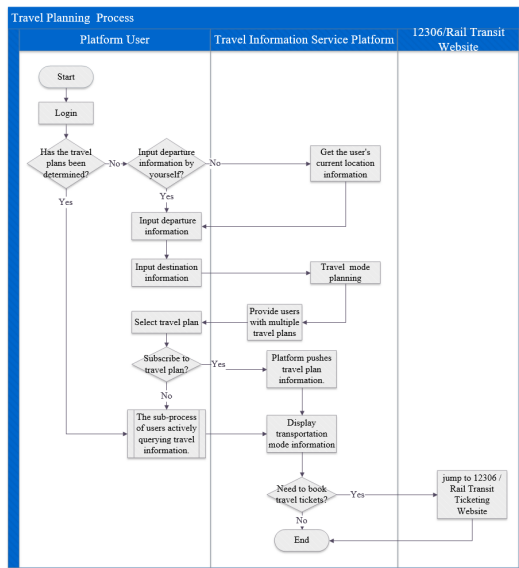


Fig. 4. Flow chart of travel planning service

This paper studies and analyses the main business processes of the public transportation travel information service platform in the hub area, and here the business processes of the travel planning service are demonstrated as shown in the figure 4.

The business flow chart depicts the entire process of travel planning on the platform. After the user logs in, it then determines whether the user has determined the travel mode. If it has been determined, input the departure information autonomously. And if it has not been determined, it inputs departure information. Then users input destination information. Afterwards, the user may choose to subscribe to the travel plan, if subscribed, the platform will push the plan information, if not subscribed, the user will independently query the travel mode information. After displaying the relevant information about the travel mode, the platform determines whether it is necessary to book a travel ticket, and if so, it jumps to 12306 and other booking websites to book a ticket, and finally ends the process. During the whole process, the platform also obtains the user's location information and carries out travel mode planning, providing the user with feedback on the optimal plan.

4 Case Design

In order to further illustrate the practical application effect of the public transportation travel information service platform, after analysing the geographic location of Chongqingdong Railway Station, the planned access routes, the planned passenger volume and the internal construction, the interface of public transportation travel information service platform is designed by using the software Axure, and the various sectors of the situation are shown in the following figure 5:



Fig. 5. Interface of the Travel Information Service Platform

1) The home page of the service platform is mainly divided into 5 parts. In the top navigation menu bar, it mainly includes two functional modules. The left navigation menu bar displays the four functional modules that are in high demand by the platform users, which makes it easy for the platform users to get the corresponding demand information quickly. On the left side, Baidu Maps open platform is used to display the geographic location information of Chongqingdong Railway Station, and users can zoom in and out of the map by operating the mouse wheel.

2) The second page contains 4 sub-functional modules under the functional module of urban public transportation travel service. Taking urban rail transportation as an example, the upper interface on the right side realises the station sketches of the 4 relevant rail transportation lines in Chongqingdong Station and information such as running time and minimum fare.

3) On the third page the left sidebar of the page realises the selection of various types of information services inside the hub, mainly including travel guidance, catering, shopping malls and supermarkets, and medical services inside the hub.

4) On the fourth page, after selecting the travelling place in the left sidebar, the platform will show the path from the place of departure to the destination, and carry out the "simulated navigation" process in the "Take me to the destination" function interface on the upper right side.

5 Conclusions

The research takes public transportation in the hub area as a foothold, summarizes the deficiencies of the existing passenger travel services, such as weak overall service, excessive group services, and single service content, and proposes to build a travel information service platform for public transportation in the hub area. On the basis of clarifying the 3 main travel stages in the travel process, travel services and diversified convenience services under different scenarios are given, and then feasible technical realisation solutions are given. Finally, the proposed solution was applied as an example, and the functional modules of the platform were determined based on the actual situation of Chongqingdong Railway Station hub.

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