Research on the Application of TOD Theory—Taking Huijin Road Station of Shanghai Rail Transit Line 17 as an Example

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Abstract. As a new way of urban development, TOD mode provides a new way to solve the problems in current urban construction. Shanghai Rail Transit Line No. 17 Huijin Road Station integrated the TOD concept into the construction and made adjustments and improvements in light of the actual situation. This paper studies and analyzes its application model in order to provide reference for the extensive practice of the future TOD model.

Keywords: TOD theory · Rail transit · Huijin Road Station · Urban construction

1 Shanghai Rail Transit Line 17 TOD Development Technology Innovation

At the beginning of the construction of Rail Transit Line 17, we actively adhered to the concept of comprehensive development of docking stations, and realized "communication integration", "space integration" and "functional integration" to promote the docking construction of the subway and the city.

In the "communication integration", we will consider all kinds of transportation modes around the Huijin Road site on Line 17, and build new transportation hubs to achieve "seamless transfer", improve passenger transfer experience, and bring great convenience for transfer trips.

In the "spatial integration", Line 17 is committed to the integration of above-ground and underground space. Through the adjustment of the docking form of the entrance and exit, the station space and the commercial space are integrated with each other. Through the docking of subway functions, the surrounding development and construction of facilities and equipment in the subway will be combined to ensure the harmonious appearance of the architectural landscape along the urban roads.

In the "comprehensive function", Line 17 introduces the concept of comprehensive urban land during the construction of the depot, comprehensively develops the land

X. Zeng et al. (Eds.): ITASC 2019, SIST 127, pp. 138–144, 2019.
https://doi.org/10.1007/978-981-13-7542-2_13

of the depot, and builds new commercial, residential and park buildings to form a super-large-scale composite urban block, changing the past. The phenomenon of low land utilization in the depot.

1.1 Shanghai Rail Transit Line 17 Development Concept

Shanghai Rail Transit Line 17 is positioned to serve the suburban line of Qingpu District, and is also the city express line connecting the Qingpu New Town. The entire Line 17 runs along the east-west direction. It is a radiation radiating from the central city to Qingpu District. It runs through the passage of the Qingpu District East-West Passenger Corridor. The Zhujiajiao, Qingpu New City, Zhaoxiang New Town and Zhaoxiang Commercial and Business District are connected in series. Xujing Town, Huaxin supporting commercial housing base, China Expo, Hongqiao Hub and other important areas.

As the node of the rail transit line, the station is the distribution point for the citizens to take the rail transit. According to the design concept of the combination of Line 17 and surrounding development, the mode of the station should be closely coordinated with the urban public space, so that the station and the upper building are integrated, forming a three-dimensional urban space combining above and below ground, becoming the relative center of the urban area. A multi-functional composite urban complex. The stations in specific areas of the city will be considered as urban public spaces to create a real urban development gathering place.

The overall development concept of the system planning along the route is to introduce the overall development model of "Metro + Property" into the construction of Line 17. Development along the route from planning to design, from construction to management, follow the strategy of overall planning, overall development, and phased development, so as to maximize the value-added effect along the line, and use the traffic-oriented development (TOD) as a regional development model, using various policies. And the planning orientation attracts the population to move in, gathers popularity, and cultivates the passenger flow of Line 17.

2 Analysis of TOD Application in Huijin Road Station

The construction of Huijin Road Station on Line 17 fully embodies the functions of rail transit to meet the needs of urban construction and rail transit to shape the urban form. Huijin Road Station is closely integrated with the surrounding development, seamlessly connected, and basically implemented simultaneously. Through the sunken plaza, the construction of ancillary facilities, the integration of "traffic" resources, and the integration of "space" inside and outside, the three-dimensional development of above-ground and underground urban spaces is formed.

2.1 Descented

The sunken plaza completely opens the intersection of the station floor and the commercial basement and processes it into a sunken plaza. This is an ideal form of entrance and exit, which not only improves the building environment on the ground floor, but also increases the interest and ease of memorization. It is also very helpful for guiding a

large number of people in an emergency. The sinking square effectively grounds the underground space, and the indoor space is outdoorized, realizing the mutual penetration of indoor and outdoor space, which not only enriches the space level, but also improves the underground closed inward space environment (Figs. 1 and 2).

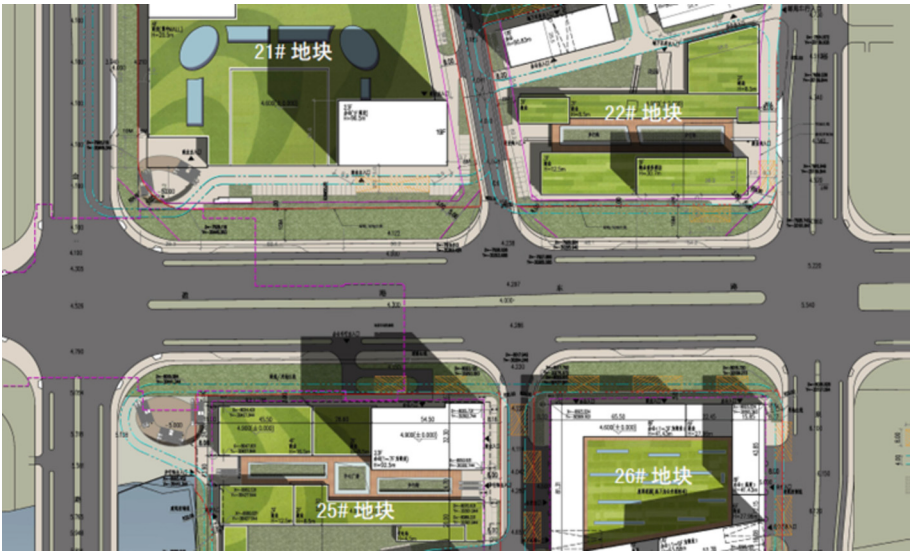

Fig. 1. Schematic diagram of the location of the sinking square at Huijin Road Station

Fig. 2. Huijin Road Station sinking square renderings

2.2 "Traffic" Resource Synthesis

The traffic function is the most basic function of the comprehensive development of rail transit stations. All kinds of transportation modes near the subway station are considered in a unified manner, which is convenient for transfer and realizes "seamless transfer".

For example, close to the subway station to set up bus hubs, intermediate stations, "P+R" public parking lots, etc., to expand the radiation range of subway stations. The comprehensive development design of the subway should fully consider the above requirements, optimize the layout of the entrance and exit, optimize the transfer path, and realize a spacious and convenient, all-weather "seamless connection" path to enhance the passenger transfer experience.

Located at the east end of Qingpu New Town, Huijin Road Station, the surrounding area of the site is planned to be the new city public service center. From the station position, it is the "P+R" portal function of the Qingpu New City docking main city. Therefore, in addition to the planning functions of commercial, office and residential, the planning and construction of the site around Huijin Road Station has built a regional public transportation hub, including 13 bus lines, between the Yuya Road and Yuquan Road. The block is equipped with 1000 parking spaces for social vehicles, which can be connected to the "P+R" function in later operations (Fig. 3).

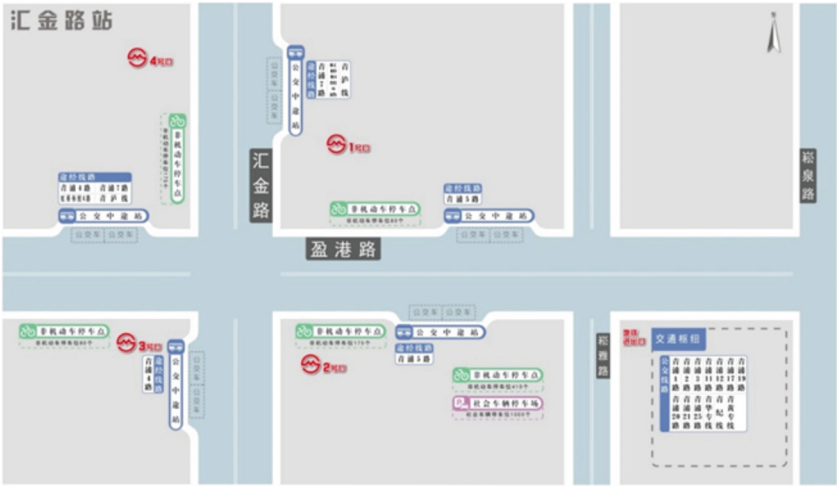

Fig. 3. Huijin Road Station public transportation facilities layout map

2.3 Integration of Internal and External "space"

The construction of the subway station is a golden opportunity for the development of underground space. Through the link effect of the rail transit station, the integration of the above-ground new underground and underground space is realized in the architectural space form. The station space and the commercial space penetrate and merge with each other to reach various spaces. "No sense of transition."

Subway and development of comprehensive and integrated development and design, combined with the functional requirements of the subway station, docking content focuses on the following two points:

2.3.1 Docking of Entrances and Exits

When the passenger flow of the station is at the entrance and exit station, especially when leaving the station hall, the passengers can choose the route according to their own destinations: they can leave directly, that is, they can directly reach the outdoor space; they can enter the transfer passage and transfer with other modes of transportation. The above two points are the fast and effective appeal of the subway station as the most important traffic flow guidance for the traffic building; it can also enter the commercial or hotel, office and other functional spaces through the interface between the subway and the development. In the design, while ensuring the orderly organization of the three types of passenger flow, we should also consider some issues such as fire protection, civil air defense, and operation management. The subway space carriers involved in this part are mainly non-paid areas for entrances and exits and station halls.

Set up a sunken plaza, the subway entrance and exit can be directly solved in the square, which can break the sense of closure of the underground space and subtly connect the underground, ground space and entrances and exits.

The transition through the outdoor open space of the sunken plaza is a more advantageous treatment. This way, the interface and space transition between the subway and the development are natural and coherent, which can well meet the independent division of fire and civil air defense. A clear and clear operational management interface is achieved. On the other hand, it is also possible to create more underground spaces such as subway stations and commercial and transportation interchanges. Through the introduction of the sunken plaza, natural light and landscape will follow, creating a comfortable, humanized and well-oriented walking environment. The transition between spaces is more organic, integrated and safe.

In addition, in the appearance of the subway entrance and exit of the development docking, through the coordinated design of the overall style of the development building, the architectural form is more coordinated and unified, avoiding the incompatibility between the unified entrance and exit of the whole line and the various development buildings (Figs. 4 and 5).

Fig. 4. Metro Huijin Road Station Exit 1 docking Baolong Square

Fig. 5. Metro Huijin Road Station Exit 2 docking Baolong Square

2.3.2 Docking of Subway Functions

The number of subway wind shafts is large and the volume is large. At the same time, there are a large number of ground equipment, such as cooling towers and VRV outdoor units. These facilities and equipment need to occupy a considerable amount of land for outdoor installation, and the shape is ugly. It has always been designed by subway stations. The landscape "disaster area" has a considerable impact on the urban landscape.

The integration of the above-mentioned equipment and facilities into the development building through design docking is an effective countermeasure to solve the above problems, which can solve the negative impact of the "large size, large number, scattered layout" of subway facilities on the urban landscape, thus ensuring the urban roads. Coordination and unification of architectural landscapes along the route (Fig. 6).

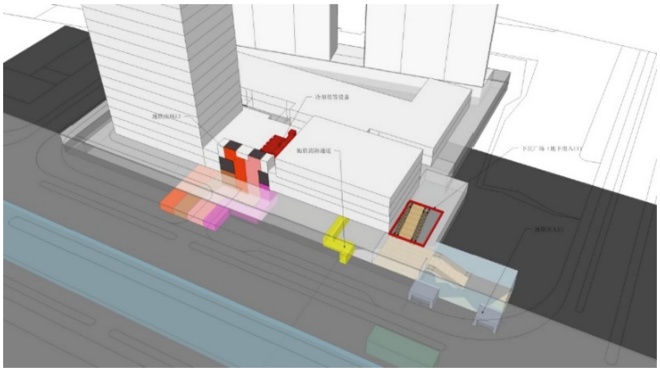

Fig. 6. The No. 2 wind shaft and cooling tower of Huijin Road Station are connected with the development building.

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