Journal of Transport Geography 42 (2015) 175–186

Contents lists available at ScienceDirect

Journal of Transport Geography

journal homepage: www.elsevier.com/locate/jtrangeo

Improving interchanges in China: the experiential phenomenon

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ARTICLE INFO

Keywords:
Interchange
High speed rail
Instrumental
Attitudinal
Affective
User experience

ABSTRACT

This paper examines the development of multimodal passenger rail hubs as part of the high-speed rail (HSR) network in the People's Republic of China (PRC). The instrumental, attitudinal and affective experience of the journey through the interchange is assessed from the user perspective. Surveys are used from three HSR stations: Beijing South, Chengdu East and Suzhou North ($N = 150$), representing three types of HSR stations, i.e. national capital, regional capital and sub-regional city. 'Expected' and 'realised' facilities are compared – with the difference representing the 'disgruntlement' factor (after Stradling et al., 2007).

The unprecedented urbanisation process currently being witnessed in the PRC, together with the rapid development of the HSR network and associated multimodal interchanges, offers much opportunity to develop a leading-edge public transport system and urban development predicated on the use of public transport. Although the importance of intermodal interchange hubs is being increasingly recognised, the journey experience through the interchange often remains poor, with problems including Wi-Fi availability, waiting and seating, the availability of door-to-door ticketing, crowdedness, access to the hub, time of travel through and waiting in the hub. MANOVA analysis and factorial (three way) MANOVA analysis are used to explore the differences between intermodal hubs, with many instrumental and particularly attitudinal and affective factors being significantly influenced by location.

1. Introduction

Modern high speed rail (HSR) networks, developed since 1964 in Japan, and the 1970s in Europe (Hall, 2009), are now being considered, planned and built in many countries internationally. HSR connects major cities in France, Germany, Japan, Italy, the Netherlands, Taiwan, Turkey, South Korea, Spain, the United Kingdom – and, of course, in the People's Republic of China (PRC). If designed well, HSR can help to shape cities both in terms of travel behaviours and urban development – it can 'shrink spaces and shape places' (Banister et al., 2013). Investment in multimodal interchanges is a critical element of this wider enhancement of public transport infrastructure, and can contribute to achieving greater sustainability in travel at the city, metropolitan and regional scales.

Transport policy in Europe has sought, over many decades, to increase public transport mode share at the city and metropolitan scales and to reduce dependence on the private car for travel. There are extensive public transport networks often available at the city level, with continued investments to extend networks to new areas, within a context of relatively marginal urban population growth. Investment in public transport in some of the more progressive cities, such as in London, has been occurring for over 150 years, since the early days of the London Underground. For example, the Metropolitan Railway opened in 1863 and the development of the early railways in the UK occurred from the 1840s onwards. In comparison, the People's Republic of China (PRC) has a very different set of contextual issues, with rapid urbanisation and industrialisation processes, dramatic levels of in-migration to the cities from the surrounding rural areas, as well as large, and very recent, investments in public transport infrastructure and multi-modal interchanges. This includes the development of the largest HSR network in the world, a comprehensive expansion of urban metros, light rapid and bus rapid transit systems, highways and airports. The scale and speed of development in the PRC are both remarkable: the infrastructure plans and investment programmes, which took more than a century to develop in the European and other so-called 'developed' countries, are now being planned and implemented to very short timescales in the PRC – since 2007 in the case of HSR. The development of transport infrastructure and intermodal hubs is very closely associated with shaping space economies (Zhang et al., 2010) and assisting in the

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http://dx.doi.org/10.1016/j.jtrangeo.2014.12.004
0966-6923/

urbanisation process through new development and city expansion (Dai, 2011). Hence there is a strong element of using major transport infrastructure investment to help shape the growth of metropolitan areas.

The interchange is a critical part of HSR and the door-to-door journey, particularly where the journey has multiple links. It can help to develop the public transport journey as a valued activity, providing the means of linking public transport services together to form a network, and creating a better integration and transfer between modes. If transfers between services can be made easier, quicker, more convenient, more productive – and more enjoyable – then better, wider ranging and more frequent journeys are likely to be made by public transport (Chen et al., 2014). Time spent at the interchange and on the whole door-to-door public transport journey can be, in theory, designed as little different to being in the office or at home: the journey no longer perceived as 'wasted time', at least to an extent – as reading, working, listening to music, accessing entertainment, eating and drinking, daydreaming and people watching, become much easier to undertake, as valued activities. These activities can often be facilitated by the emerging information and communication technologies on offer (Lyons and Urry, 2005; Jain and Lyons, 2008).

The interchange hub can therefore perform two key functions:

1. As an important element of the multiple link public transport journey (part of the internal interchange environment).
2. In providing the opportunity for hub area development. High density, mixed use development around the hub can help support the (re) development of city neighbourhoods, support patronage on public transport, and also improve vitality for the user experience in the hub (the external interchange environment).

The multimodal interchange in the PRC is often quite distinctive to the European model, with large, airport-style buildings, usually built on a multi-level basis. Ground level (first floor in the PRC) tends to be occupied by the rail lines and platform; the second floor provides space for the waiting hall and drive in and drop off; underground floor one is the departure and interchange level, with connections to the Metro if applicable, and also car parking and taxi pick up; underground floor one and two can provide space for the Metro lines. With such large spaces involved, the experiential nature of the interchange journey seems critical. We should remember that the experience of the public transport journey needs to be positive if to be repeated – in terms of the enjoyment of travel and also the potential for productivity. All of these issues are important if urban development in the PRC is to be predicated on the greater use of public transport. Alongside massive investment in public transport infrastructure, there has also been massive investment in highway infrastructure in cities in the PRC, and there is a great danger that cities and lifestyles are becoming very car dependent – in some, such as Beijing, this is already the case.

In the research literature (Table 1), the journey experience has been examined in terms of different attributes, including instrumental dimensions (relating to the practical aspects of travelling, such as journey time, cost, efficiency and flexibility), attitudinal dimensions (referring more to the perceived quality of facilities), and even affective dimensions (the feelings or emotions induced by travel, such as liking or disliking, pleasure or displeasure, boredom and stress). The utility of travel seems to be not only dependent on its instrumental value, but also on wider attitudinal and affective factors. The affective factors are particularly interesting, resulting from feelings or emotions, as a result of interaction with stimuli or a response to the 'situational cue' (Zajonc, 1980). The analysis within the transport field has moved from an understanding that travel may be more than a 'derived demand' (Mokhtarian and Salomon, 2001), to an examination of the motives for using the private car (such as Steg, 2005; Anable, 2005), with analysis by different public transport passenger segments and journey types (Anable and Gatersleben, 2005; Stradling et al., 2007; Price and Matthews, 2013; Carreira et al., 2013, 2014). Useful approaches have been developed to measure the level of (dis)satisfaction of particular features across different modes (including Stradling et al., 2007).

Much of this work has been carried out from the European or 'developed' country perspective, and there is little research evident, to the knowledge of the authors, in the PRC or Asian context. In practice, the design of multimodal interchanges in the PRC, and elsewhere, has focused on planning for projected passenger volumes, in improving the instrumental features of travel, and there has been much less consideration of the attitudinal and affective experience of travel. Closely linked to this is the potential 'seamlessness' of travel (Hamiduddin et al., 2013). Seamlessness is defined as: "improving the overall door-to-door journey, not just the individual elements. Journeys need to be conceived and developed as coordinated, integrated, productive, enjoyable and easy to use, with points of 'friction' within and between different stages removed or reduced" (Hickman et al., 2013). The seamlessness of the journey can involve instrumental, attitudinal and affective factors – indeed all of these areas need to be improved to enhance the journey experience.

This paper seeks to address the perceived research gaps,[1] examining the experience of travel through interchanges in the PRC, the differential experience across interchanges, and the relative importance of instrumental, attitudinal and affective factors. The analysis is structured in two main parts: firstly, the development of HSR and multimodal hubs in the PRC are considered; and, second, through a survey of three recently completed multimodal interchanges on new HSR lines, the instrumental, attitudinal and affective nature of the journey experience through the interchange is explored. It is hoped that the paper will contribute to the current debate on the design of HSR hubs in the PRC, in particular concerning the role of the interchange in enhancing the door-to-door public transport journey experience and in wider urban development at the city level.

2. The development of HSR hubs in the PRC

Since economic reform in the late 1970s, rapid industrialisation has dramatically changed urban China, resulting in unprecedented spatial-economic growth. The demographic transition from rural to urban areas is associated with a move from an agriculture-based economy to manufacturing, technology and service industries. In just 30 years, the urbanisation rate in the PRC has more than doubled, from 19% in 1980 to 52% in 2012 (World Bank, 2013). 11 cities currently have populations at over 5 million (at the urban area level) and three of these are over 10 million – Chongqing, Shanghai and Beijing. The wider metropolitan populations are even larger. In 2007, the National Development and Reform Commission (NDRC) announced 10 designated mega-city regions (MCRs), including three around the major coastal economic zones and seven in inland China. These MCRs amount to around 10% of the national land area, but their productivity accounts for more than half of the national total output in terms of GDP (Xiao and Yuan, 2007). An additional 300 million Chinese rural dwellers are likely to move to cities over

[1] Much of the research reported on in this paper was carried out as part of a project on 'Improving Interchanges' for the Asian Development Bank: Chen et al. (2014). Improving Interchanges. Towards Better Multimodal Hubs in the PRC. Manila: Asian Development Bank.