Chapter 5
Space–Time Behavior Survey for Smart Travel Planning in Beijing, China

Yanwei Chai
Peking University, China

Zifeng Chen
Peking University, China

Yu Liu
Peking University, China

Tana
Peking University, China

Xiujun Ma
Peking University, China

ABSTRACT

In China, smart travel planning, trying to influence traveler behavior using information and communication technologies, has attracted growing interest from governments and scholars because of its potential to alleviate urban transportation problems. The implementation of smart travel planning should be based on in-depth investigations and analysis of activity-travel behavior; it is necessary to use space-time behavior data and studies in smart travel planning. This chapter argues the necessity of space-time behavior surveys for smart travel planning in China and discusses a recent example. The survey was carried out in the Shangdi-Qinghe area of Beijing and involved 709 residents recruited through a multi-stage cluster sampling procedure. GPS tracking technologies were integrated with Web-based activity-travel diaries to collect data of high spatial and temporal resolution. The data shows that, on average, respondents participated in 8.19 activities and 2.66 trips per person per day. Despite several defects, the data provides a good quantitative foundation for smart travel planning in the study area.

INTRODUCTION

Over the past 30 years, the economic-centered urbanization in China has brought about both prosperities and challenges. In the transportation realm, despite fast growth in investment and construction of urban roads, subway systems, and other transportation facilities, big cities in China are becoming increasingly congested, and residents are suffering even more difficulties in daily travel. In this context, there are increasing attempts to explore new approaches of transportation planning in Chinese cities. With the development of mobile communication, cloud computing, the Internet
of Things, and other technologies, “smart travel planning” that influences traveler behavior using information and communication technologies (e.g. Internet-based transport information delivering, mobile phone App of trip decision support system, etc.) emerges as an innovative approach for enhancing travel efficiency and alleviating urban transportation problems, and has attracted growing interest from governments and scholars.

Smart travel planning should be implemented based on in-depth investigations and analysis of activity-travel behavior. Recent practice of space-time behavior research in China, with detailed surveys and studies of residents’ activity-travel patterns, has shed light on the understanding of activity-travel behavior. In this chapter, we argue the necessity and discuss a space-time behavior survey in smart travel planning. The remainder of the chapter is organized as follows: The next section begins with the rationale for applying space-time behavior surveys in smart travel planning in China. Then, after a brief review of space-time behavior data collection in China, we discuss an example of a GPS-based activity-travel diary survey for smart travel planning, which was implemented in Beijing, in the year 2012.

RATIONAL FOR SPACE-TIME BEHAVIOR SURVEY IN SMART TRAVEL PLANNING

The development of space-time behavior research has promoted the transition of urban modeling and public policies in Western countries, and has grown into an influential approach in urban geography, urban planning, and transportation planning (Dijst, 1999; Kwan, 2002; Timmermans, et al., 2002). In China, research on space-time behavior, using disaggregate survey data, has also become influential over the last two decades, as geographers and planners have tried to make sense of the dynamic interactions between individual life experiences on the micro-level and urban social and spatial transformations on a macro-level. The space-time behavior approach in China was initiated and developed in this context and has subsequently been widely applied to empirical research and planning practices.

In recent years, the emphasis of planning has begun to shift from infrastructure expansion to travel demand management in some Chinese cities. Based on information and communication technologies, there are increasing attempts to apply travel planning services as a solution to urban transportation problems, but few of these attempts have used analysis of space-time behavior. In this context, we try to explore the necessity of applying space-time behavior data and analysis in smart travel planning.

TRANSPORTATION INFORMATION DELIVERY

Transportation information services based on Websites or mobile phone apps are emerging in Chinese cities. These services provide real-time information about navigation, road traffic situations, operations status of public transport, traffic regulations, traffic emergency, etc. Currently, three types of transportation information services can be distinguished. The first type of service, in which neither the socio-demographics nor location data of travellers are used, only delivers information about traffic congestion, traffic regulations, and traffic incidents of the whole city or district. The second type of information service, in which the location data of travellers are used, delivers information about traffic congestion, traffic incidents, and bus stations close to certain road sections, based on the travellers’ current locations. Using data of the traveller’s speed and acceleration, the transportation mode can be identified automatically, and related transportation information can be selected and delivered. The third type of service,