Travel Behaviour and Society 12 (2018) 11–22

Contents lists available at ScienceDirect

Travel Behaviour and Society

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

Impact of ICT on multitasking during travel and the value of travel time savings: Empirical evidences from Mumbai, India

Varun Varghese, Arnab Jana*

Centre for Urban Science and Engineering, Indian Institute of Technology Bombay, Mumbai 400076, India

ARTICLE INFO

Keywords:
Multitasking during travel
Travel time use
ICT
Value of travel time savings
Developing nations

ABSTRACT

This study looks into the multitasking patterns for the developing world, while providing empirical evidences of the effect of multitasking on the value of travel time savings (VTTS). The multitasking behaviour during travel was studied, ascertaining the effect of various socio-economic variables, access to information and communication technologies (ICT), and travel related factors. Travel diary data was collected across the city of Mumbai, India for 1123 individuals capturing their revealed preferences on travel and multitasking during travel. It was observed that having a smartphone with an internet usage of more than one GB data had positive significant impacts on ICT dependent multitasking activities. In addition, the proportion of no-activity also significantly reduced with higher access to ICT. It was observed that the VTTS reduced by 26% for individuals who performed multitasking. Furthermore, for reading on a mobile device, usage of social media, messaging or talking to someone on phone, and for gaming, the VTTS reduced by 25%, 37%, and 16% respectively. Findings were used to make cross country comparisons and discuss policy implications.

1. Multitasking during travel: an introduction

Individuals conduct activities sequentially or simultaneously by distributing their time between production and consumption activities based on their incomes and social standings (Becker, 1965). However, with the advent of information and communication technologies (ICT) the possibility of performing more than one activity at a given period of time has been enriched. Several researchers have focused their studies on the role of multitasking (Ironmonger, 2003; Kaufman et al., 1991; Szalai, 1972), which accounts for the simultaneous part-taking in more than one activity. Ironmonger (2003) listed out the nomenclature adapted in different studies viz. 'simultaneous activities', 'overlapping activities', 'concurrent activities', parallel activities', 'secondary activities', 'multitasking', and 'polychronic time use'. Multitasking as explained by Ettema and Verschuren (2007) is primarily conducted for two reasons a) to do activities in a more efficient manner, b) to make primary activities more enjoyable. The former, they argue indicate time pressures, and the latter is performed to improve the utility derived from primary activities. The type of multitasking activity depends on the nature of the primary activity and in this study we focus on the secondary time uses of travel. Travel is one of the few activities which provide the scope for natural multitasking, a behaviour where both the activities are performed concomitantly and not as a result of passiveness or busyness of either activity (Stoneman, 2007).

Travel has traditionally been considered as a derived demand with its primary function being of an access provider to different activities. Thus, travel time is considered wasted and reduction in one's travel time has been used to justify investments in transportation (Lyons and Urry, 2005). However, Mokhtarian and Salomon (2001) argued against this tenet stating that travel in itself can have positive utility (or less negative utility) if a) activity at the destination end has a high perceived utility, b) when one can perform other activities while traveling which reduces the disutility, and c) when the travel itself has an intrinsic positive value attached to it. The last decade has seen a flourishing rise in the use of ICT based applications and services. These services has deeply affected and influenced the manner in which we participate in activities. Digital activities along with other types of multitasking (as listed in Lyons and Urry (2005)) can affect the value of travel time savings (VTTS) and consecutively have significant impacts on transportation policies. As a result it becomes important to study multitasking behaviour and the factors affecting it. The study of factors will help us identify attributes which can alter multitasking behaviour thus having impending influence on transportation policies. Keseru and Macharis (2017) in their review of the geographical coverage of studies on travel time use have pointed out the lack of studies on travel time use in developing country scenarios. Only few studies (such as Tang et al. (2017)) have analysed the multitasking during travel behaviour in developing countries and there is an urgent need to enrich the

* Corresponding author.
E-mail address: arnab.jana@iitb.ac.in (A. Jana).

https://doi.org/10.1016/j.tbs.2018.03.003
Received 19 August 2017; Received in revised form 17 December 2017; Accepted 9 March 2018

understanding of the same. Taking in account the existing disparity and the recent outburst of telephone and internet connectivity in India, the study aims to achieve two primary objectives:

a) *To analyse the multitasking behaviour during travel, identifying the effect of various socio-economic variables, access to ICT and travel related factors, and*
b) *To identify the impact of multitasking on value of travel time savings*.

In addition, as per the knowledge of the authors very few studies, e.g. Ettema and Verschuren (2007) and Malokin et al. (2017) have empirically quantified the effects of multitasking on value of travel time savings. Therefore, we believe that our study will be an essential contribution to the travel time use literature by not just strengthening the empirical foundations of the effect of multitasking on VTSS, but also deepening the understanding of multitasking behaviour with a study from the developing world.

With these objectives, the rest of the article is organized as follows. Next section sets the context for this study explaining the developing country scenario for multitasking behaviour. Meanwhile, Section 3 provides a review of the literature on factors affecting multitasking during travel and its impact on VTTS, a special focus is provided to identify the effect of ICT and other influence factors on ICT based multitasking. Section 4 describes the survey technique, data collected, study area, and the research methodology adopted, sub-sections in this section are dedicated towards describing the conceptual framework, hypothesis formulation, and the modelling techniques used for the study. Section 5 describes effects of different socio-economic and travel related factors on multitasking behaviour. Section 6 highlights the implications of our findings on the current policies by discussing the effect of multitasking on VTTS. Finally, we conclude our article with key findings, limitations, and the way forward for this research in Section 7.

2. Contextual setting – developing country scenario

The context of studies on multitasking has been primarily focused on its potential impact on travel utility and transport appraisal (Wardman and Lyons, 2016). Apart from that a number of studies also explored the relationship of multitasking during travel with individual wellbeing, mobile work and overall productivity, mode choice, use of ICT, ergonomics, and psychological-behavioural aspects (Keseru and Macharis, 2017). However, the geographical coverage of these studies have been limited to countries from the developed world with the most number of studies coming out from United Kingdom (Keseru and Macharis, 2017). The lack of studies from other parts of the world and especially from developing countries leaves us with little to no knowledge about how disparity in socio-economic conditions affect multitasking behaviour. In addition, there exists enough variation in terms of mode choice behaviour in a developing country like India, e.g. use of intermediate public transport (IPT) modes such as *autorickshaws* are a common mode of transportation along with public transport modes such as trains and buses. IPT modes provide the privacy to perform various multitasking activities at a low cost. The effect of such modes on multitasking during travel needs to be analysed. Moreover, in terms of use of ICT such as mobile phones and internet, there is a worrying gap between developed and developing countries. In India, for example only 30% of the total population has access to internet, whereas in United Kingdom almost 95% of the total population has access to it (ITU, 2016). However, the rise in use of mobile phones in India shows promise towards reducing digital disparity (ITU, 2016). Previous studies, such as Guo et al. (2015) and Gripsrud and Hjorthol (2012) have looked into the effects of availability of equipment such as smart phones and laptops on multitasking behaviour and witnessed significant effects. Therefore, especially for the Indian context with existing digital disparities, the effect of varying levels of mobile phone and internet usage on multitasking behaviour must be examined.

Mumbai is India's largest metropolis with a population of 12.44 million, with 42% of its population living in slums under poor housing conditions (Census of India, 2011a). MCGM (2016) conducted a survey of 5000 households capturing their socio-economic conditions and travel behaviour. It was observed that nearly half of the trips (46%) were performed by non-motorized transport (NMT) modes and out of the remaining motorized trips, 67% were made using public transport modes such as trains and buses. There exists little evidence on how NMT modes effect multitasking behaviour, with the advent of ICT, the possibility of performing certain passive activities such as listening to music becomes plausible. Moreover, the mode share of IPT modes such as auto-rickshaws and taxis in Mumbai were 10.3% and 5.8% of the total motorized trips respectively (MCGM, 2016), indicating high proportion of ridership in such modes and the effect of that on multitasking behaviour must be tested. In addition, it was observed that nearly three-fourth of the trips were made for mandatory purposes such as work and education. Purpose of travel is an important indicator influencing multitasking behaviour and thus it becomes imperative to analyse its effects in the context of Mumbai. In addition, existing disparity in housing conditions, income poverty, lack of access to ICT devices and services, and other socio-economic characteristics which are specific to a developing country scenario might also affect multitasking behaviour and therefore should be examined.

3. Literature review

The conceptual foundation to travel time use and the potential of multitasking to alter the utility of travel was laid in the beginning of the 21st century with researches questioning the tenet of travel being purely a derived demand. Researchers started pointing out the gap in how transport policy makers valued travel time use vis-à-vis how passengers valued it (Watts and Urry, 2008). Mokhtarian and Salomon (2001) opined that multitasking can reduce the disutility attached with travel and this can further impact the travel time budgets and mode-choice. In transport appraisal practices, travel time has been considered wasted or unproductive, whereas travel time savings have been considered as a major benefit for transport investments. However, by performing an enjoyable activity while traveling passengers can reduce the disutility attached with it. Lyons and Urry (2005) in their conceptual exploration of the importance of travel time use in the information age introduced a possible set of travel time uses that the passengers might indulge in. They argued that these travel time uses can alter their value of travel time, consecutively having an effect on appraisal of transportation schemes. Meanwhile, Kenyon and Lyons (2007) argued how ICT have opened up newer opportunities enriching the multitasking during travel experience. This brief review of the literature focuses upon explaining the background of multitasking during travel research bringing out the gaps in survey techniques, geographical coverage, and studies on effects of determinants. A special focus has been provided upon the impact of ICT and influence factors of ICT on multitasking during travel and VTTS.

In their review of empirical studies on multitasking during travel, Keseru and Macharis (2017) noted the varied nature of survey techniques being employed and pointed out the lack of standardization in capturing multitasking behaviour. They grouped 11 different survey techniques into qualitative, quantitative, and mixed approaches. They pointed out that early empirical work employed qualitative methods such as observations (Laurier, 2004), in depth interviews and diaries (Brown and O'Hara, 2003), and focus group discussions(Jain and Lyons, 2008). The focus later shifted towards quantitative approaches with researchers adopting intercept surveys (Rhee et al., 2013), household interviews (Mokhtarian et al., 2015), and quantitative structured observations (Russell et al., 2011). Questionnaire based survey techniques were either personal interviews or self-reported. Timmermans and Van der Waerden (2008) noted the limitations regarding self-reported