Chapter 15
A Study on the Transportation Mode Choice Behaviour of Individuals With Different Socio–Economic Status

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ABSTRACT
This chapter presents a study on the transportation mode choice behaviour of individuals with different socio-economic status. A previously developed system dynamics model has been adopted by differentiating the population mass into upper, middle, and lower classes. The simulation experiments with the model revealed that generally the upper class individuals would be more inclined to use a private car (PC) instead of public transportation (PT) when their tendency is compared to middle and lower class individuals. It was also observed that lower class individuals would be more willing to use PT instead of PC when their tendency is compared to middle and upper class individuals. As such, it would be difficult to encourage the upper class individuals to use PT instead of PC, and it would be successively easier to do so in the case of middle and lower class individuals. However, the results also indicated that under certain different circumstances, the upper class individuals would also prefer to go for PT, and the lower class ones could prefer to own and use PC instead of PT.

INTRODUCTION
The increasing use of private cars for transportation is a persisting matter of concern in growing cities. In order to develop and maintain a functional and sustainable transportation system, it is better that excessive use of private cars be kept under control but it seems that there is little or no success in doing so in the cities around the world especially those which are growing rapidly. A large number of research works have been done to understand the tendency of choosing private car as a mode of transportation. In this research, a particular line of inquiry has been taken to understand how the socio-economic status of...
individuals residing in and around city area affect their mode choice behaviour. It was found that personal or household income is a closest key construct that represents the socio-economic status of individuals. Generally, it has been reported that usage of personal cars in comparison to public transportation would rise with increasing income levels (Alqhatani et al., 2013; Luo et al., 2007; Paulley et al., 2006). However, there are numerous observations that clearly indicate that the relationship between socio-economic status and mode choice decision is still not very clear. For example, in AASHTO (2013) it is reported that increasing income level would not necessarily increase the use of private car in comparison to public transportation. Giuliano (2005) found that even low-income households used public transit for only small portion of their travel. Combs (2017) reported that public transit ridership by even lower wealth households did not increase even though public transit accessibility has been improved much for them.

A previously developed system dynamics model by the author has been used for this research (see Bajracharya, 2016 for the model, and Sterman (2000), Morecroft (2007) or Azar (2012) for details on the systems thinking and system dynamics approach). The model was used to study individual mode choice behaviour in the context of homogeneous population mass by taking Dubai as a case city. The model is not an agent based detail model, but it attempts to portray the micro behaviour that has potential to demonstrate the macro behaviour of population mass. The model takes the advantage of system dynamics that can demonstrate aggregate behaviour without the need to collect and use big data for simulation purpose (Pruyt, 2016). In this research, a change has been made in using the model by categorising population mass in terms of socio-economic status of individuals residing in a typical growing city. The core structure of the generic model has been retained as it is, and only the relevant parameter values have been altered to create the situations of heterogeneous socio-economic status of individuals.

In this chapter, first the description of the generic feedback loop and simulation model have been presented as it was done in Bajracharya (2016). Then the concept of heterogeneous socio-economic status of individuals has been explained and operationalised in terms of the values of relevant parameters in the model. The model was then used to do series of simulation experiments based on which some pertinent findings have been extracted and reported.

CONCEPTUAL FEEDBACK LOOP MODEL

Private Car Ownership and Usage

Private car (PC) in general would be a preferred choice for transportation in modern urban life if one can afford to own and use it. This proposition is largely supported by most of the literature in car psychology and behavioural mode choice. Private car is taken as a sovereign mode of transportation that can provide protection, convenience, flexibility and reliability to make private trips (Hiscock et al., 2002). There are other numerous literature (such as Innocenti et al., 2013; Gatersleben and Uzzell, 2007; Mann and Abraham, 2006; Steg et al., 2001) that describe why the concept of private car is intrinsically related to the attachment to consume its possession and use. In addition to that, there is a distinct set of theoretical arguments on why people own and use car. Steg (2005) and Steg et al. (2001) stated that private car ownership and use is strongly influenced by the whole set of instrumental, symbolic and affective motives. The instrumental argument suggests that private car is basically a means of transportation. People prefer to use it because it is taken as a safe, comfortable and superior means of transportation. The symbolic argument explains that the possession and use of private car exhibit one’s social identity