



How do users choose their routes in public transport? The effect of individual profile and contextual factors



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ARTICLE INFO

Article history:

Received 30 September 2016

Received in revised form 9 June 2017

Accepted 29 August 2017

Available online 18 September 2017

Keywords:

Decision-making

Route-planning

Transportation

User profiles

ABSTRACT

The aim of the present study was to better understand how public transport users make their choice of route, in order to favor the use of public transport (henceforth PT) in large cities. Based on decision-making theories, a classical choice paradigm (Slovic, 1975), and recent findings in psychology (Chowdhury & Ceder, 2013; Grison et al., 2016) we developed a new method to investigate the effect of contextual and individual factors on PT route choices. We proposed to sixty PT users realistic forced choices between two PT routes that differed in affective (level of physical comfort) and instrumental (number of transport modes) attributes. We also varied the context of the decision (long or short route; route to go to work, to a leisure activity, etc.), and we recorded various individual characteristics (age, sex, attitude towards PT, habits, etc.). Our results highlight that: the comfort of the route is preferred to the number of transport modes, especially for long trips; the choice of the comfortable alternative or the one with only one transport mode depends on user characteristics; the length of the trip and habits are the most important variables in the decision, but attitudes also seem to play a major role. Our study furthers current knowledge about the psychological process of PT route choice in light with multi-attribute choices theories, and provides new insights that can contribute to improving current large city route-planning aids.

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1. Introduction

The promotion of public transport (henceforth PT) use can be a promising way to reduce the current increase in air pollution and traffic congestion in large cities. A first avenue of research has been dedicated to understanding the behavioral switch from the use of the private car to the use of public transport (see for example Litman, 2008; Popuri, Prousaloglu, Ayvalik, Koppelman & Lee, 2011; Rubens, Gosling, & Moch, 2011). These studies have been essential to show the influence of various structural, contextual, and individual factors on transport mode choice.

Recently, a complementary promising way to study this issue has been promulgated. Chowdhury and Ceder (2013) argued that focusing on the route choice behavior of current public transport users should enable to extract information that could then be used to enhance the use of public transport (see also for example Grison, Gyselinck, & Burkhardt, 2016). This proposal is particularly suitable for large cities, where various transport modes and routes are available. For example in Paris (France), taking only the public transport network into consideration, travelers can take the subway, the bus, the tramway, or

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they can combine several of these transport modes. Moreover, the density of the transportation network allows people to choose between many alternatives resulting from different transport modes or combinations. Consequently, users have to compare the alternatives, and select the alternative that suits them best depending on their own preferences (Tversky, 1972).

In the current literature, how people make such route decisions between several PT routes remains under-investigated. As a consequence, to date no model explains this particular behavior from a user perspective. Thus, the aim of the present study is to better understand how PT users plan their route, how they proceed, what the factors involved in their decision are, and how these factors influence their choice. From an applied viewpoint, clarifying the factors and the decision processes involved in PT situations can provide fruitful insights to develop innovative solutions for supporting and promoting the use of PT, such as the improvement of route planning aids.

The paper is structured as follows. First, a review of the literature concerning experimental data acquired these last years on PT route choice is presented. Then a theoretical framework to explain PT route choice is discussed followed by the research question. We follow by the presentation of the methodology of the study. Finally, the results are presented and discussed in light of the current literature and of their implications in improving route-planning aids.

2. Literature review

2.1. Routes choices in public transport system

2.1.1. Attributes and criteria considered in PT route choice

When making a choice of transport to travel, people consider various aspects of the route to make their decision. In this paper, we will use the term “attribute” to refer to the characteristics of the route; and we will refer to the term criteria when speaking of the user’s preference when making a choice, such as favoring one attribute rather another, or having a cut-off on an attribute. In global transport literature on mode choice, three categories of attributes have been identified: instrumental (i.e., cost, travel time), symbolic (i.e., norms, social representation), and affective (i.e., emotional dimension linked to the travel/mode) (Steg, 2005). To date, the attributes highlighted in literature on PT route choice can be classified in the instrumental and affective categories (Ben-Elia, Di Pace, Bifulco, & Shiftan, 2013; Bovy & Hoogendoorn-Lanser, 2005; Chiu, Lee, Leung, AU, & Wong, 2005; Guo & Wilson, 2011; Raveau, Guo, Munoz & Wilson, 2014; Raveau, Munoz & de Grange, 2011). The main findings of studies investigating PT route choices are that beyond some well-established instrumental attributes such as the travel time and cost, other attributes like the transfers’ characteristics (Guo & Wilson, 2011), and the network topology (Raveau, Guo, Muñoz, & Wilson, 2014; Raveau, Muñoz, & de Grange, 2011) can be involved in the decision process. The results also highlight that trips are composed of different slices of time (i.e., waiting time, walking time, in-vehicle time) that are evaluated differently by users when making their choice. Indeed, people assess the waiting time and walking time as being more important for their decision than the in-vehicle time (Raveau et al., 2014).

The finding that slices of the travel time can have different values depending on their nature is important since one of the most important attribute of PT routes is that they frequently imply transfers between lines or transport modes. In most door-to-door trips using PT, users have to make transfers, which are negatively perceived because they involve waiting time, walking, uncertainty, and loss of control over the trip (Friman, 2010; Hine & Scott, 2000). Moreover, Heye and Timpf (2003) observed that transfers could lead to a difficulty in accomplishing the trip, especially due to the physical and cognitive load on wayfinding induced by transfers. In their attempt to modeling wayfinding in public transport, Rüetschi and Timpf (2005) proposed that finding our way in unfamiliar public transport is a difficult task because numerous signs are present, and the information is not always well displayed. It has been indeed shown that understanding signs in the public transport system is essential for the wayfinding task, especially at transfer or egress (Fontaine & Denis, 1999; Timpf, 2002). Moreover, Hannes, Janssens, and Wets (2009) demonstrated from interview data that having a good spatial representation of the environment help in finding the best transport mode to make the trip, and facilitated the accessibility of the transport mode. Recent work also shows that the more transfers the route has, the more difficult the route planning task is (Grison, Gyselinck, Burkhardt, & Wiener, 2016). For all the above-mentioned reasons, users tend to avoid transfers or to plan ahead when they expect to have transfers in the PT route (Hine & Scott, 2000). As a result, the literature focusing on PT route choice has mainly investigated the factors that can facilitate the use of PT routes including transfers. Chowdhury and Ceder (2013), for example, observed in their survey-based study that if some instrumental aspects of transfer – such as the reliability between modes, the walking time, and traffic information or waiting time – were improved, users would be more prone to use PT routes with transfers.

All these studies show that various instrumental attributes can be considered when making a PT route choice. In addition to this kind of attributes, a few studies have reported that users can also consider affective dimension of the route to make a decision. For example, Hölscher, Tenbrink, and Wiener (2011) asked participants about the reasons of their choice of route (i.e., walking routes) and found out that some affective attributes such as the attractive characteristics (esthetics) of the route can be considered at the same level as instrumental ones. In a recent study on PT route choice, Grison et al. (2016), asked participants to describe real PT route events. The descriptions included the reasons of their choice of route. The authors point out the fact that affective attributes such as the comfort in the transport (e.g., be seated, quietness), and the fact to travel with a friend can be strong reasons to choose a particular route. To date however, while these recent studies report that affective attributes are considered by users to make their choice, these attributes have been understudied compared to instrumental ones.

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