The influence of personality traits on airport public transport access mode choice: A hybrid latent class choice modeling approach

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ABSTRACT

Many objective and subjective factors affect individual tendencies. Such subjective factors include personality traits, attitudes, identities, perceptions, and feelings. The choice of transportation mode is an individual tendency that is considered important in policy-making decisions, and it can affect sustainable transportation, particularly in metropolitan areas. The present study's main aim is to determine the impact of the Big Five Personality Factors on individual preferences toward public transportation modes. We use data from a survey conducted in January and February of 2015 at Imam Khomeini International Airport (IKIA). Passengers were asked to indicate their preferred mode of transportation to access the IKIA and to respond to questions on the NEO Five-Factor Inventory. Based on 557 valid responses, hybrid discrete latent class modeling was conducted to understand the heterogeneity in the respondents' individual preferences regarding the Big Five Personality Factors and their preferences toward public modes of transportation. The results indicated that individuals who display *neuroticism* were more likely than the others to be concerned about carrying heavy luggage and about inclement weather conditions when using public transportation. In addition, interesting results indicated that *conscientious* individuals likely paid more attention to travel cost than to any other attribute of public transportation, and the model of the *conscientious* latent personality trait was a better fit to the data. Finally, this paper examined the taste heterogeneity of each personality trait and the results indicate the usefulness of considering personality traits in mode choice models for richer insights toward sustainable transportation.

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1. Introduction

1.1. Research objective

Although research on the impact of psychology on transportation is not new, focusing on the psychology of the transport user as an active agent for organization toward more sustainable processes is a novel challenge (Gehlert et al., 2013). Thus, an in-depth understanding of how psychometric variables affect individuals' behavior regarding more sustainable transportation is needed to alleviate this challenge. Due to the important role of public transportation in policy making, mode choice analysis is probably the single most important element in transport planning (Ortúzar and Willumsen, 2011). Therefore, analyzing the influence

of psychology on mode choice models, particularly those focusing on public transportation, can produce more applicable results for transportation psychologists, engineers, and policy makers.

There have been many attempts to psychologically determine the mode choice process by using action theories such as theory of planned behavior (TPB) (Bamberg and Schmidt, 1998) and norm-activation model (NAM) (Hunecke et al., 2001) or habit (Friedrichsmeier et al., 2013). Other studies have used a combination of theories, like the TPB with a habit construct (Verplanken et al., 1994), the combined TPB and habit resistance to change model (Nordfjærn et al., 2014), or the comprehensive action determination model (CADM), which integrates the main assumptions of TPB, NAM, habit, and the ipsative theory of behavior (Klöckner and Blöbaum, 2010). Other research studies have employed modeling approaches that consider different psychological variables; for instance, a study concluded that multiple identities are related to travel mode choice on regular journeys (Murtagh et al., 2012), the effect of attitudes on freight mode choices (Bergantino et al., 2013), and the attitudes and awareness

toward environmentally friendly modes (Sottile et al., 2015). Nevertheless, few efforts have been made to consider the effect of an individual's personality, particularly by examining the known traits.

Personality traits as well-studied psychological variables are defined as "dimensions of individuals differences in tendencies to show consistent patterns of thoughts, feelings and actions" (McCrae and Costa, 2003). As the result of several decades of research that began in the 1970s, and included factor analysis of self-reported behaviors and observations, personality is often considered to consist of five main components, which are known as the "Big Five" (Almlund et al., 2011; Goldberg, 1993). The Big Five traits comprise the "most generalizable, empirically rooted, and theoretically sound model of personality" (Gill and Hodgkinson, 2007). These traits include *openness to experience* ("the tendency to be open to new aesthetic, cultural or intellectual experiences"), *conscientiousness* ("the tendency to be organized, responsible and hardworking"), *extraversion* ("An orientation of one's interests and energies toward the outer world of people and things rather than the inner world of subjective experience; characterized by positive affect and sociability"), *agreeableness* ("The tendency to act in a cooperative, unselfish manner"), and *neuroticism* ("A chronic level of emotional instability and proneness to psychological distress") (VandenBos, 2006).

Accordingly, this paper's objective is to explore the probable association between each personality trait and the preferences toward public modes of transportation by using a case study from the Imam Khomeini International Airport (IKIA) that employed the hybrid latent class (HLC) modeling approach. For this purpose, we used a survey conducted in January and February of 2015 at the IKIA. In the following, section 1.2 provides details about the IKIA and section 1.3 presents the paper's overall structure.

1.2. Imam Khomeini International Airport (IKIA)

The IKIA covers an area of 13,500 ha in Ahmadabad county and is located 30 km (19 miles) outside the boundaries of Tehran, which makes it the largest airport in Iran. The IKIA exclusively serves international flights with its one passenger terminal which has a total annual capacity of 6.5 million passengers and 120,000 tons of cargo; however, a second terminal, "The Pilgrimage" is currently under construction. Constructed in 2004, the IKIA was designed to replace the Mehrabad International Airport (MIA), which is the busiest airport in Iran with 13.8 million annual passengers (Anna Aero, 2015; IAC, 2015). Tehran's growing population and continued development have caused various environmental pollution and safety issues in the use of MIA, which serves both military and civilian functions and is within the city limits. Flights gradually moved to the IKIA because of long access times, Tehran's incomplete subway connectivity, and the lack of a comprehensive study concerning the distribution of traffic between the two airports and the capacity constraints at IKIA (Tarahan Parseh Transportation Research Institute, 2011). The IKIA air traffic has shown an average annual growth of 23% during 2005–2014, and the airport offers non-stop flights to destinations in 30 countries across Europe, the Middle East and Asia (Anna Aero, 2015). This airport plans to accept 90 million domestic, international, and transit passengers upon completion of its final phase in 2030. However, this planning scheme is ambitious; for reaching such a development in air traffic, the IKIA needs serious management and policy-making efforts regarding ground access, particularly in developing public transportation services and facilities. Furthermore, the IKIA is in the process of significant development plans in an effort to make it an "airport city" and to increase its attractiveness as a regional hub (IKA City, 2015).

Currently, only taxis and private cars provide access to the airport (which is to be parked or drop off passengers). There are two options for parking at the IKIA: 1) the terminal's roofed parking area, which is occupied most peak hours, and 2) outside the terminal without roofed parking areas, where a free bus is available for transferring passengers from the terminal to these parking zones and vice versa (IKIA, 2015). An extension to the southern part of Tehran's metro Line 1 to the IKIA is currently under construction, and a long-term plan exists to have a metro Line 3 (express line) reach the IKIA, but there are no plans at present for other modes of transportation (such as buses) (IKIA, 2015; Tehran Metro Group, 2015). Previously, a shuttle bus linked the MIA to the IKIA, but this is no longer available. The modal split at the IKIA is distinct because of no public access to the airport and due to the limited parking in roofed areas, which causes the majority of passengers to use taxis. Owing to the numerous issues surrounding the development of the IKIA, such as limited roofed parking areas, the perceived insecurity and environmental issues associated with unroofed parking, and no current public transport modes to the airport, it is crucial for airport managers to acknowledge and to understand the key factors influencing public transport to the IKIA for improved future planning and designs.

Therefore, the IKIA is unique in being a relatively newly built airport in a developing country without current public transportation, and this study can provide useful information for other developing countries and for those airports designing public transportation or multi-airport regions worldwide. Furthermore, this paper can provide useful findings for airports that currently have no public access, particularly those in developing countries with specific cultures.

1.3. Structure of the paper

The remainder of the paper is structured as follows. Section 2 contains a brief literature review regarding personality traits and individuals' behaviors, particularly in transportation studies and airport access mode choice research. Section 3 deals with procedures, methods, and materials. Section 4 describes the results and presents a discussion about the models. Section 5 concludes the paper with the outcomes of this research and issues to explore in future studies.

2. Literature review

Personality traits have been broadly studied regarding their effects on individual behaviors, such as the relationship between personality and eating behaviors or body mass index (Elfhag and Morey, 2008; Kakizaki et al., 2008; van Strien et al., 1985; Walker et al., 2015), green behavior (Gordon-Wilson and Modi, 2015), academic performance (Chamorro-Premuzic and Furnham, 2003; Conard, 2006; Feyter et al., 2012), environmental sustainability (Hirsh, 2014), sustainable behavior (Pappas et al., 2015), health (Allen et al., 2015; Handbook of the Psychology of Aging, 2016; Hill and Roberts, 2016), and physical activity (Rhodes and Smith, 2006). Furthermore, the following subsection deals with the assessment of personality traits in some domains of transportation, and section 2.2 provides a brief review of research regarding airport access mode choice.

2.1. Personality traits and transportation studies

The effect of personality traits and factors on transportation research have been widely studied for understanding driving behavior (Beanland et al., 2014; Classen et al., 2011; Delhomme et al., 2012; Jovanović et al., 2011; Marengo et al., 2012; McPeek