Exploring the factors affecting bike-sharing demand: evidence from student perceptions, usage patterns and adoption barriers

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Abstract

Shared mobility is an innovative transportation strategy defined as the shared use of a vehicle, bicycle or other mode which enables users to gain short-term access to transportation modes on an as-needed basis. Bike-sharing systems have rapidly expanded around the world with important implications for urban areas, which generally experience problems such as recurrent congestion, air pollution and undesirable livability of the city. Considering the benefits regarding cycling and implications deriving from bike-sharing services implementation, this paper presents an in-depth analysis to investigate a variety of determinants, barriers and motivation that can influence the willingness to cycling and join bike-sharing. The study focuses on a specific target group represented by university students and their preferences have been collected through a structured questionnaire in applying the Likert Scale. A statistical analysis has been realized based on a chi-squared test, deriving the difference between expected and observed frequencies for several combinations of the analyzed attributes. First results highlight the differences between the impact of economic, environmental and social factors for students cycling and provide useful suggestion to define the way for a well-thought-out design of a bike-sharing transport service.

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1. Introduction

The term shared mobility refers to a variety of transportation modes that are shared on an as-needed basis (Shaheen et al., 2020). It includes various forms of carsharing, bike-sharing, scooter sharing, ridesharing (carpooling and vanpooling), transportation network companies (TNCs), and microtransit. Over the last decade, the international discourse on sustainable transport has been bursting with supposed best practices like bike-share, a system of short-term bicycle rental popular in cities across the globe. Today over 500 cities proudly host a bike-share, and that figure grows annually (Wood, 2020; Pucher and Hagen, 2014), increasing the positive environmental, social, and transportation-related impacts of these services. As young and presumably healthy adults, students have the physical capacity to cycle; allegedly, they should have more knowledge, motivation, and awareness about sustainability issues. On the other hand, they usually have fewer financial resources than employed people, this being only one crucial issue that could contribute to their more frequent use of bicycles (Pogacar et al., 2020). Furthermore, the characteristics of these young bike-sharing users represent an important aspect to investigate, taking into consideration that they may differ from city to city (Efthymiou and Antoniou, 2016). Thus, the variability of bike-sharing users' travel patterns and the factors that determine their decision to join, maintains the research interest around this subject high. Based on this premise, focusing on a specific target group consisting of university students, this paper extends the current literature and contributes in this direction by proposing an in-depth analysis to investigate a variety of determinants, barriers and motivation that can influence the willingness to cycling and join bike-sharing.

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2. Methodology, research area and data collection

There are several studies in the literature that have addressed the analysis of bike-sharing propensity, using different procedures of acquiring user demand data (Chevalier and Chalermague, 2019; Pawlowski et al., 2014; Swiers et al., 2017). The proposed study sees the involvement of a large sample of students, with the aim of investigating their perceptions, usage patterns and identifying adoption barriers in the propensity to use aforesaid service, from a sustainable perspective (economic, social and environmental viewpoints). The analysis has been conducted by developing a structured questionnaire survey divided into 4 section: the first related to socio-demographic information, the second to investigate the travel behavior, the third to analyze perceptions and usage of bicycle and the last one correlated to the propensity to join new forms of shared mobility, focusing on the factors that positively and negatively influence the use of the bike. Specifically, factors related to the service such as price, travel time, reliability, safety and comfort have been taken into account. In addition, factors related to the optimal functioning of the system, flexibility to avoid congestion, easily accessible parking and finally the lack of a private vehicle available have also been investigated. For most of the questions on individual perception, a five-level Likert's scale has been used and a statistical analysis based on chi-squared test has allowed to evaluate the difference between expected and observed frequencies for several combinations of factors (Campisi et al., 2020). The described methodological approach has been carried out in two different cities: Catania and Enna, both located in the southern part of Italy and characterized by the presence of a large number of university students. The data collection campaign has been conducted during the period of December 2019 – February 2020 and 200 interviews have been collected with a paper questionnaire dispensed within a large consultation survey carried out in the University Campus of the two cities, by involving a sample with heterogeneous characteristics of travel pattern, so as leading to a good classified the beta tester.

3. Results and discussion

The sample has been consisted of undergraduate and postgraduate university students enrolled in different courses, gender equally distributed, of which 90% with an average age between 23 and 26 years and the remainder between 18 and 22 years old. Detailed analysis have been performed by segmenting the sample and a chi-squared test has been calculated to analyse several combinations of attributes and to assess their statistical dependency/independency, particularly related to the usage patterns (i.e. frequency of bike usage) and adoption barriers (i.e. infrastructural aspects), in order to understand which factors can influence the take-off of a bike-sharing service in the study areas.

Results from correlation analysis showed an almost total convergence on the negative use of bike sharing and poor cycling due to the lack of dedicated infrastructures and the low perceived safety. On the other hand, a high sensitivity to the environmental and social aspects has been highlighted. These findings can be used as an input for delivering policy interventions in future urban transportation strategies, looking to promote and reinforce bike-sharing usage and increase cycling. Besides, the performed procedure could be useful to gain more insight into citizen preference structures. The paper also offers valuable guidance to mobility providers about how bike sharing businesses can prosper long-term in an environment where shared mobility schemes constitute novel socio-technical interventions.

Main references


