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Green helpfulness or fun? Influences of green perceived value on the green loyalty of users and non-users of public bikes

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ABSTRACT

This work aims to understand how to establish green loyalty for public bike schemes using a modified version of the technology acceptance model (modified TAM). Moreover, the findings also reveal that the mediation effect of perceived fun to use has stronger power, and perceived ease of use has no obvious influences on sustainable loyalty for either users or non-users, the implication of which is that fun in people's lives hugely reduces the significance of usefulness for users, and perceived ease of use cannot produce sustainable loyalty to public bikes. Therefore, governmental policies are needed to promote users' perception of enjoyment of using the bikes and non-users' perceived usefulness so as to increase their green loyalty to public bike-sharing.

1. Introduction

For a better natural environment, reducing the utilization of energy and carbon emissions has become the responsibility of all of us in the international community (Mowery et al., 2010; Arent et al., 2011; Trappey et al., 2012; Rosen and Guenther, 2015). Environmental issues have become a crucial and influential topic owing to the recent global warming phenomenon (Newell and Paterson, 2010; Wirl, 2012; Cho et al., 2014; Desmet and Rossi-Hansberg, 2015). Users and consumers are also paying more attention to environmental trends and the environmental impact of pollution (Awuni and Du, 2015; Zhao et al., 2016). Therefore, environmentalism is flourishing among users and consumers, and norms for industrial sustainability have become more rigorous all around the world (Flammer, 2013; Qu et al., 2015). The general public is also more willing to use or consume green products as long as they are considered to be sufficiently trustworthy regarding their environmental usefulness (Wells et al., 2011). Similarly, Peattie (1992) and Ding et al. (2015) also indicated that governments should disseminate accurate information so that consumers will increase their trust in and perceived usefulness of the green products and services they provide. It is thus clear that how to develop a sustainable world is now a more critical issue than it was in past decades.

The transportation sector is responsible for creating 14% of the greenhouse gas emissions and nearly 50% of global oil consumption and 20% of the energy use in the world, the principal contributors of which are discharged by urban transport (IEA, 2015; IPCC, 2015). Hence, many transportation policies have been instituted to strengthen alternative transport systems, such as, for example, the systems of bike-and-ride and public bike-sharing in urban areas, so as to reduce the harm inflicted on the environment (Martens, 2004; Kaltenbrunner et al., 2010; Pucher et al., 2011; Kaplan et al., 2015). In addition, despite the current focus on environmentalism, and the environmental value of this public transportation service, usage of such systems is still not high. Hence, a clear understanding of the psychology of using public bikes is crucial for increasing the use of bike-and-ride and public bike-sharing services. This study therefore focused on the analysis of a public bike system (YouBike) run by the Taipei City Government, which promotes the short distance use of bicycles, thus decreasing private transportation use in the urban area.

YouBike is a public bike system with an online membership registration system and radio frequency identification control panel system in an urban area and would be regarded as a new transportation technology from the riders' perspective. The modified technology acceptance model (modified TAM) is the most commonly applied theory for assessing technology acceptance (Ajzen and Fishbein, 1980; Davis, 1989; Moon and Kim, 2001; Chen and Chao, 2011). Therefore, this study adopted the modified TAM to explore the use of this new transportation technology based on the five constructs of green perceived value, green perceived usefulness, perceived ease of use, perceived fun to use and green loyalty. Nevertheless, green loyalty is a central concept in the theoretical framework, and this research aims to assess whether the continuous usage of public bikes originates from a sustainable

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motive. Consequently, green loyalty refers to the extent of reuse intention due to a significant environmental motive for public bike-sharing. Loyalty is also a critical outcome for satisfaction, attitudes and habit (Chen and Chao, 2011; Park and Kim, 2014; Passafaro et al., 2014) and is hence the central construct in this work. The findings of this study can provide evidence for governmental policies to promote implementations of green transportation by green consciousness construction, and to enhance green loyalty to public bike usage via the four proposed constructs. Past surveys have extensively studied the issues of the five constructs of general TAM usage, but, to the best of the author's knowledge, no survey has as yet studied whether the external variable of green perceived psychology influences green usefulness, ease of use and fun for environmental loyalty based on the modified TAM concept for public bikes. This study hence focuses on filling this gap in the understanding of transportation behaviors.

A framework consisting of the five prior constructs of public bike use is proposed, combined with the modified TAM, to address the issue of public adoption of green transportation. In this work, the framework is applied to identify the ways in which governmental policies can increase green loyalty to green transportation via the four other constructs of public bike users and non-users. The literature regarding green consciousness, psychological marketing and modified TAM is reviewed in order to create a novel theoretical framework for public bike usage.

This article is structured as follows: the literature review and hypotheses are presented in Section 2; the data explanation is discussed in Section 3, which also presents the sample, data information and constructs. The descriptive statistics, reliability and common method variance, factor analysis, multicollinearity, correlation coefficients between the variables, discriminant validity and convergent validity, as well as the results of the bootstrap analysis and structural model are all described in Section 4. Finally, Section 5 presents the conclusions based on the findings, while also discussing the implications of the findings and suggesting directions for further research.

2. The concepts and research hypotheses

2.1. Green transportation service

Transportation is a critical factor in governmental and commercial environmental policies because of its huge impact on the planet and the obvious carbon emissions by the average household (Yang et al., 2009; Glaeser and Kahn, 2010; Nagurney et al., 2010; Kormos et al., 2014; Cui and Li, 2015). However, even though the environmental impact of transportation is huge, few definitions of green transportation services have been put forward in the literature. The focus of prior investigations has been on how to support the services through taxation (Potter et al., 1999; Björklund, 2011).

A clear definition of green transportation services according to Dudow (1998) is that service which does not damage the health of mankind or ecological conditions, regardless of its short or long term use. Four criteria were proposed: (1) the amount of emissions and waste must fall below the loading of the planet; (2) the usage of renewable resources must be less than the rate of their production, and the usage of non-renewable resources must be at or below the rate of producing renewable substitutes; (3) it must use the least land and produce the least noise, and (4) the total cost of the system must be borne by the users. Jeon et al. (2010) provided a similar explanation: (1) it meets the transportation needs of individuals and society consistent with human and ecosystem health and with equity within generations; (2) it is affordable, operates efficiently, offers choice of transportation mode, and supports a vigorous economy, and (3) it produces limited emissions and waste which fall within the environmental ability to absorb them, minimizes the usage of non-renewable resources, reuses and recycles its ingredients, and minimizes the depletion of land and the production of noise.

Bike-sharing services conform to the above characteristics owing to their low emission and waste levels, and include the attributes of low access cost, moderate travel speeds and flexibility of departure time compared with other travel modes. They also bring many health benefits, while helping to improve the environment and the user's quality of life (Akar and Clifton, 2009; Fishman et al., 2013; Zhao et al., 2014). In addition, public bike usage is a sustainable form of transportation which can contribute to lowering greenhouse gas emissions and waste, and to minimizing the use of land and output of noise (Bai et al., 2006; Gehlert et al., 2013; Gärling et al., 2014). Hence, users can perceive this type of service as a green alternative, and the service is an essential and unavoidable development to achieve sustainable transport goals.

2.2. Modified technology acceptance model

A transport system with an online membership registration system and radio frequency identification control panel system in an urban area, such as public bikes, can be regarded as a new transportation technology from the traveler's perspective. The TAM is the most commonly utilized theory for evaluating technology acceptance (Davis, 1989; Chen and Chao, 2011), and therefore is appropriate in this case for evaluating the acceptance of the public bike system by its users.

The TAM, as proposed by Davis (1989), is derived from the notion of the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980), which is related with the behaviors of new technology usage. TAM considers the relationships of external factors with beliefs, attitudes and intentions (Davis et al., 1989; Venkatesh and Morris, 2000). It consists of two constructs that affect the acceptance intentions: perceived usefulness (an increase in the performance in some part of the user's life within an organizational context) and perceived ease of use (the extent to which an individual believes that using the system would be effortless) without the antecedents of usage intentions and behaviors.

Green loyalty is the main variable of being explored via these constructs of perceived fun to use, based on the modified TAM of Csikszentmihalyi (1975) and Moon and Kim (2001), perceived ease of use and green perceived usefulness (Teo et al., 1999). Since this framework focuses on sustainable usage, loyalty and environmental usefulness, and is formed as a green modified TAM, we therefore consider green perceived value as the antecedent to investigate green loyalty to a public bike system (Benbasat and Barki, 2007). Furthermore, future research adopting TAM could be focused on the antecedents of the consequences of usage behaviors.

Some prior works have adopted TAM to explore issues in the transportation field such as a study on users' perceived usefulness, perceived ease of use and habit to evaluate the switching intention to public transportation (Chen and Chao, 2011), and another which explored a model of personal innovativeness, perceived risk, perceived usefulness, perceived ease of use and behavioral intentions of the TAM to examine consumers' decision to adopt mobile ticketing for high speed rail passengers (Cheng and Huang, 2013). However, these works were more general studies of TAM applications, and only this study integrates sustainable consciousness with perceived usefulness and loyalty to establish the green modified TAM to investigate issues of green loyalty psychology for public bikes.