Investigating the willingness of use autonomous bus as a last-mile travel mode: First evidence from public trial in Kista, Stockholm

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Problem Statement and Research Gaps

In urban cities, a metro system is an essential public transport service to move people in and around the cities. It enables people to travel at a more cost effective way. That is said, often less-than-satisfactory first-mile and last-mile access to this metro service is one of the key factors which affects people to choose driving over using public transport service (Hai & Amedeo, 2016).

The presence of small size autonomous bus (AB) opens up more alternatives to the existing last mile travel options. It can be used to enhance people's first-mile and last-mile travel experience. Whilst there have been a significant number of studies were conducted to understand factors affecting user's perceptions and acceptance of autonomous vehicles (AVs) and AB, there are, however, much limited number of literatures on the models to study intention to use an autonomous bus service over other travel options. Also, the factors affecting and the complexity underlies the travellers' intention to use AB for this last-mile service is largely unknown.

Research Objective

Our work aims to investigate the factors affecting people's willingness to use a last mile autonomous bus service over their existing last mile travel modes. The data used in this study was collected among travellers who live and work along the roads served by autonomous bus, as their last-mile alternative, in Kista Science City, Stockholm, Sweden.

Methodology

Firstly, literature review in searching for significant external variables including socio-demographic, travel characteristics and travel attitudes variables affecting people's intention to use AB service was performed. Socio-demographics in terms of gender (Brandon & Sivak, 2015) and age (Rödel et al., 2014), automated driving technology awareness (Schoettle & Sivak, 2014), acceptance of advanced driving systems (Continental, 2013), data privacy concerns (Zmud, Sener, & Wagner, 2016), experience with Advanced Driver Assistance Systems (Zmud, Sener, & Wagner, 2016), using multiple modes (Krueger, Rashidi, & Rose, 2016), and population density -urban areas (Krueger, Rashidi, & Rose, 2016) are found to be significantly affecting people's intention to use an AV; In-vehicle security (Salonen, 2018), waiting time and travel time (Scheltes & de Almeida Correia, 2017),and travel fare, passenger security especially in

night time and existence of on-board steward (Piao et al., 2016) are found to be significantly affecting people's intention to use an AB service.

Many of the literatures mentioned above were collected based on hypothetical situations. Not many studies were collected based on respondents who have been exposed to such service in real life. Having exposed to the real vehicle operation on their roads daily would give them an opportunity to use the vehicle on daily and basis and more accurate context of the pros and cons of the vehicle in making choice to use the service. To address this research gap, this study aims to investigate what variables influence the users who live and work along this road willingness to use the autonomous bus service over other travel options. To reach this research objective, self-regulation theory (Bamberg, Fujii, Friman, & Gärling, 2011) model, as shown in Figure 1, will be used. This model was derived from past behavioural change models including Theory of Planned Behaviour (TPB) (Ajzen, 1991), norm-activation theory and joint theory. This model gives a beginning point for a new line of research but still further empirical research is needed to validate the model (Bamberg, 2013).
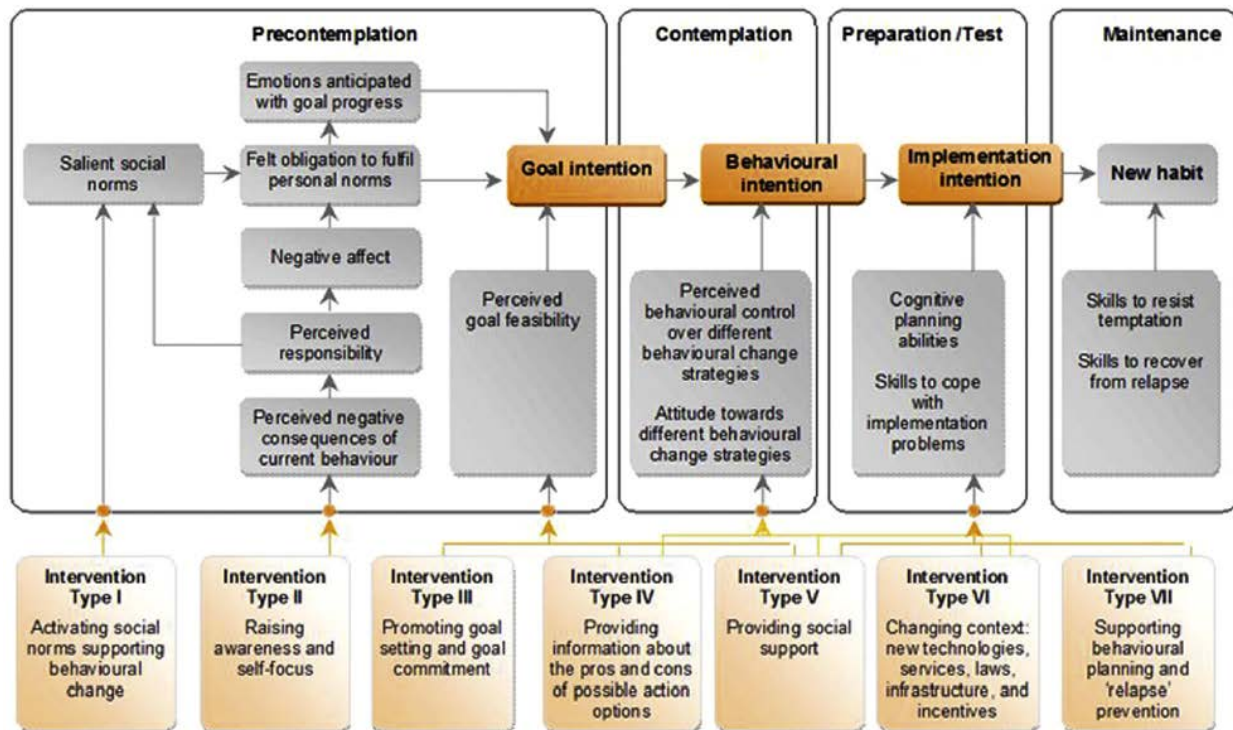

Figure 1 Self-regulation theory (Bamberg et al., 2011)

The dataset used in this study come from 524 respondents who are identified as the potential users of a last mile AB operating in Kista, Stockholm. The identified determinants of the potentials users' willingness to use the last mile AB service will be identified. Structural equation modelling (SEM) will be used to examine the interactions between different elements underlie the decision to use the service.

Preliminary findings

Preliminary findings from analysing the first wave of data collection shows that social influence, public transport usage, commute by bus, metro, train and cycling for daily trips, and level of experience with riding AB are positively correlated to the potential users' intention to use the last mile AB service operating in Kista, Stockholm. On the hand, against common believe, being tech-savvy is negatively correlated to their willingness to use the service.

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