The influence of non-instrumental variables on individuals' time-scale responses towards the introduction of a new public transport option

Nursitihazlin Ahmad Termida*, Yusak O. Susilo and Joel P. Franklin
Department of Transport Science, KTH Royal Institute of Technology, Teknikringen 10, 100 44 Stockholm, Sweden

*Corresponding author, email: nursitihazlin.termida@abe.kth.se

EXTENDED ABSTRACT

It is a human nature that individuals may take time to adopt a modified or new public transport (PT) option introduced in their neighbourhood area because of various factors, which resulting in the dynamic behavioural responses. Due to these phenomena, this study is aiming on examining the impacts of individual's non-instrumental variables (e.g. attitudes, perceptions, etc.) on his/her dynamic responses towards the introduction of a new PT option. Many previous researches have argued that non-instrumental variables play a vital role as well as instrumental variables (e.g. travel cost, travel time, etc.) on individual's learning and decision process over time in using PT services (e.g. Taniguchi and Fujii, 2007; Lanzendorf, 2003, 2010). Douglas (2003) and Chatterjee (2001) hypothesised that non-instrumental variables such as travel habit, learning process and many other elements affect individuals' time-scale responses towards the use of a new or modified PT option after its introduction. Unfortunately, despite being mentioned often as one of several possible critical elements that influence individuals' learning processes (e.g. Chatterjee and Ma, 2006, 2007, 2009), there have hardly been any studies that examine this hypothesis empirically, except for a study done by Chatterjee and Ma (2007) and Chatterjee (2011) where they found that different individual with different socio-demographic background and also past travel behaviour did influenced the individuals' time-scale responses towards the use of a new fastway bus airport service in Southern England by using duration model. Therefore, individuals' dynamic behavioural responses are important in order to understand the short- and long-term demand and business viability of a new transport service. Hence, it is important to incorporate both subjective and objective factors that influence individuals' dynamic behavioural responses in order to produce better predictions on travel demand in a changing environment.

This study proposes an alternative model that modified the Theory of Planned Behaviour (TPB) model framework (Ajzen, 1991) with "situational motivation" variables, for explaining the intention on using a new PT option soon (within 1 week) after its introduction. The case study in this paper is a new extension of a tram line connecting the suburbs of Alvik and Solna Centrum in Stockholm, Sweden. The "situational motivation" element is added to the modified TPB framework because Chatterjee (2001) argued that individuals may react differently in unexpected/different situations. For example, experiencing unexpected delays on a current mode due to a road works closure is one factor that may influence individuals' quicker responses towards using a new transport option. Then, past behaviour variables were used in the model framework in order to test the theory's sufficiency as argued by Ajzen (1991: 2002). Finally, the panel analysis on the effect of non-instrumental variables towards the frequency of using the new tram line extension service over time since it was opened to the public was done.

A Simultaneous Equation Modelling (SEM) technique was used to estimate the relationships between behavioural constructs and panel data, which was collected in four different waves: two weeks before the service was opened (wave 1), a month after (wave 2), four months after (wave 3) and seven months after (wave 4) the new tram line extension opened to the public. A 7-point Likert scale questionnaire measuring all of the non-instrumental variables, as well as stated intention to use the new PT service soon (within 1 week) after its introduction, were distributed through an online survey approach. The actual use of the new tram service was obtained in waves 2 and onwards, where respondents stated in which preceding week they first used the new tram line extension service, relative to its opening day. Then, five categories of individuals' time-scale responses were developed, where category 1 was defined as a 'very quick-response' (using the new extension within 1 week after

its opening). Respondents' 2-week travel diaries were collected during the observed period. Out of 130 participants, 96 individuals completed all 21 questions used for this analysis, where the remaining sample consists of 69 males (71.9%) and 27 females (28.1%). As for the panel analysis, 45 out of 96 individuals who already used the new service and also involved in all waves questionnaire were included in the analysis.

The results (χ^2 = 274.9 ($p < .05$); df = 188; χ^2/df = 1.46; RMSEA = .07; CFI = .88; NFI = .72; AIC = 448.9) are somewhat mixed as to whether the model is a good fit (Ullman, 1996; Browne and Cudeck, 1993; Hu and Bentler, 1999; and Bryne, 1994). However, based on the argument by Bearden, Sharma and Teel (1982) regarding low NFI values for small sample sizes, the model was accepted and the results were interpreted. It was found that the TPB determinants can predict the intention, and only the intention can predict the behaviour of individuals' time-scale responses towards the introduction of a new PT option. The "internal situational motivation" latent variable significantly influenced the intention which indicates that the new PT option should fulfil individuals' desired destinations in order for them to adjust their travel choices and develop their intentions to use the new PT option as soon as possible under unexpected conditions. This finding suggests that the accessibility from individual's perspective for example proximity of destinations and spatial distribution of different land use mix (offices, stores, recreational areas, etc.) are crucial for individuals to add the new PT option introduced in their choice set. This suggestion is also applicable based on the findings from the panel analysis in which that individual's perception on walking distance in using the new tram line extension service can influence his/her to use the new service frequently and constantly within seven months period after the new service was introduced. As argued by Frank et al. (2003) and Handy et al. (2002), access to destinations has positively correlated with walking for transport. Note that none of the past behaviour variables were significantly influenced the individuals' time-scale responses behaviour. Therefore the theory behind the model framework proposed can be accepted and sufficient in order to predict the individual's time-scale responses. Despite the small sample size, this study sheds light on the subjective factors affecting individuals' time-scale responses towards the introduction of a new PT option.

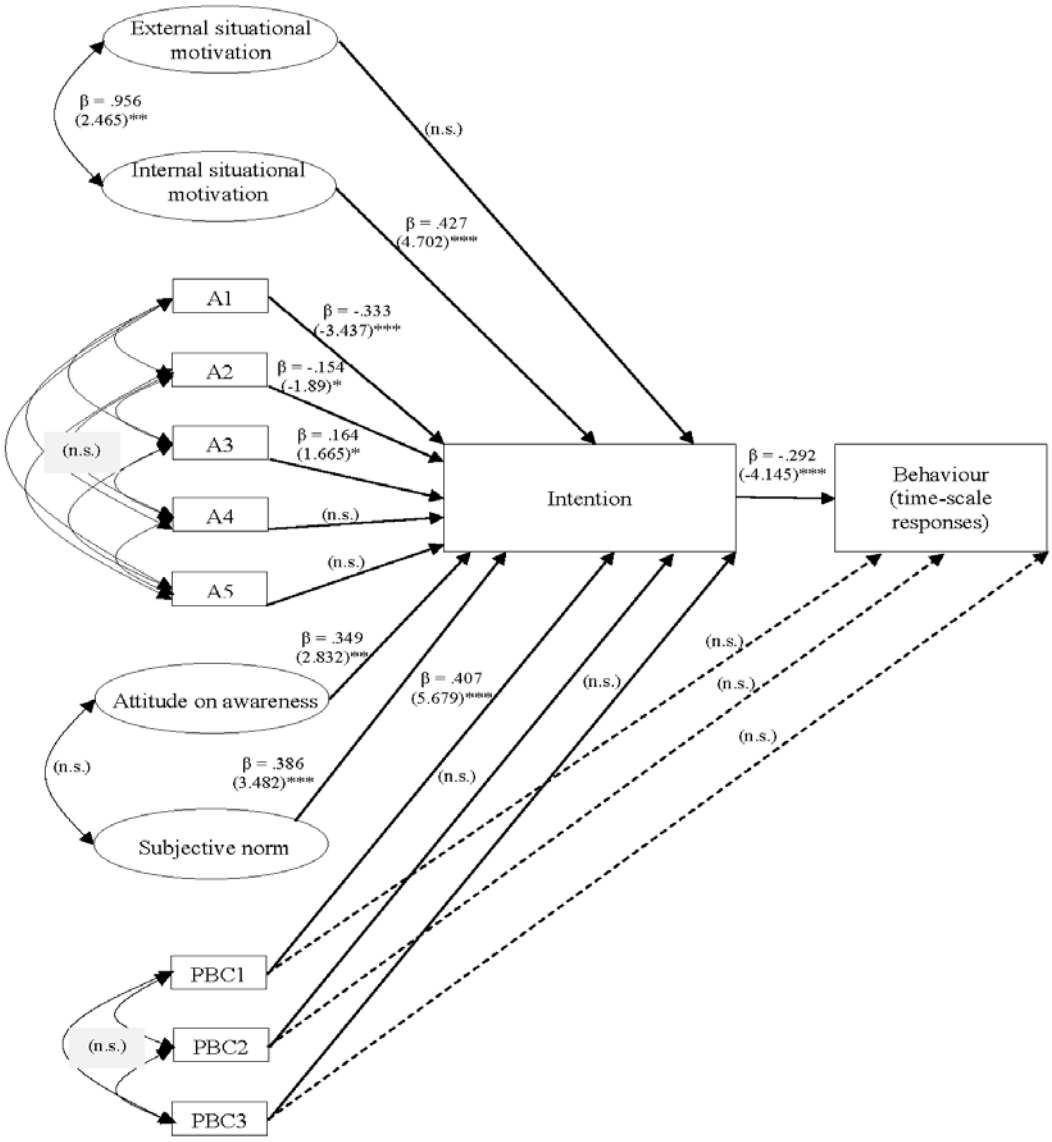

Figure 1: Determinants of individual's time-scale responses behaviour (N = 96).
Note: "A1 to A5" measure attitude towards PT, "PBC1 to PBC3" measure perceived behavioural control in using a new PT option, t-values are stated in parenthesis and *** p < .001, **p < .05, *p < .1 and "ns" means non-significant.

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