Discovering Causal Structure from Observations: The Relationships between Technophile Attitude, Users Value and Use Intention of Mobility Management Travel App

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Abstract : The increasing complexity and demand of transport services strains transportation systems especially in urban areas with limited possibilities for building new infrastructure. The solution to this challenge requires changes of travel behavior. One of the proposed means to induce such change is multimodal travel apps. This paper describes a study of the intention to use a real-time multi-modal travel app aimed at motivating travel behavior change in the Greater Copenhagen Region (Denmark) toward promoting sustainable transport options. The proposed app is a multi-faceted smartphone app including both travel information and persuasive strategies such as health and environmental feedback, tailoring travel options, self-monitoring, tunneling users toward green behavior, social networking, nudging and gamification elements. The prospective for mobility management travel apps to stimulate sustainable mobility rests not only on the original and proper employment of the behavior change strategies, but also on explicitly anchoring it on established theoretical constructs from behavioral theories. The theoretical foundation is important because it positively and significantly influences the effectiveness of the system. However, there is a gap in current knowledge regarding the study of mobility-management travel app with support in behavioral theories, which should be explored further. This study addresses this gap by a social cognitive theory-based examination. However, compare to conventional method in technology adoption research, this study adopts a reverse approach in which the associations between theoretical constructs are explored by Max-Min Hill-Climbing (MMHC) algorithm as a hybrid causal discovery method. A technology-use preference survey was designed to collect data. The survey elicited different groups of variables including (1) three groups of user's motives for using the app including gain motives (e.g., saving travel time and cost), hedonic motives (e.g., enjoyment) and normative motives (e.g., less travel-related CO_2 production), (2) technology-related self-concepts (i.e. technophile attitude) and (3) use Intention of the travel app. The questionnaire items led to the formulation of causal relationships discovery to learn the causal structure of the data. Causal relationships discovery from observational data is a critical challenge and it has applications in different research fields. The estimated causal structure shows that the two constructs of gain motives and technophilia have a causal effect on adoption intention. Likewise, there is a causal relationship from technophilia to both gain and hedonic motives. In line with the findings of the prior studies, it highlights the importance of functional value of the travel app as well as technology self-concept as two important variables for adoption intention. Furthermore, the results indicate the effect of technophile attitude on developing gain and hedonic motives. The causal structure shows hierarchical associations between the three groups of user's motive. They can be explained by "frustration-regression" principle according to Alderfer's ERG (Existence, Relatedness and Growth) theory of needs meaning that a higher level need remains unfulfilled, a person may regress to lower level needs that appear easier to satisfy. To conclude, this study shows the capability of causal discovery methods to learn the causal structure of theoretical model, and accordingly interpret established associations.

Keywords : travel app, behavior change, persuasive technology, travel information, causality
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