Transportation Research Part A 117 (2018) 302–318

Contents lists available at ScienceDirect

Transportation Research Part A

journal homepage: www.elsevier.com/locate/tra

Potential uptake and willingness-to-pay for Mobility as a Service (MaaS): A stated choice study

Chinh Q. Ho*, David A. Hensher, Corinne Mulley, Yale Z. Wong

Institute of Transport and Logistics Studies (ITLS), The University of Sydney Business School, NSW 2006, Australia

ARTICLE INFO

Keywords:
Mobility as a Service (MaaS)
Choice experiment
Service bundles
Willingness-to-pay
Nonlinear choice model

ABSTRACT

Mobility as a Service (MaaS), which uses a digital platform to bring all modes of travel into a single on-demand service, has received great attention and research interest. Different business models have emerged in which travellers can either pre-pay for their mobility services bundled into a MaaS plan, or pay-as-they-go using a smart app linked to the service. This study aims to understand how large the potential market of MaaS would be if travellers are offered this one-stop access to a range of mobility services, and how much potential users might value each item included in a MaaS plan. A stated choice survey of 252 individuals administered via a face-to-face method is conducted in Sydney, Australia and a state of the art preference model is estimated to address the research questions. Results indicate that almost half of the sampled respondents would take MaaS offerings, and the potential uptake levels vary significantly across population segments, with infrequent car users being the most likely adopters, and car non-users the least. On average, Sydney travellers are willing to pay $6.40 for an hour of access to car-share, with one-way car-share valued more than station-based car-share. Estimated willingness-to-pay for unlimited use of public transport is $5.90 per day which is much lower than the current daily cap. These findings suggest a careful segmentation of the market and a cross-subsidy strategy is likely to be required by MaaS suppliers to obtain a commercially viable uptake level.

1. Introduction

Imagine a city landscape in which you could travel seamlessly from a shared car, stationed close to your home, to a train after leaving the car at a designated parking lot at the platform's doorstep, to an express bus operating on a designated corridor, and then to a taxi which takes you to your final destination. Imagine that you can use any combination of these transport modes without the need to own a car or public transport tickets, check bus and train timetables, or pre-book a taxi, since they are all available via an app on your smartphone linked to a mobility service subscription plan. This mobility service gives you access to all modes and real time information for each journey, as well as providing instant journey planning and booking. This kind of door-to-door service, powered by disruptive transport technologies, has previously been a vision but is now starting to emerge in cities around the world under the name 'Mobility as a Service' or MaaS.

MaaS is no longer a theoretical concept to bring all modes of transport into a single mobility plan that travellers can subscribe and pre-pay for the use of all transport modes, in much the same way as people choose a mobile phone plan that meets their need in terms of calls, text and internet access. MaaS has recently been commercialised in Helsinki, Finland through the smartphone app called

* Corresponding author.
E-mail addresses: chinh.ho@sydney.edu.au (C.Q. Ho), david.hensher@sydney.edu.au (D.A. Hensher), corinne.mulley@sydney.edu.au (C. Mulley), yale.wong@sydney.edu.au (Y.Z. Wong).

https://doi.org/10.1016/j.tra.2018.08.025
Received 18 July 2017; Received in revised form 29 March 2018; Accepted 21 August 2018

Whim and the service will soon be available in the West Midlands in the UK. Other countries such as Sweden, Austria, Germany, and the US have tested mobility services on real people, real networks with real mobility plans. Australia and New Zealand are also joining the MaaS trend with the establishment of MaaS Australia, SkedGo, and other players actively working to bring the concept to market.

With a mobility plan customised to each subscriber, MaaS has a real potential to shift the traditional car ownership paradigm away from outright ownership, thereby changing the overall modal share given that car use starts from car ownership (Maat and Timmermans, 2007; Ho and Mulley, 2015). A shift in ownership is already being observed, accelerated by a myriad of mobility options such as Uber, GoGet (car-sharing), Car Next Door (peer-to-peer car-sharing), bike-sharing, and ride-sharing schemes. A move from car ownership to shared membership will no doubt be affected by the increasing deployment of self-driving vehicles promoted by several major automakers and technology giants moving to make self-driving vehicles commercially available by 2020 (Muoio, 2016). The commercial release of fully self-driving vehicles opens new markets for car-sharing (as existing non-drivers will be able to travel in a fully self-driving vehicle on their own), suggesting the effect of car-sharing on car ownership will be substantial. Recent research evidence suggests that the mobility services offered by Uber and GoGet have resulted in deferring their users' decision to purchase a car (SGS Economics & Planning, 2012; Newberg, 2015). This is a sign that shared self-driving vehicles and MaaS could deepen the reduction of private vehicle ownership, especially among the younger generations (Delbosc and Currie, 2013; Goodwin and Van Dender, 2013) since mobility will increasingly be achieved without the need to own a car or even a valid driving licence.

Among the most important questions for local governments, transport modellers, planners and economists, is whether the arrival of the repackaging of transport modes will trigger changes to short-term travel patterns (e.g., transport mode choice) and long-term choices, for instance home and work locations. Just like Uber and car-sharing services, MaaS and in due course, self-driving vehicles are initially expected to become dominant in dense urban areas, providing a good opportunity for cities to reduce the role of private cars and their negative consequences on the liveability of the city from air pollution and emissions. Once MaaS and self-driving vehicles spread beyond urban centres, the boredom of car commutes may disappear as commuters can do more productive activities such as eating, working, reading, and even sleeping. This means that travel time can be used more productively in a self-driving car than in a conventional car, and thus car users may not value travel time savings as highly as they do now. The distinction between working at the office and working while travelling may start to blur with travellers becoming 'passengers'. This possibility is supported by Ho et al. (2016) and other national guidelines, such as the New Zealand Economic Evaluation Manual (2013) and the Netherlands (Significance et al., 2012), which evaluate the value passengers place on travel time savings (VTTS) as a proportion of the car driver's values. Such a reduction in VTTS means that people are likely to be more tolerant to a long commute and this may impact on longer term decisions such as residential location, possibly moving further away from the cities to benefit from lower dwelling prices or more land for a given expenditure. This would have a significant impact on urban planning, traffic management, greenhouse gas emissions, congestion, and the viability of conventional public transport services.

The impact of shared mobility on our cities and our lives is manifold and the question of how transport technology innovations might disrupt or alter urban transport systems and, in turn travel behaviour, is being highly debated with much speculation but little substantive insight. This is partly due to the lack of relevant behavioural data and models that can provide guidance on the potential uptake of new mobility opportunities and how emerging transport options will change travel choices in the short and long terms. This paper aims to set a benchmark in identifying mobility service packages that align with the preferences of travellers, how they may take these services up, and how drivers may question the necessity to own vehicles if and when offered one-stop access to a range of transport mobility options. This study is timely in informing MaaS providers as to the business model to follow and how best to package, cost and market mobility plans to end users to obtain sustainable goals by way of designing MaaS plans that are likely to have a high take-up rate.

The remainder of the paper is organised as follows. The next section reviews the literature on MaaS with a focus on the business model and the way in which different transport options are packaged into MaaS plans for end users to subscribe. The section that follows sets out the design of a choice experiment to capture the data necessary to establish preferences for new mobility opportunities as mixtures of transport options under varying plans, followed by a summary of the empirical setting and sampling strategy required to obtain geographical coverage and representativeness of the sample. Empirically, a nonlinear logit model is estimated to provide quantitative evidence of mobility-cost trade-offs, taking into account current travel needs, and establishing the WTP for the various elements of a MaaS plan. The paper concludes with the implications the evidence has for the demand for MaaS and the development of MaaS plans that are attractive to achieve sustainability outcomes.

2. Literature on MaaS

Mobility as a Service (MaaS), also known as Transportation as a Service (TaaS), describes a personalised, one-stop travel management platform digitally unifying trip creation, purchase and delivery across all modes. For customers, it offers total integration across public, intermediate (ridesourcing, microtransit and taxi) and private (through car-sharing or cycle hire) modes of transport. MaaS provides user benefits in terms of true competition with vehicle ownership and a seamless customer experience, and benefits service providers by improving the capacity utilisation of their vehicles and opening up new opportunities for forward thinking businesses (as mobility brokers). For society, MaaS can circumvent some of the potential urban efficiency issues (e.g., autonomous vehicle externalities related to deadheading, traffic congestion, land use and the urban form) associated with new transport technologies and trends (Wong et al., 2017).

At present, there exists a small but growing academic literature specific to MaaS—investigating government interest (Heikkilä, 2014), impacts on land use (Rantasila, 2015), customer expectations (Sochor et al., 2015b), intelligent transport systems (Hu et al.,