



Projected prevalence of car-sharing in four Asian-Pacific countries in 2030: What the experts think



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ABSTRACT

This paper presents a “big-picture view” for policymakers and related stakeholders regarding the future development of car-sharing services. Car-sharing has the potential to significantly disrupt the personal mobility market. Thus, understanding their market penetration and implications is urgently needed. Previous studies in this domain have predominantly focused on the views, opinions, and preferences of consumers. In this study, we complement the current demand modelling research on car-sharing by applying an expert elicitation and aggregation technique that relies on transport experts’ opinions to investigate the role of car-sharing in the future. Specifically, based on the opinions of mobility suppliers, this research elicits experts’ judgment from across government, industry, and academia to gain insights into the future of car-sharing markets in four countries – Australia, Malaysia, Indonesia, and Thailand. The analysis reveals that, from a mobility supplier’s perspective, energy and vehicle prices will not have a statistically significant impact on the future adoption of car-sharing. The results also show that the more knowledgeable an expert is, the more pessimistic they are about the market penetration of car-sharing in 2016, and the more optimistic they are about the prevalence of car-sharing in 2030.

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1. Introduction

Numerous resources in modern society are under-utilized. This is particularly the case within the transport sector, where private vehicle ownership dominates the set of mobility choices in spite of the fact that a typical car remains unused for approximately 95% of the day (Shoup, 2005). This particular example of inefficiency within our current transport system highlights the potentially significant benefits that new mobility services present to policymakers who aim to reduce the environmental and health impacts of congestion, as well as improve the overall liveability of urban environments.

Car-sharing is a mobility service that allows members to have short-term access to automobiles (Duncan, 2011). After signing up for a vehicle-sharing service that allows members to use a variety of vehicles, one can reserve a vehicle for a specific trip. The main aim of car-sharing is to provide individuals with a mobility solution that requires lower responsibilities and smaller associated costs than vehicle ownership (e.g., initial capital cost, fuel, maintenance, insurance, etc.). Convenience and

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affordability are core features of car-sharing, and it is therefore of particular interest to consumers who only occasionally use a vehicle or cannot afford to own a private vehicle (Litman, 2000).

Over the past decade, researchers have investigated a range of issues related to car-sharing, including understanding consumer preferences, identifying barriers and opportunities, and forecasting future market potential. This study contributes to this discussion by applying a unique approach within the car-sharing literature to elicit experts' opinions. This, in turn, will shed light on what transport experts expect the future of the car-sharing marketplace to look like in Australia, Malaysia, Indonesia and Thailand over the next 15 years.

When predicting future events, policymakers, researchers, and industry stakeholders need to account for the uncertainty associated with the evolution of a wide range of variables (Morgan et al., 1992). Predicting the car-sharing market potential is fraught with challenges because it involves expertise and knowledge from a broad range of fields, including government, academia, and industry. One way to accommodate its multidisciplinary nature is to obtain cross-sectional knowledge by eliciting the opinions of experts who have informed views about the likely future evolution of the mobility marketplace and are aware of the relevant factors. This approach has been frequently and successfully used in studies across a wide range of disciplines, such as forecasting national economic growth (Gordon and Helmer, 1964), analyzing the risk associated with nuclear waste storage (Dewispelare et al., 1995), forecasting climate change (Morgan et al., 2001), assessing environmental health (Knol et al., 2010), and modelling shipping accidents (Zhang and Thai, 2016). However, eliciting experts' opinions presents two well-known challenges: experts may not have the appropriate incentives to reveal their true beliefs, and some experts may be better informed than others. The Bayesian Truth Serum (BTS), proposed by Prelec (2004), is an analytical solution designed to address these two challenges. More discussion on BTS is provided later.

Mainly using BTS, this study forecasts market penetration (measured as the trip proportion) of car-sharing in four countries. More specifically, the unweighted or average aggregated (using the majority rule) forecasts are compared with the BTS-weighted/aggregated ones. Factors influencing experts' predictions and changes in car ownership are also analyzed. This specific investigation into the future of the car-sharing market was part of a larger project aiming to build market intelligence regarding the mobility market in Asia-Pacific countries over the next 15 years. The scope of the overarching project encompassed forecasting uptake of different mobility services, and the potential impacts of different policies and market variations, such as fluctuations in energy prices. The ultimate aim of this broader project is to use the information obtained through this research piece, in addition to other consumer-focused studies, to generate a series of likely mobility market scenarios from 2016 to 2030 for Thailand, Indonesia, Malaysia, and Australia. In the context of the larger project, we intend to compare the results obtained through elicitation of experts' opinions with those obtained using more conventional consumer survey techniques (including stated preference tasks) at a later date in order to better understand the relative merits and pitfalls of each approach.

This paper continues by providing an overview of the car-sharing literature, particularly car-sharing demand modelling in Section 2. Section 3 presents the methodology employed in this study, specifically the elicitation method (i.e., the BTS) developed by Prelec (2004). This is followed by the results which are documented in Section 4. Finally, Section 5 concludes with a discussion of this study's main contributions and limitations, as well as topics that warrant further investigation.

2. Literature review

The following section provides an overview of the car-sharing literature with a focus on demand modelling.

2.1. The case for car-sharing

Globally, vehicle ownership continues to grow. More vehicles will be manufactured as developing countries keep improving the living standard of their citizen, and the improved features of private vehicles such as comfort, convenience, and prestige will lead people to move to motorized vehicles as long as economically feasible (Wright and Fulton, 2005; Dargay and Gately, 1999; Dargay et al., 2007; Fulton and Eads, 2004; Bradshaw, 2010). As a consequence, the increasing ownership and usage of vehicles are leading to numerous social, economic, and environmental issues (Schuster et al., 2005; Frank et al., 2010; Nordlund and Garvill, 2003; Booth et al., 2000; Steg, 2005). In response to this situation, the potentially positive effects of car-sharing are of interest to policymakers and researchers. Car-sharing programs have the potential to reduce automobile usage and personal vehicle ownership, as well as encourage individuals to use public transport/cycling/walking more frequently (Martin and Shaheen, 2011). Ultimately, a more-efficient utilization of urban mobility services can reduce the total number of vehicles on the road, lead to vehicles being used more efficiently, reduce idling time and, in turn, reduce the need for parking spaces (Mitchell et al., 2010).

2.2. History of car-sharing

Car-sharing began in the mid-20th century. The first trial was launched in Zurich, Switzerland, in 1948 and expanded during the following decades to other European countries, including France, Netherlands, Sweden and others. In North America, car-sharing started with two projects: Mobility Enterprise, conducted by a Purdue University research group; and Short-Term Auto Rental (STAR) in San Francisco in the early 1980s (Shaheen and Cohen, 2007). The first car-sharing programs

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