

# Lessons learnt from a corporate car-sharing system: the case of the University of Luxembourg

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## 1. Problem and research questions

Car dependency in modern societies carries important social and environmental costs. In Luxembourg, 75% residents commute by car, and this ratio rises up to 89% if one considers cross-border commuters (Carpentier and Gerber, 2009). Reducing car use for the morning and evening commute is an important challenge. Ambitious modal split targets have been set by the government, with the main objective to limit the rapidly emerging congestion issues, which made Luxembourg City the 5<sup>th</sup> most congested metropolitan area in Europe in 2016, despite a population slightly exceeding only 120.000 inhabitants (European Commission, 2016). Travel demand and supply management measures (e.g. parking pricing, subsidized public and soft modes of transport, etc.) as well as a polycentric and densification spatial planning policy to favor proximity between residential areas and the location of other activities have been implemented in the last years to meet the ambitious sustainability targets.

However, if the provision of residential opportunities and the investments on public transport is a must, reduction in car use still depends on the complexity of activity chains both during commuting (Bhat, 1997) and more generally on the whole activity-travel chain (Cirillo and Axhausen, 2012). Moreover, it has long been argued that long-term decisions such as workplace relocation may have negative impact on modal split, hence not always yielding to reduced car use (Sprumont et al., 2014).

We argue that, in this particular context, public institutions and large private companies located in Luxembourg are key actors on which one needs to rely for fostering sustainable mobility. On one hand, they are the intermediaries between policy makers and the travellers, hence having a large responsibility in monitoring the sustainable mobility and in the same time have the interest to guarantee high welfare and commuting satisfaction of their employees.

An effective way of incentivizing people not to commute by car is to offer alternative solutions that can be competitive. However, competing alternatives should not only be considered for the home-work trips, but also for the out-of-office activities, which also require connecting transport modes that are of sufficient quality to guarantee minimizing the wasted time out of the office. Providing solutions like corporate car sharing is therefore appealing for companies to improve the employees' productivity and their overall satisfaction.

Despite these solutions are well established and widely adopted, and their benefits to both enterprises and car-sharing providers has been supported by past studies (e.g. Shaheen and Cohen, 2012), not much is known of how these systems are actually used, and whether they help in increasing the trips done by Public Transport or other alternative modes for the commuting trips.

This study aims to advance onto this direction by analysing data collected at the University of Luxembourg, where a corporate car-sharing system has been implemented since 2015. Using both survey data and data shared by the car-sharing company we aim to gain insight into how these systems are used, and in turn how they can be effectively implemented to foster sustainable mobility.

## 2. Methodology, research strategy

In order to gain insight into the use of corporate car sharing, a car-sharing pilot system was launched in September 2015, consisting of a fleet of 9 cars freely accessible to the University of Luxembourg employees (Figure 1). Initially, the system was restricted to a limited number of initial testers (50) for the first 9 months, and then this number was doubled. In September 2016 the system was finally opened to all staff members, reaching a final number of registered of, currently, more than 180, which currently represents more than 10% of the University's population.

These cars are mainly offered to the staff for any type of professional out-of-office activity, including intercampus connectivity. The university is in fact consisting of four campuses, three of which are in Luxembourg City, while the newest and biggest campus is located in the *City of Sciences/Belval* (around 25 km from the capital), one of the new activity poles established by the government in the south of the country. One of the main reasons supporting the adoption of corporate car sharing is that the university expects to improve the accessibility of the new campus especially considering that in this newly developed area the public transport offer is not yet fully deployed. In turn, the expectation is that the existence of this alternative may have a positive influence to the mode chosen for commuting. For the same reasons, apart from the corporate cars, the university also launched a shuttle service (mainly for use by the students), which connects the campuses each hour between 8AM till 19PM, and a carpooling platform. We focus however only on the car-sharing system, leaving a more comprehensive multimodal study to the future.



Figure 1: corporate car sharing fleet located in Campus Kirchberg

Therefore, in this study we aim at empirically assessing the car sharing system and identifying the main control variables when optimizing the system in function of the mobility needs. In order to reduce the number of controlled variables and factors that could influence the use of the car sharing system, we placed no restrictions in the number and duration of the reservations.

The commercial service provider, CityMov', offered us the possibility to collect different types of data, from the more traditional reservation starting and ending times, to more interesting and insightful ones such as GPS positions of the cars and (when filled) the motivation of the trips. In addition, we collected in June 2016 a travel survey for the whole university, where some additional questions were asked to the car-sharing users. This set of data is rather unique and is argued to help enormously companies like the university to optimize and make best use of the mobility resources and budget used.

In the full paper we will study and profile car-sharing users in order to understand how these systems are exploited. Here we present some preliminary findings, based on the first year of collected data.

### 3. Major findings

In the preliminary analysis we focused on understanding what type of profile the car sharing users have. Figure 2 shows for example the growing use of the cars in the period January-September.

The first growth is attributable to a learning phase, as the car-sharing was initially not enough promoted, while the second change in between June and July is due to the doubling of the registered users. At this stage, the number of cars was sufficient and the chance to have no availability of the cars was relatively low. This means that we are still reasonably far from the capacity of the service. The data collected after September, and currently being processed, contains significantly more cases of no availability. This helps us also at understanding how people change behavior when they concurrently use a sharing mode under limited capacity.

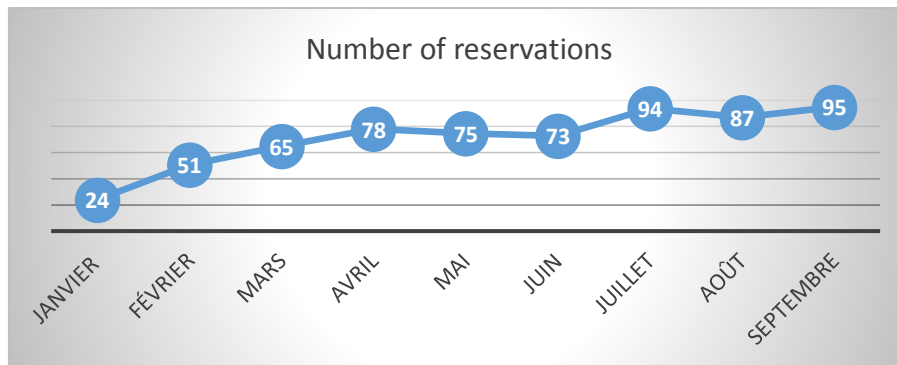


Figure 2: number of reservations in time

One of the interesting aspects that we expect to change is how early users will book their cars. Figure 3 (top) shows for instance how much time in advance users reserve their cars. As one can see, in case of low chance of no availability, there is a large number of users that books their car almost at the time they need it, while a relatively lower percentage plans the trip and reserves the car one or more days in advance. We expect this habit to change when the system reaches its capacity.

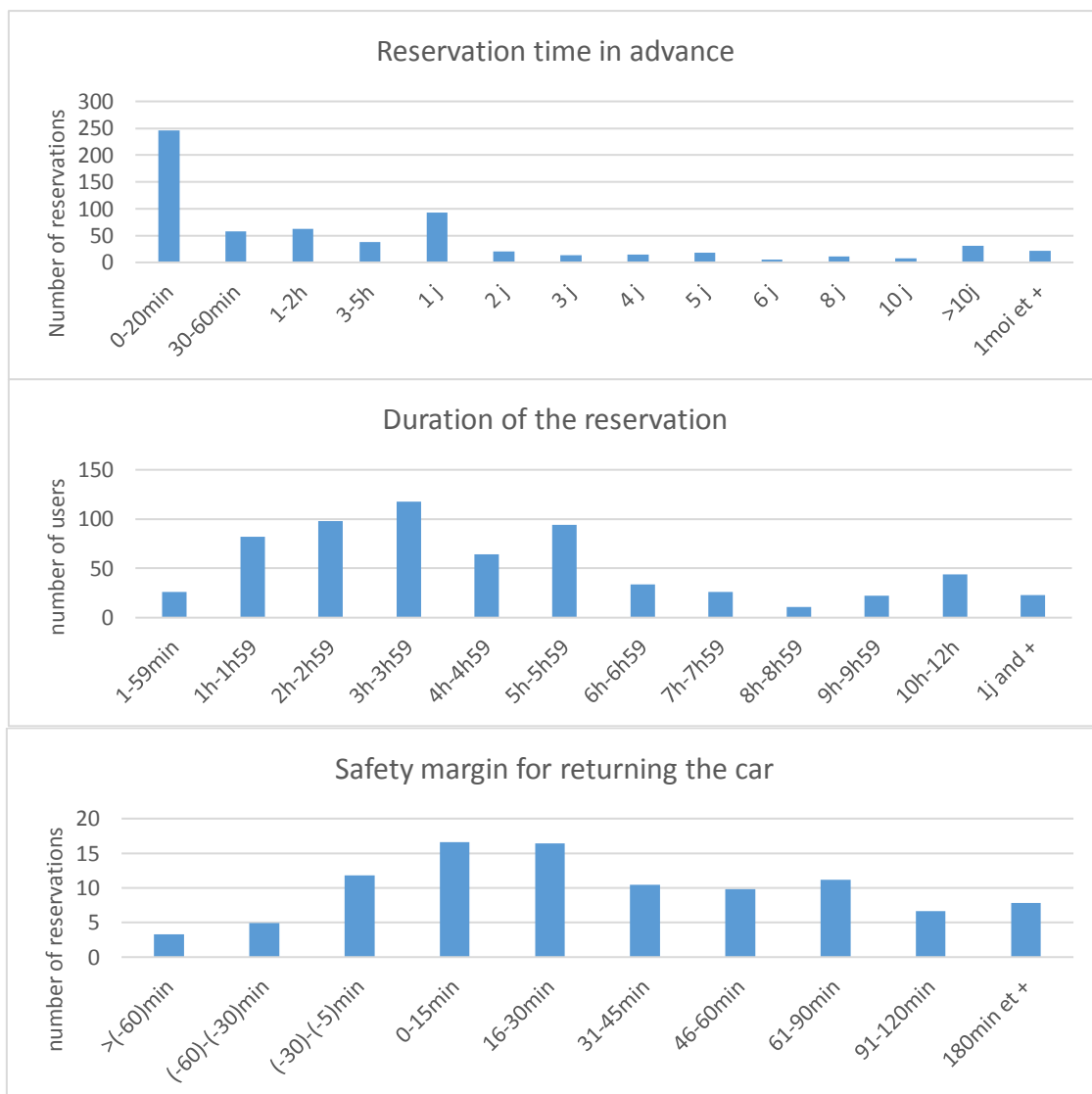


Figure 3: How much time ahead users book cars, for how long and how early they return them

Figure 3 (middle) shows instead the distribution of duration times for the booking. As one can see, the most frequent case is for half a day, but generally there is a skewed distribution pointing at two main primitives, one around half day, and the other for a full day, although we need to process more data to fully characterize these distributions. This will be possible once the full year will be processed.

Note again that there is no time limit for exploiting the system, and in some exceptional case the car can be kept also overnight, although this is allowed only in special conditions. It is clear that the reason for having relatively long booking times, is that there is no real incentive of estimating well the time the car is needed, as no cost or limitation in time is involved in this initial phase. This is also confirmed by the graph in Figure 3 (bottom), which shows that the users tend to return the cars very often with a large margin of anticipation (more than one hour). Clearly, this is cause of inefficiency for such a system, as the cars are reserved for longer time than necessary, hence is a waste of capacity.

#### **4. Takeaway**

The preliminary findings already give a number of potential directions where to further explore the collected data. We aim to acquire additional insight into the type of users of the car sharing system. Thanks to the additional information collected also through the travel survey, we want to also understand if the existence of the car-sharing is providing some positive effect on the commuting mode chosen by the university staff members. In the travel survey, about 10% of the car sharing users stated to commute by car, which is significantly lower than the same statistic for all staff members (around 44% of car users). This of course only partly points at a positive influence of the car-sharing system, as clearly PT users are more attracted to use the car sharing to reach activities out of the office. Additional information is currently being collected, to highlight the net effect of the car sharing system.

The full paper will show the full one-year dataset, and we aim to profile the car-sharing users using characteristics probability distribution functions. The final model developed will be used to predict the impact of the size of the fleet and the number of users on the main variables (average reservation times, booking times, probability of overbooking, etc.).

#### **5. Keywords**

Corporate Car-Sharing; Sustainable Mobility; Statistical Analysis; User Profiling

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