Testing a New Model for a Sustainable Mobility in the City of Milan: The Condominium Car Sharing

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Abstract This chapter will describe the testing and prototyping of one service-idea concept: condominium-based electric car sharing. It describes the testing phases in a detailed way, explaining the choice of the prototyping specific contexts, the testing modality and the results. The choice to prototype the service idea, directly in interested locations, was made in order to come in contact with potential users and initiate a co-design process. Involving users has two main goals: understand the needs and the desires of users on the one hand, provide information and make car sharing opportunities more known and available to a wider public on the other hand. The interaction with users also allows the users themselves to come up with service improvements and integrations. The prototype was made in two co-housing complexes in Milan with different sizes and cultural background using the same prototyping method: testing lasted six months with a plan of meetings, focus groups and observation. During the testing, the conditions of use were modified and verified with the users. Users feedback, as well as design insights, were then elaborated and were able to generate a series of results and considerations. Subsequently, during the phase of re-elaboration of the results of our experimentation, we tried to imagine transitory solutions towards a future growth of electric car sharing (and related environmental and urban benefits), exploiting the opportunity provided by Milan's many underground public and private parking lots.

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1   The Goals of the Field Trial Study

The Green Move project included a real trial of the idea of condominium electric car sharing. It was important to include this stage to verify and prototype elements of the solution in an early phase of the project. All things considered the testing resulted useful for another reason; by involving people outside the research group, it fosters communication and dissemination of new mobility scenarios. In one of the testing contexts, communication reached about 100 families. Not all of them took part in the testing, but the awareness of the opportunities for development of new models has been reached. The experimentation allowed exploring and better understanding the different phases: (1) access/acceptance: how is the idea perceived? Is it accepted? What are the barriers for entry and the difficulties met? At this stage, also communication strategies, the systems of registration and enrolment and the pricing system were tested. (2) Use: for what reason and on what occasion it is used, who uses the cars and how? What is the degree of user satisfaction? Here we examine technical issues related to the vehicle and to the reservation system. Finally, at this phase we evaluated the user experience. (3) Future use: how people imagine the service in the future after the trial is over? What are the design ideas and conditions for future use? This is the last moment of verification with users that examines the scenario as a whole, beyond the limited period of the trial. Here we questioned again all elements of the service.

2   Methodology and Phases

Thinking about condominium car sharing, one cannot ignore the trend of integrating collaborative services into living units. When housing units not only offer a basic solution (product/accommodation) but integrate collaborative services (Manzini 2008) for everyday life management, the solutions can be called Collaborative Housing. Or else, where people collaborate to overcome difficulties and create pleasurable urban life. Collaborative Housing is defined as the solutions where collaboration between the residents is an essential part of the housing model. Some examples are: co-housing, self-constructing groups, joint ventures, cooperatives, communes, integrated residences, student houses and elderly co-housing (Rogel and Cotubolo 2012). The integration of collaborative services into existing dwellings has the great potential to transform those places into more socially, economically and environmentally sustainable. The sharing of tools, objects, time and knowledge between neighbours is only natural; it is based on well-known dynamics of the courtyard and the family. Bringing it into nowadays urban areas, where social ties are getting loss is a key towards a more sustainable urban living. Car sharing is one of the opportunities we have in using the proximity of neighbours to create better mobility. In this test, as described below, we began by working in environments that already had a social predisposition.

2.1 The Selected Case Studies

The buildings selected for the trial were chosen looking at their technical aspect: the number of apartments/inhabitants and the presence of adequate (not common) spaces for shared vehicles. On the other hand, we looked at the social composition and the existence of relationships between neighbours. The latter was a first condition since it guaranteed an easier adaption and a quick and better introduction of the project in the communal environment. The two buildings respond to the first two conditions, but have interesting difference: the first, in Donadoni Street 12 in Milan, is a co-housing condominium, which presents large shared areas that were decided and designed by the inhabitants. The second, in Scarsellini Street 17, was built through a construction cooperative and saw a use of an online social platform that has further reinforced the relationship between neighbours.

The co-housing in Donadoni Street is a fairly small house of 30 families. They share a living room with a kitchen, a laundry room, a swimming pool and a workshop space. Spontaneous car sharing already took place among neighbours. The inhabitants are people well-accustomed to the idea of sharing. The building did not have an adequate space to place one or more extra vehicles, but the proximity of the Bovisa train station, where car sharing is already located (provided by the Ferrovienord, brand E-vai), has allowed the neighbours to participate.

The building in Scarsellini is a new building, with 100 apartments. Two empty garages were available with electrical plugs and counters. In the building, there are two shared rooms, one for general use where parties, dinners, sport courses are taking place and another one for children's play. The social composition here is quite diverse, both in age and in ideology. There are some neighbours that are very active and others that are not at all involved.

2.2 Organization and Procedures of the Trial

The trial was organized following the following phases:

1. Meetings with the people involved: stakeholders, directors, administrators and inhabitants;
2. Technical and users survey: verification of technical conditions and the availability of the neighbours to participate;
3. Launch event;
4. Test and closing event.

Below the phases of trial organization and run are detailed.

1. **Meetings with the people involved**

The first meetings were with those people already active in the community life of the specific building: during these meetings the idea was presented and there was

the possibility to discuss it with researchers from different departments of Politecnico di Milano involved in the Green Move project. The meetings gave us the opportunity to introduce the trial to people who are already decision-makers and influencers. In both cases, the meetings were useful and proactive. The idea was accepted well, and their enquiries were mainly aiming to clarify economic and technical details. The idea was presented to the whole of the community as well by mailing list and Web.

2. Technical and users survey

Having received the consent of the building councillors and administrators and a general interest from the inhabitants, we proceeded with the verification of the conditions of use.

Some technical conditions had to be verified: in Scarsellini it was crucial to verify that the signal for opening the car would be received in the underground garage. Usually, the cars in car sharing services are positioned outside in open parking lots. Here the car should have been positioned in -1 floor. The garage was already equipped with electrical socket and counter so that nothing remained but to set up the box with accessories. More in general, as a pre-operational simulation, at the campus of "Città Studi" of Politecnico di Milano, we had already tested the basic technical elements for the activation of an electric car sharing service. Among these some of the most time consuming, at the stage: the non-easy steps of request for installation of a charging point of E-moving (E-moving 2016); the rental of some electric cars to be made available to multiple users; the identification of specific and recognizable parking areas (Fig. 1); the replacement of the locks of some (non-private) garages and the methods of key exchange of the garages and vehicles in common areas.

To check the availability and interest of the owners, a survey was launched. This questionnaire based on a larger one ("demand analysis", chap. 5) but lighter and shorter allowed to understand how many potential users are in the building and what kind of use they imagine for the car sharing service.
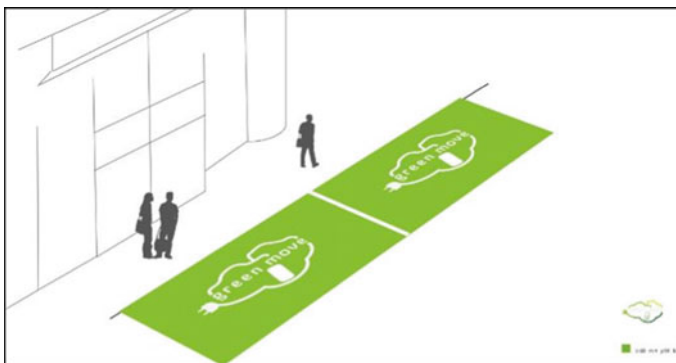

Fig. 1 A preliminary sketch of the two Green Move parking areas in front of a building of the Politecnico di Milano at the "Città Studi" campus

Fig. 2 Some figures illustrating Green Move trial (Scarsellini condominium)

3. **Launch event**

To launch the experiment, we organized a small event with the following purposes: to present the project, to see and test the car, to sign up the service with our support.

4. **Test and closing event**

Our testing was ensured by the use of an existing car sharing service that dedicated four cars only to our use. This has allowed us not to worry about technical support and booking matters while still able to monitor the specific users and position the cars where we planned. In Scarsellini, two cars were placed in the building area, while for Donadoni two cars were positioned in the near train station parking lot. Though in a public area, they were of exclusive use of the trial users.

Kilometres travelled and usage time for each user have been monitored: additional info has been provided by users themselves through a dedicated social network. Half way through the trial there was another promotional evening in which we also organized a focus group to collect feedback.

At the end of the trial there was a final meeting for feedback collection and idea generation (Fig. 2).

2.3 Check and Control System

During the trial the users were monitored and followed using the following channels:

- the car itself englobed a device for the registration of kilometric quantity and time of use.

- through the Internet social network (in Scarsellini) we collected qualitative data and experiential feedback.
- in the two apartment buildings few inhabitants were commissioned to gather opinions and recommendations in a spontaneous way.
- two focus groups were held, in the middle and at the end of the trial. The focus groups aimed to:

    – understand what are the current uses of the cars and the experiences (positive and negative) that occurred,
    – understand why some people that showed interest in the beginning did not use the cars,
    – generate future scenarios of use (to be implemented immediately or in the future) and effective communication.

During the meeting, users talked about their experience of use or their motivation for not using the service. With a guided work, the group has completed a SWOT analysis of the so-far-offered service (Fig. 3).

Fig. 3 The SWOT analysis completed at the end of the Green Move trial

3   Results

The results described here are divided on the basis of the three stages of the trial: the first is *access/entry to the service*, then *service use and user experience* and last *future considerations*.

3.1   The Start-up Process: Overcome Barriers

This is definitely the most difficult barrier we found during the trial that needs to be overcome. The initial mistrust and lack of information makes approaching the service slow and difficult. Many people in the buildings were not even interested in having information about the service, considering themselves out of user target. Others, who have passed the first barrier, found the registration to the service complicated and slow. This sometimes caused them to stop the procedure and not complete the registration. Some considerations on elements may influence this first part of the trial are:

- Communication: the first communication of the service should be very simple and very straightforward. For example, advantages of the electric car sharing should be expressed clearly: free parking spaces, the free entrance to city centre, etc., are motivations to use the car sharing services rather than the private car. In addition, give people the opportunity to test electric vehicles without commitment and understand how they work in order to overcome the fear to try a new kind of driving. Equally important are video stories that can easily explain the use. All these could facilitate the initial approach to the service.
- Rates are another important element in the start-up stage, as people do not want to take the risk of a financial commitment before even trying. Prices should be kept low and especially flexible in the beginning.
- The environment: the apartment buildings where the cars were positioned resulted as a "saturated environments" in the sense that almost all of the people living there were already in possession of one or two cars. Usually, car sharing services substitute the second cars, but in this case having been a time-limited trial, people did not take important decisions such as abandoning the second car. All in all, they felt it was simpler to use their own cars rather than the shared vehicle.

3.2   The User Experience

After overcoming the initial barrier, we were able to observe and reflect on user experience. Here we describe the use of the cars and the way it was used throughout

the trial. Subsequently, some considerations of how communication and rates have influenced the use are:

- *Types of usage*: the cars were used mainly to answer two types of needs: (1) short-term use for quick chores, often in the city centre. In this case users took advantage of the opportunity to free-park anywhere and not having to pay to enter the city centre (Milan "Area C"—see: AreaC (2016)). (2) For short trips just outside of town, especially in the weekend.
- *Ease of use*: the booking of the car was easy both via website and the phone. The cars were easy to drive with some doubts due to the automatic gear that is uncommon in Italy. Passed the first time, no one has reported difficulties in driving and, more in general, in using the car (Fig. 4).
- *Additional services*: in Scarsellini, some accessories were available as add-ons: specifically, child seats and material for cleaning the vehicles. This has contributed to the participation of families with children in the trial and made it more comfortable if not essential for family use.
- *Communication*: communication during this phase was helpful to increase subscribers and to involve those people that initially enrolled but did not use the service. The main communication task here was to figure out how to create an active community around the service that would be able to create support by itself (members help members). This was the main reason for choosing a quite innovative format of the community TV (Chap. 7).
- *Fees and rates system*: there were tariff changes during use that have modified the same: initially the rate was an hourly rate that included everything. This was comfortable and convenient for short distances use. All in all, longer rides, like the ones we observed during weekends, were not convenient with this type of pricing. Therefore, the second pricing was a combination of an hourly rate, that was lower than the previous one, and an additional kilometric rate. This rate has increased the amount of bookings mainly for trips in which people do not drive much but need the car for the whole day. This is the case of visiting family outside the city or going for a hike in nature. The last change in the tariff involved the integration of a subscription fee and thus a lower per-use rate. People could choose whether to opt for this or remain with the slightly higher rate. A few users have chosen the subscription, the more frequent users. It should be noted that the last tariff change took place next to the end of the trial.

4 Future Scenarios: Studies and Applications

Generally speaking, the condominium car sharing service idea was confirmed as positive by the trial. Some advantages (confronting to traditional car sharing services) are: the location of the car always close to home and the exclusivity of the car by the community of neighbours. In an environment where people know each other,

> Not owning a car, Green Move allows me to move easily when I need to, it is convenient, and just what I was missing.

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Married with two children (two and four years old)

Use of Green Move

Urban use

Extra-Urban use

3h, 17km   6h, 54km

I gave a try to both cars. I drove in the Citroën with my family to Agrate Brianza and back (by motorway). I chose the Fiat Panda to go to the cinema in Milan. Both cars provided a confortable drive. Surely, the Citroën consents a better acceleration than the Panda.
They are both perfect in town thanks to the combined presence of automatic gear and electric motor.
The only things to pay attention to are pedestrians and cyclists because they cannot hear that you are coming! Both cars are very silent. It is a pleasure to be able to park everywhere. :-)

Hints for the future.

Consider the possibility of different prices and provide an automatic calculation of the more cheap.

Fig. 4 A Green Move users feedback

sharing an object like a car makes it more personal. The feeling created by sharing among neighbours is different than rental cars and is more similar to shared ownership. The car customization with some accessories makes this feeling even stronger.

The initial entrance barrier is not to be underestimated. If a group of neighbours should be engaging in paying an initial fee for the service to start, there must be a strong group of users to begin with. This gives us two kinds of ideas: one, buildings under construction can be already designed to fit electric car sharing with the relative infrastructure. With "in hand service" people would be more willing to use it and try it and even decide to abandon their car when moving to a building offering this service. Two, a new stakeholder should be identified to invest in the implementation of condominium car sharing. In the case of car sharing services in a company, it is the company itself buying the cars and offering their use. Who could it be in this scenario? Purchasing the cars is to be excluded from this scenario as it will result very complicated to put neighbours together to such economic investment. We should think about a service model that allows the free positioning of cars in the building and then pay-for-use methods: next paragraph tries to design this new concept idea.

4.1 From Condominium-Based Electric Car Sharing to a Hybrid Model at Neighbourhood Level

Trying to answer the last question, we have developed the following concept idea.

Milan is one of the largest car sharing markets in Italy, accounting for more than a third of all the Italian car sharing members (ANSA 2016; Enjoy 2016). Market-driven forces (Car2Go, Enjoy, Twist), "pro-car sharing" policies (GuidaMi/GirAci, the access to limited traffic areas and parking spaces, etc.) and "pro-electric mobility" (Share'NGo, E-Vai, electric-bikesharing BikeMi, E-moving charging stations) have shown Milan inhabitant how car sharing and electric mobility can help to meet their mobility needs, especially regarding occasional car users, for shopping, visits to friends and family, etc. (Enjoy 2016; Car2Go 2016; GirAci 2016; BikeMi 2016; Twist 2016; Share'NGo 2016; E-Vai 2016, E-moving 2016). Such a trend is not an isolated case, but it is considered logical (Kim 2015) in a framework of increasing car ownership expenses, as in Italy. However, it is uncertain whether this recent car sharing/electric mobility growth will continue, this being true also in the case of Milan, considering, for instance, the inactive members at the end of car sharing companies aggressive marketing campaigns (Martin et al. 2010). In addition, it should be considered if electric mobility expansion will permanently meet the mobility needs of a significant portion of the residents of the city.

In this framework, condominium-based electric car sharing could represent an option to balance the vehicles demand of car sharing services for recreation usage in weekdays and at night B2C (business to consumers), in order to become an option for everyone in need in diverse occasions and hours, and not only for young people or B2B (business to business) users (Mishra et al. 2015). In a parallel way,

condominium-based electric car sharing could represent a key element for the expansion of electric charging points and the "culture" of electric mobility.

Just as many enterprises and public bodies have enjoyed budget savings by reducing their vehicle fleets or switching existing long-term contracts with traditional rental car into car sharing programmes, likewise condominium-based electric car sharing could help, not only "low income" people but also persons aiming at being free from thinking about the maintenance of a car (e.g. the second car) or garage, or if they are not adept at handling a smartphone or looking for a car sharing vehicles in the neighbourhood.

Yet, as a matter of fact, in most condominiums in a city such as Milan, it is not easy to find free parking places to share cars, nor to reach a minimal sufficient scale from an economic point of view. Nonetheless, the city of Milan has today a rare opportunity: a widespread distribution of new underground car parks built, thanks to the Italian Government acts (from the 122/89 law, also called Legge "Tognoli", to the National State of Emergency Act of 15 November 2001) which encouraged the development of such urban parking areas in the last 20–25 years (Ferilli 2008; Peluso 2011). The high number of parking lots is realized in this period (nearly 140 in public concession and several more built by private owners), and the large number of parking spaces (up to 300 or more in each one of them) perhaps an oversized number (Cfr. Italianostra[1]; Comune di Milano 2012a, b; Mottini 2010) has produced the fact that a large number of garages is still "for sale" or constantly free "for rent", as shown in Fig. 5, taken during the spring 2016, to exemplify the situation of the city.

This overabundant quantity of parking spaces could be an opportunity to expand the condominium-based electric car sharing, giving the possibility of car sharing not at the level of a single building, but involving many buildings of the same neighbourhood, in contexts where an 18-/24-h reception/concierge service is already present. The service could be easily upgraded to manage the cars and systems maintenance (or even the reservations), keys guarding and the needed equipment (car customization and cleaning), also becoming a help for people less used to the required technology.

As regards environmental benefits: car sharing reduces greenhouse emissions (reducing vehicle kilometres travelled and favouring the use of public transit), reduces the average number of vehicles per household and the needs for public parking spaces (Jonuschat et al. 2015; Baptista et al. 2015); electric mobility also reduces emissions; in addition, underground car parks further reduces the need for public parking spaces compared to the "classic" car sharing. All these aspects together work in synergy, offering better (extra) performances.

The possibility of success of such a kind of "hybrid model" (among B2B, B2C and P2P) of car sharing is due to the fact that, in a city such as Milan, a portion of the population makes a relatively infrequent use of its own car, as the typical car sharing members of today demonstrate, allowing the possibility of more efficient

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[1] www.italianostra-milano.org/cms/files/IN_parcheggi.doc.

Fig. 5 Pieces of the "puzzle of car parking spaces" for sale or rent in some underground car parks in Milan, the result of our survey

fleet operations. As a matter of fact, there is evidence that the B2B market segment of car sharing is now growing faster than car sharing in general, since the member of a working staff is provided access to a car sharing organization's fleet through his employer (Clark et al. 2015). Similarly, an underground car parking could provide an easy access to electric condominium car sharing.

The car sharing concept of the underground-based condominium electric car sharing is the back-to-base one (one-way), in which the user takes a vehicle from a specified location, performs a round-trip tour and returns the vehicle to the same location at the end of the usage. It could be an emerging sub-market of the shared-mobility sector, to be tested in future projects, during which to verify the possibility of overcoming two barriers of our ideal scenario (P2P, peer-to-peer, electric car sharing) but keeping fixed both the location of the car, close to home, and the exclusivity of the use of the cars by the neighbourhood community. This way it would be possible to overcome the two barriers: the low propensity to switch to the electric engine, since one more possibility to test it is given; the cost and availability of the infrastructure required by this model (above all in relation to the acquisition or rental of garages in addition to vehicles and charging points).

Tentatively, a starting estimate (to be tested) of the quantity of shared vehicles to satisfy this car sharing demand could be between 2% and 5% of the places of an

underground car park, if we consider the multiple uses of a neighbourhood when compared, for instance, with B2B car sharing consumption of university employees (Zhou 2013), being a university campus comparable to a limited urban area, like a condominium compound.

Interested in such a kind of project could be not only the members of the underground parking condominiums (the owners of other private garages) and the car sharing companies, but also the electric vehicles producers, to promote their products, as well as cooperative companies managing many underground parking sites in Milan, who are still burdened by many unsold garages.

4.2 Other Ideas from the Users of Green Move Trial

Some ideas about the car sharing service came from the users of condominium-based car sharing:

- Create partnerships with commercial and cultural stakeholders: e.g. supermarket or cinema.
- Facilitate the creation of an online community of users and allow transparency of uses: it may be useful to know who uses the car to go where as it could facilitate forms of car-pooling or solve some problems that may arise after use.
- Instructions for use inside the vehicles for the use of the automatic gear.
- Inclusion of additional accessories: navigators, ski carrier, bicycle carrier, etc.
- Integrate both the traditional car sharing and peer-to-peer car sharing based on existing vehicles.

5 Conclusions

Though some barriers are still to be crossed and verified, the idea of condominium electric car sharing seems to have a good potential of implementation. The use of the car in a car sharing service requires the user to plan more: programme the trip, book it and respect timings in respect of other users. Other mentality change is getting used to payment by usage. With the general spreading of shared vehicle services, we have a reason to believe that the condominium version may be successful. Especially for buildings under construction, it could become a standard, dedicating parking spot with charging plugs and accessories for a shared-use car.

The experiment was useful both for research and for the dissemination of good practices of car sharing. Even people who did not eventually use the service have learned a little more about car sharing and certainly are more willing to seize new opportunities.

This phase of the project has been helpful to the redefinition of the scenario and the different elements that constitute it.

The car sharing concept of the underground-based condominium electric car sharing seems to be interesting to be tested as a way to improve participation rates of electric car sharing services in Milan.

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