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First Advanced City Cars Showcase report (La Rochelle)

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1 Executive summary

The objective of the CityMobil project is to achieve a more effective organisation of urban transport, resulting in a more rational use of motorised traffic with less congestion and pollution, safer driving, a higher quality of living and an enhanced integration with spatial development. This objective is brought closer by developing advanced concepts for innovative autonomous and automated road vehicles. At three sites: Heathrow, Castellón and Rome, large scale demonstrators are being set up to supply proof of concept of innovative transport systems integrated in the urban environment.

Alongside with the three demonstrations CityMobil investigates the effects of advanced transport solutions on urban areas through modelling and small-scale demonstrations limited in size and time called showcases. This report deals with the results of the second of CityMobil showcases: La Rochelle.

Two typologies of showcase-vehicles are made available in CityMobil framework: advanced city cars and cybercars. The showcase to organise with the first typology of vehicles aims at demonstrating how enhanced manoeuvrability (i.e. safe turning around tight corners in narrow streets), automated access/exit from parking, and platooning can make a car-sharing service cheaper and more attractive through easier vehicle relocation and enhanced accessibility. The cybercar showcase aims at showing how fully autonomous road vehicles can be effectively used in conjunction with public transport, especially in low to medium demand areas and periods, to make it more reliable and frequent even where conventional public transport is not.

Several European cities, members of the CityMobil reference group, expressed their willingness to host a showcase; a selection process was organised to select, for each of the two showcase typologies, two or three sites to hold such events. A selection process aimed at excluding those sites where the showcase was not feasible for technical, legal or safety reasons and ranking the others according to a number of criteria covering from the feasibility of the implementation to the user acceptance to the geographical coverage was completed. In this process, La Rochelle was ranked second in the selection process among the eight showcase candidate cities.

2 Introduction

The objective of the CityMobil project is to achieve a more effective organisation of urban transport, resulting in a more rational use of motorised traffic with less congestion and pollution, safer driving, a higher quality of living and an enhanced integration with spatial development. This objective is brought closer by developing advanced concepts for innovative autonomous and automated road vehicles. At three sites: Heathrow, Castellón and Rome, large scale demonstrators are being set up to supply proof of concept of innovative transport systems integrated in the urban environment.

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La Rochelle has a long tradition of innovation in public transportation. It claims the invention of the first "car free day" and the first pedestrian urban area. Amongst its many innovative public transport services, it has a bicycle sharing service, an electric boat service to cross the Old Port, a "boat bus" connecting the old port and the "Minimes" area, and a car sharing service with electric vehicles named Liselec. This service is the main motivation of the city to host an advanced city vehicles showcase, since it is planning its extension to the whole urban area (La Rochelle Urban Community), but it encounters economic limits because of the high cost of the fleet redistribution that the extension would require. Therefore, the city wanted to evaluate if the platooning techniques available in Advanced city cars could be applicable to solve this problem. The showcase should also provide data concerning the system acceptance among the population.

This report describes the activities performed in the framework of the showcase and the analysis of the data collected through users' interviews after having tested an Advanced city car.

La Rochelle city and site description and reasons for selection

La Rochelle is a port located in the French Atlantic Coast. Its main activities include industrial fishing, heavy industry and tourism. With more than three millions visitors per year, it is the third most visited city in France. The city is part of the “Urban Community” of La Rochelle, a group of eighteen cities around La Rochelle municipality. The mobility problems must therefore be considered in relation with the other cities. The whole Urban Community has a population of around 147 000 inhabitants.

2.1 La Rochelle mobility situation and plans

As mentioned above, La Rochelle has a long tradition of innovation in public transportation. Amongst its many innovative public transport services, it has a car sharing service with electric vehicles named Liselec, operating since 1999. This service is the main motivation of the city to host an advanced city vehicles showcase. La Rochelle also develops innovative programs for the mobility of goods. In 2001, the City opened to service an interchange platform named Elcidis, where heavy lorries discharge goods that are then distributed in the city centre with electric vehicles.

2.1.1 The Liselec car-sharing system

One of the many innovative public transportation services in La Rochelle is Liselec, a city-wide car-sharing system using electric vehicles. This system was put to test in 1993 through an agreement between the city of La Rochelle, the car manufacturer PSA Peugeot Citroën and EDF (Electricity of France), and opened to public service in 1999. Currently there are 7 Liselec stations spread around the main spots in the city centre and a fleet of 250 vehicles. While not in service, the electric cars are parked and recharged in the stations.

The city is considering renewing the car fleet and expanding the operation from the city centre to a larger area of the Urban Community. The city yielded the operation of the car-sharing systems to a private operator in 2006.

For the city, the objectives of the showcase were:

- To experiment new technologies that might improve the system operation, mainly by reducing vehicle redistribution costs.
- To determine the feasibility of an extension of the operation area.
- To reduce or even eliminate private car circulation in the city centre to reduce noise and pollution.

2.2 Reasons for selection

The selection process was based on questionnaires completed by the Reference Group member cities. These questionnaires were analyzed using the MAESTRO methodology, in order to determine the feasibility of the execution of the showcase, as well as its potential impact (GEA, 2007).

Despite the fact that only Genoa and La Rochelle were candidates to host Advanced city cars' showcases, La Rochelle was ranked second overall the eight showcase candidate cities, guaranteeing a good visibility to the showcase and a high level of implication of the local government in the organization of the demonstration. External factors like the EC's preference to spread as much as possible the activities were also taken into account (GEA, 2007) for the project to make the definitive choices. The indicators concerning La Rochelle that were qualified higher were “consistency at local level”, “application integration with other policies and complementary measures”, and end-users and operators' acceptance.

2.3 Site description

The site selected for the execution of the showcase was a 20 000 m² square located in the city centre (Verdun Square). This point is a major transport hub in the city, hosting a Liselec car-sharing station, an urban and interurban bus station, an underground and surface parking and a bike-sharing station. This spot was selected to give the showcase the largest possible visibility among the local population.

Figure 1 and Table 1 show the different transport modes present at the showcase site and their location.

Figure 1. Transport modes available in the showcase site

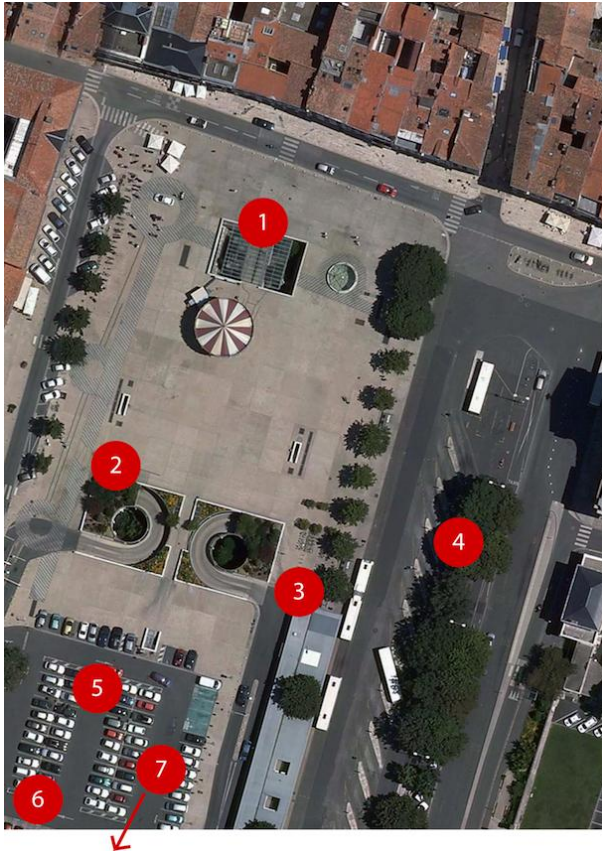


Table 1. Transport modes available in the showcase site

#	Transport mode	Type
1	Underground parking	Private
2	Ground level parking	Private
3	Bike sharing station	Public
4	Urban bus hub	Public
5	Electric car sharing station	Public
6	Regional (intercity) bus station	Public

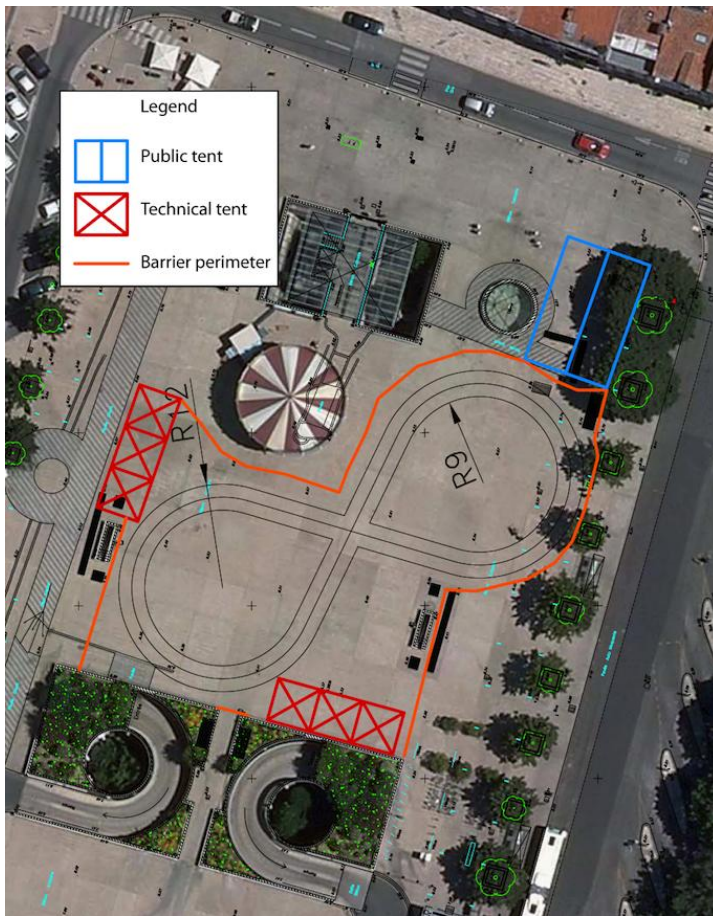
To take advantage of the organization of the CityMobil showcase, the Cybercars2 project

(INRIA, 2009b) final demonstrations¹ were also organized in the same place and time. This allowed to present more advanced technologies to the local government and to the inhabitants of La Rochelle than those required by the Mayor in the questionnaire. Since the goal of the Cybercars2 project was to develop a "set of tools and systems to enable driverless vehicles to perform the necessary driving manoeuvres in a co-operative manner" (INRIA, 2009), the vehicle's track was configured as a one-way 8-shape, which allowed the continuous circulation of the vehicles, in order to demonstrate the platooning techniques, and featured a crossing that the vehicles should negotiate in a collaborative way using communications. Since CRF vehicles' automated driving system used a lane following guidance technique, the 8-shape path and a series of "bar codes" for the vehicles (to reset their localization system) had to be drawn on the floor. This infrastructure was provided by the City.

In order to guarantee the safety requirements established by the corresponding CityMobil deliverable (CRF, 2009), the square was closed with metallic barriers to avoid the risk of intrusions of the public in the vehicle's trajectory, and another perimeter was delimited with crash resistant barriers, to limit the impact of an eventual vehicle malfunction. 6 tents (5x5 m) were placed in the restricted area, in order to store and protect the vehicles (many of which are not waterproof prototypes), to install the management centre and to serve as a workshop for the team members. A 15x10 m tent was placed outside of the protected area to install the public exhibit presenting CityMobil and other smaller scale demonstrations directed to the public. Figure 2 shows the site and track configuration and the position of the technical and public tents.

¹ Several CityMobil partners (CRF, INRIA, Robosoft, TNO) were also members of this project.

Figure 2. Site configuration for the showcase execution



3 Showcase execution

One of the main advanced technologies to be considered in this showcase was vehicle platooning. Vehicle platooning consists of moving several cars with a single driver, and without the presence of a physical link between the vehicles. This can be implemented using different techniques such as Advanced Cruise Control (ACC), communicating highly precise GPS positions between the different vehicles or simply using an obstacle detection technology to keep the inter-vehicle distance. In La Rochelle the two later techniques were demonstrated, since many different vehicles were present (CRF's and TNO's Advanced city cars, INRIA's and Robosoft's cybercars) and not all of the vehicles had the same type of equipment to perform both platooning techniques. The operation of CRF's electric vehicles was made in dual mode: automated and manual on a dedicated infrastructure. INRIA's cybercars and TNO's Advanced city cars operated only in fully automated mode. presents the Showcased vehicles per partner.

Table 2. Showcased vehicles per partner

Partner	Advanced city cars	Cybercars	Total number of vehicles
CRF	3	-	3
INRIA	-	4	4
TNO	1	-	1

Robosoft	1	1	2
Total			10

Besides these vehicles, Shanghai Jiao Tong University also presented a demonstration (Cybercars-2) with small vehicles (remote control sized) driving on an 8-shaped track, and capable of overtaking and of managing autonomously the crossing. This demonstration was presented in the public tent.

The public was allowed to take one or two laps inside the CRF vehicle on fully automated mode. A CRF professional driver was always present in the driver's seat for safety and insurance reasons, but also to explain to the passengers the way the implemented techniques work and to demonstrate the possibility of overriding the automated driving at any moment. Using the vehicle's obstacle detection system, which used a Laser scanner, a scenario of obstacle detection and avoidance was also presented by the team members.

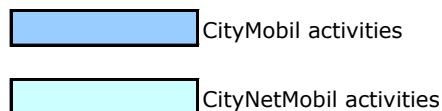
The showcase preparation started 3 days prior to the first demonstration activities with the infrastructure setup (tents, path markings, barriers, electric supply). Other elements (exhibit) were installed the following days while the demonstrations were being prepared and tested.

3.1 Parallel activities

In the framework of the showcase, a series of parallel events were organized, to take advantage of a large number of mobility and technical experts present: the Reference Group members, the partners involved in the demonstrations, the CityNetMobil project members (present for the project launch) and the Cybercars-2 project members (present for the project closing demonstrations). A conference was organized on the opening day, with speakers such as the Mayor of La Rochelle and the CityMobil and Cybercars-2 project officers, as well as CityMobil members. This conference had 150 national and international assistants, which can be considered as a success in a medium sized city as La Rochelle. Finally, in order to give visibility to the showcase and to give journalists the opportunity to interview the present experts, a press conference was organized the day of the showcase opening. Figure 3 presents the agenda of all the events organized in parallel to the showcase.

Figure 3. Showcase parallel events agenda

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
15	16	17	18	19	20	21
Showcase preparation			Showcase execution			
		CityNetMobil project launch	Reference Group meeting & demo	International Seminar Automation for Urban Transport		
			SP 1.5 meeting	Press conference and demo		
				Cocktail		
22	23	24	25	26	27	28
Showcase execution						
Cybercars-2 meeting	SP 3 meeting	Car-free day				End of the showcase
29	30	1	2	3	4	5
Dismantling						



4 Evaluation of users reaction

4.1 Indicators

For the showcase at La Rochelle a reduced number of indicators were collected compared to the other showcases. As shown in the next table, the questionnaire included questions on 7 indicators among those measuring the user acceptance level, 4 of which belonging to the “Acceptance” evaluation category (“Usefulness”, “Ease of use”, “Reliability”, “Willingness to pay”) and 3 to the “Quality of service” category (“Comfort”, “Safety”, “Security”). All these indicators were surveyed both in terms of weight and performance, including the willingness to pay (in the other surveys this indicator was not surveyed in terms of importance).


The whole situation is reported in the following Table 3. The surveyed indicators are marked with a “✓”.

Table 3 Indicators dealt in the user acceptance survey of the La Rochelle showcase

Evaluation Category	Impact	Indicator	Importance	Ex-post performance rating
Acceptance	User acceptance	Usefulness	✓	✓
		Ease of use	✓	✓
		Reliability	✓	✓

		User satisfaction for the on demand service		
		Integration with other systems		
	Willingness to pay	User willingness	✓	✓
Quality of service	Information	Availability		
		Comprehensibility		
	Comfort	Perceived comfort	✓	✓
	Privacy	Perceived level of privacy		
	Perception of safety and security	Perception of safety	✓	✓
		Fear of attack	✓	✓
Transport patterns	System performance	Average journey time		
Social Impacts	Service accessibility	Access (times) for mobility impaired users		

“✓”= indicator quantified through specific question;

 = no rating available

4.2 Results

In the following Figure 4, Figure 5, Figure 6, Figure 7 the distribution of the sample (made of 253 interviews) is shown, according the different available characteristics of the interviewed people (age, education, employment and income).

Figure 4 La Rochelle interviewed people divided per age

La Rochelle showcase User Acceptance survey
 Interviewed people per AGE

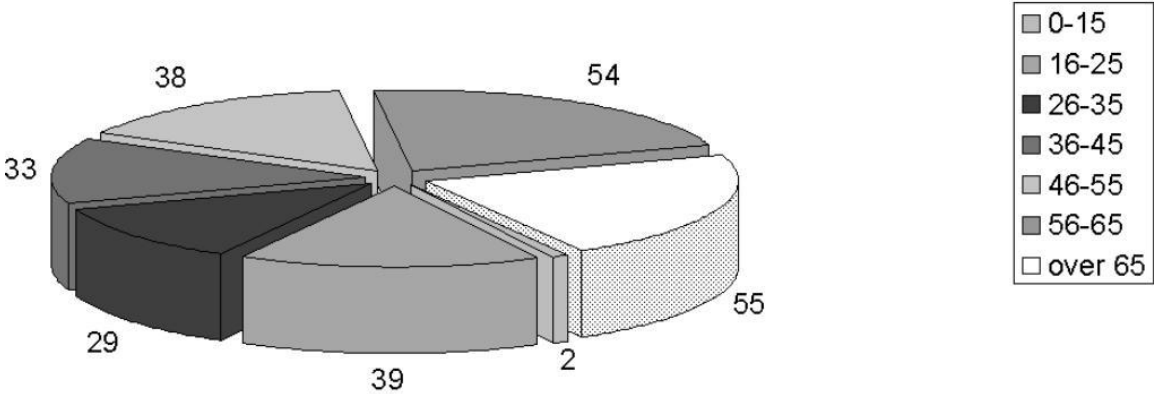


Figure 5 La Rochelle interviewed people divided per education

La Rochelle showcase User Acceptance survey
 Interviewed people per EDUCATION

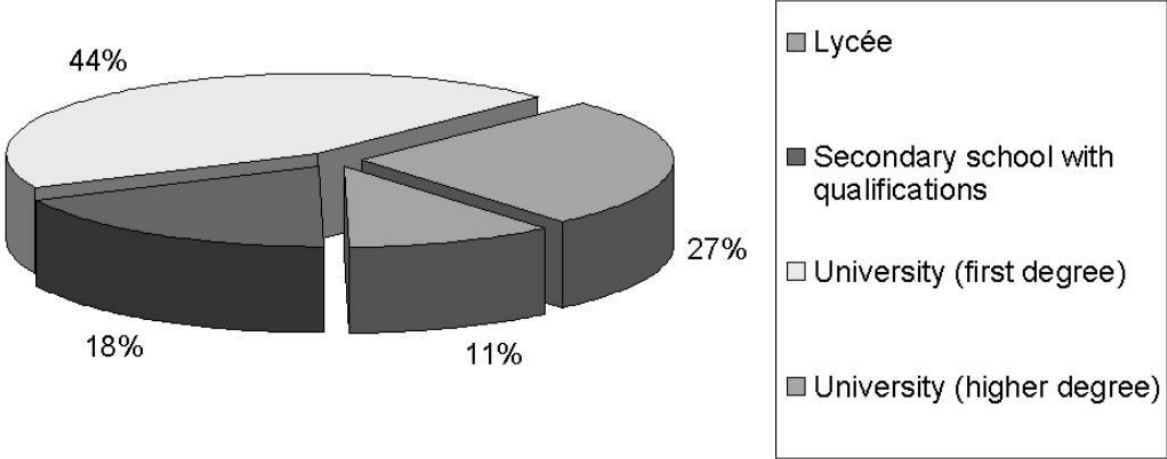


Figure 6 La Rochelle interviewed people divided per employment

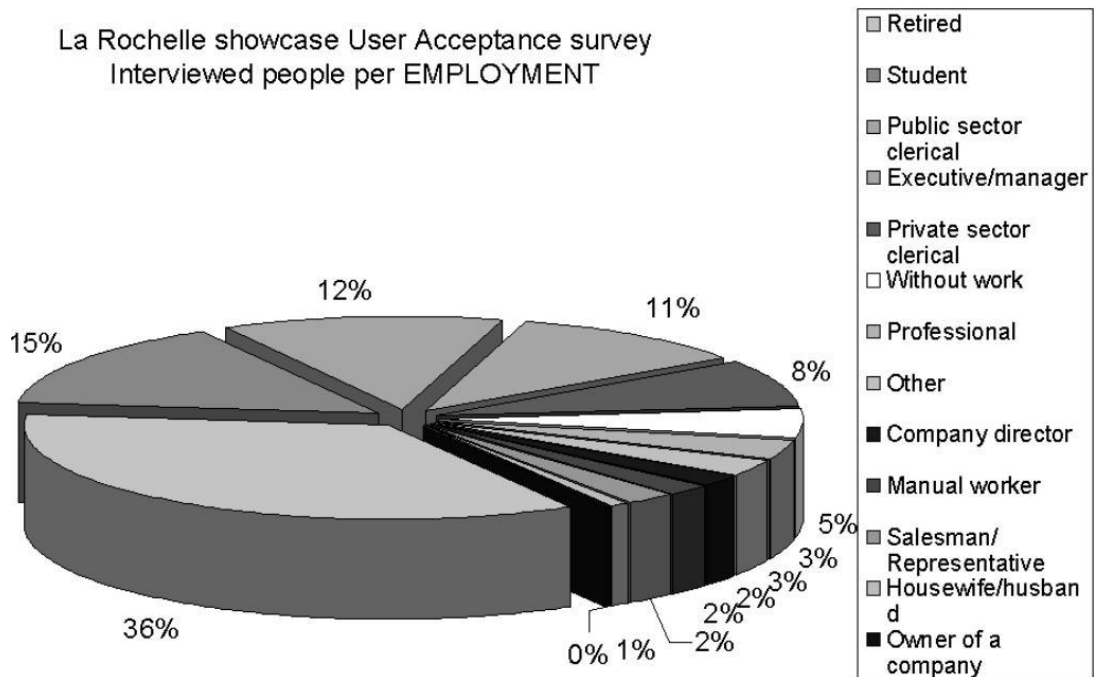
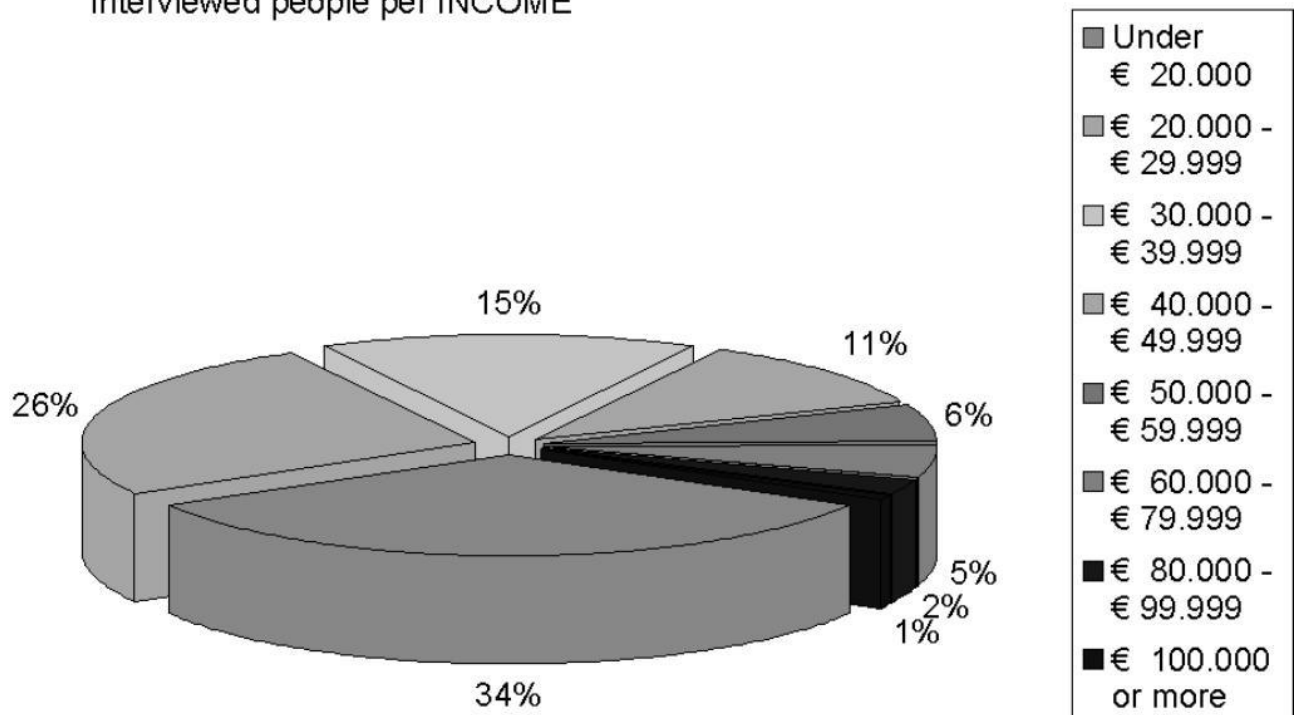


Figure 7 La Rochelle interviewed people divided per income

La Rochelle showcase User Acceptance survey
Interviewed people per INCOME



The results averaged on the whole interviews are reported in the following Table 4.

Table 4 Average values for indicators dealt in the User acceptance survey of the La Rochelle showcase.

Evaluation Category	Impact	Indicator	Importance (1=most, 5=less)	Ex-post performance measure (1=least; 5=most)
Acceptance	User acceptance	Usefulness	2.7	3.8
		Ease of use	2.4	4.0
		Reliability	3.2	3.6
		User satisfaction for the on demand service		
	Integration with other systems			
	Willingness to pay	User willingness	4.0	2 to 3€
Quality of service	Information	Availability		
		Comprehensibility		
	Comfort	Perceived comfort	2.7	3.6
	Privacy	Perceived level of privacy		
	Perception of safety and security	Perception of safety	2.1	3.8
		Fear of attack	2.6	3.7
Transport patterns	System performance	Average journey time		
Social Impacts	Service accessibility	Access (times) for mobility impaired users		

In terms of rating (column before last in table 4) the most important indicator was judged “the perception of safety” followed by the ease of use perception of security (fear of attack) and comfort and usefulness together. Beside selecting the most important indicators the average obtained rating can also serve the purpose of setting a threshold for success. In fact being 6 the measured indicators beside the willingness to pay which is measured with a different scale, subtracting the average obtained rating to 6 we have a threshold against which comparing the actual system performances. The highest threshold is 3.9 (6 minus 2.1) for the perception of safety which is just above the scored 3.8 which means the vehicles tested in La Rochelle are perceived as safe but slightly less than expected. The ease of use threshold, 3.6, is well below the scored 4 meaning the vehicles are easier to use than expected; incidentally Ease of use is also the indicator scoring highest. All other indicators, applying the same rule to obtain the threshold for success from the rating, have thresholds between 2.4 (fear of attack), 3.3 (usefulness and comfort) and 2.8 (reliability) all score much better than the thresholds. However the rating of the reliability indicator being so low, appears to and

Willingness to pay scored a definitely high value (2 to 3€), but it must be recalled that in this case the fee is referred to one hour usage and moreover the system offers in this case a private use of the vehicle and not a shared cab as in the other sites.

Also for this site, since the interviewed people profiles are available (gender, age, education, employment, income), the indicators averages were calculated distinctly for two couples of respondents categories:

- users with high school education (or higher),
- users with primary school education (primary school plus junior high school),
- people up to 30 years old,
- people over 30 years old.

The results for these user categories are reported in

Table 5.


The main differences are recorded in the rating that was averagely given to the Ease of use and Reliability indicators. Ease of use was rated as more important by mature people, while Reliability by younger people. Lower differences emerge for the importance given to safety and security: under-30 people care slightly more for safety compared to the over-30, the opposite for security. Security is given a little more importance by lower-educated people compared to highly educated.

On the performance side, lower educated people gave a slightly higher value to the perception of reliability compared to highly educated people (3.8 vs. 3.5); both averages were fairly high however. Finally, highly educated people surpassed (although just slightly) the threshold of 2€ for the willingness to pay.


Globally the level of acceptance by travellers turned out to be good, considering that the lowest scored indicators got a 3.6. Some indicators (e.g. ease of use) may benefit from the fact that people in La Rochelle already use and know a car-sharing system, although not with the advanced characteristics that were presented in the showcase. Therefore a higher value within the assessment is deserved by the indicators that are addressed to the advanced features introduced by the new system (reliability - 3.6/5, usefulness - 3.8/5, perception of safety (3.8).

Table 5 Average values for indicators dealt in the User acceptance survey of the La Rochelle showcase distinct by two age categories

Evaluation Category	Impact	Indicator	Importance					Ex-post performance				
			All	Secondary school	Higher education	Under 30	Over 30	All	Secondary school	Higher education	Under 30	Over 30
Acceptance	User acceptance	Usefulness	2.7	2.8	2.7	2.7	2.7	3.8	3.9	3.8	3.6	3.8
		Ease of use	2.4	2.3	2.4	2.9	2.3	4.0	4.0	4.0	4.2	4
		Reliability	3.2	3.2	3.2	2.8	3.3	3.6	3.8	3.5	3.5	3.6
		User satisfaction for the on demand service										
	Integration with other systems											
	Willingness to pay	User willingness	4.0	4.1	3.9	4.0	3.9	2 to 3€	1 to 2€	2 to 3€	2 to 3€	1 to 2€
Quality of service	Information	Availability										
	Comfort	Perceived comfort	2.7	2.8	2.6	2.7	2.6	3.6	3.7	3.6	3.6	3.7
	Privacy	Perceived level of privacy										
	Perception of safety and security	Perception of safety	2.1	2.3	2.1	1.9	2.2	3.8	3.7	3.8	3.7	3.8
Fear of attack		2.6	2.3	2.7	2.9	2.6	3.7	3.7	3.7	3.6	3.8	
Transport patterns	System performance	Average journey time										
Social Impacts	Service accessibility	Access (times) for mobility impaired users										

 = no rating available

 = difference between Under30 vs. Over30 is >0.5 (or 1€ as for the willingness to pay)

 = difference between Under30 vs. Over30 is >0.2

5 Press coverage

Thanks to the organization of the press conference, with the concurrence of INRIA's press managers, the press coverage was extremely large, specially at national level. Besides local and regional newspapers, the showcase was presented in the news show of one of the main national TV channels (TF1) at the highest rating time: 8 PM. This channel requested to make its report the day before the press conference to present the showcase before any other channel. Even one international TV channel viewed in the Arab world, Al Arabiya, made a report on the showcase.

Sources

Reference List

CRF, 2009. La Rochelle showcase: Recommendation for the operation including safety issues. CityMobil deliverable 1.5.3.2.

DITS, ITS, ET. AL., 2006. Questions for the Reference Group Cities to select candidates for city-wide studies and site-specific applications. CityMobil project deliverable (WP 1.5.5 and WP 2.4.3).

GEA, DITS, 2007. Selected sites. CityMobil project deliverable 1.5.4.

INRIA, 2009. Cybercars - 2 final report. Cybercars - 2 project deliverable.

INRIA, 2009b. *Cybercars-2* [online]. Available from: <http://cybercars2.paris-rocquencourt.inria.fr> [Accessed 9 November 2010].