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Towards Smarter Urban Mobility: Willingness to Pay for an Advanced Traveller Information System in Lyon

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Abstract: Advanced traveller information systems (ATIS) are meant to assist people in their daily travel decisions as well as to prompt a shift from cars to alternative and more environmentally-friendly transport strategies. Not many comprehensive studies have been undertaken so far in order to assess the willingness to pay (WTP) for ATIS, despite a development of these tools during the last two decades. This paper aims at analysing the WTP for Optymod'Lyon, a smartphone application which plans your journey travels using real-time information about all available transport modes. To this end, a quali-quantitative approach was adopted, administering a questionnaire to participants and organising focus groups before and after the test of the application. A sample of 42 people living in the metropolitan area of Lyon was involved. Results showed four clusters of participants: *idealists*, *pragmatics*, *the ambiguous* and *opportunists*. A strong majority of idealists and pragmatics were unwilling to pay, mainly for economic reasons and the availability on the market of free information. They record a lower share of trips to work and a higher share for leisure, shopping and study purposes. Those willing to pay (of which 37.8% were *opportunists*) report a low monthly charge level (0.2–3 €/month) and are mainly highly-educated car users, travelling for work.

Keywords: advanced traveller information systems; real-time information; travel behaviour; willingness to pay; sustainability

1. Introduction

In 2008, the European Commission [1] started the process that led to the issue of the 2010/40/UE Directive [2], presenting the action plan to accelerate and develop the deployment of intelligent transport systems (ITS). In a context where road transport generates many disadvantages such as road congestion costs, negative environmental impact, high petrol consumption, and road fatalities [3], ITS is seen as one of the solutions to tackle some negative transport issues [4]. Advanced traveller information systems (ATIS), a key component of ITS, aim at helping drivers and, notably, commuters to make better choices at the onset of or during their journeys, or when making a route choice [5].

Modern cities show an increasing interest in ATIS, with a growing attention to real-time multimodal information. Through these systems, decision-makers hope to prompt a shift from car to alternative, environmentally-friendly modes of transport, thus reducing the environmental impact of transport systems. Unfortunately, few comprehensive studies have been undertaken in order to assess travellers' reactions to the use of ATIS. Most previous research has investigated the effects of traffic information on car drivers' satisfaction—mainly commuters [5–8]—highlighting the potential of ATIS to reduce the variability of travel time [9–11]. Just a few studies have explored the

consequences of travel information on public transport (PT) ridership, notwithstanding its potential role in increasing PT patronage and the improvement of customer satisfaction [12,13]. Arguably, the lack of information discourages people from using PT [14], while available real-time information offers advantages to PT users, improving the perceived quality of the service [15]. Even though ATIS are generally seen as potential contributors to the modal shift from car to public transport [8,16,17], there is no convincing evidence that such information systems can successfully increase transit use, especially among non-transit users [18,19]; furthermore, the effects of multimodal real-time navigators have been even less analysed. In fact, the potential of ATIS to affect mobility behaviour has hitherto rarely been researched [20,21]. However, there have been many attempts to assess ATIS benefits through data-gathering from various sources, predominantly from surveys, but also from field observations and simulations [22]. Most of the surveys concerned the effects of traffic information on car drivers, mainly commuters, to estimate user satisfaction and the effects of ATIS operation [5,21,23].

Despite the lack of specific results proving the efficiency of multimodal real-time information systems in changing people's behaviour, the development and implementation of ATIS and the provision of personalised, dynamic, multimodal travel information continue to be encouraged [24–26]. Currently, decision-makers think that technological devices could be the turning point in changing travel behaviour, encouraging the use of more sustainable transport modes thanks to better information.

To this end the Optymod'Lyon project was funded to develop a multimodal real-time navigator and, at the same time, to provide a test to analyse the ability of such a tool to influence travel behaviour. The research also aimed at verifying if a reduction of 24,000 tons of CO_2/year in Lyon, equivalent to 1% of modal shift from cars to bikes and/or public transport, was attainable, as stated by the expert group on urban ITS (2011) [27]. The results of this research led to a lack of trust in the capacity of ATIS, by themselves, to bring about a 1% modal shift. ATIS have to be part of a wider strategy to achieve sustainable urban mobility, including more investments in public transport, in pedestrian/bicycle routes and measures to discourage car use [28].

Arguably, ATIS are expensive to introduce and to maintain over time [29–31]; this aspect is even more challenging due to a decline in public investment, and as a consequence, customers will be likely asked to pay for all or part of ATIS equipment and services [6].

The literature does not provide a clear response regarding the willingness to pay (WTP) to obtain travel information, and WTP levels and the market penetration of ATIS appear different from one study to the next. More specifically, in the first wave of the survey for the TravInfo project [32]—a traveller advisory telephone system implemented in the Bay Area of San Francisco providing traffic and transit information—drivers expressed a WTP of $2 per month, half as much as transit users. According to researchers, such a low WTP would not allow the device to be financially self-sustainable, as it would require support from public funds. However, after the second wave of the survey, the results were more optimistic. Indeed, Wolinetz et al. [33] showed that only 22% of users would refuse to pay a fee for multimodal information services, while those who were willing to pay declared a value of $1.00 per call (52%) and $7 per month (39%). Only 12% of BayernInfo users—a smartphone mobility planner proposing multimodal information—were willing to change travel behaviour. 65% of ARTIMIS users—a traffic advisory telephone service—were willing to pay on average only $0.25 per call even if they perceived benefits by using the service [34]. In a study combining field experience and a stated preference survey, 35% of drivers from Minnesota expressed their WTP for pre-trip information about travel-time, but they would not pay more than $1 per trip [35]. Finally, PT users were unwilling to pay for information about the arrival of vehicles at the bus stop [31] and would rather pay for a better frequency or reliability of transport services [36].

Some projects have delved into features that could encourage people to pay for using information systems. The WISETRIP project showed that the WTP for an interurban journey planner, including the provision of personalised information before and during the trip, increases when dynamic information is included [37]. Occasional users of TravInfo, in the Bay Area of San Francisco, gave positive feedback

to the inclusion of a customised service, although the WTP for those people was rather low [38]. Molin and Timmermans [30] showed that PT users were willing to pay for real-time information, as well as for specific information improving the attractiveness of PT, such as alternative planning options, ticket pricing or walking routes to reach PT vehicles.

Evaluating a technology only according to its attributes may not be the most effective way to assess a potential WTP, as other factors may interfere with users' judgement. High-quality [39] and reliable information [40] is perceived as an essential requirement to prompt people to pay, and as necessary to attract and retain PT users [24]. Another relevant factor is related to the perceived benefits [41,42]; a study conducted on the users of SmartTraveler—a real-time traffic and transit information service in Boston—showed that the WTP was positively correlated to the expected benefits (reliability, relevance and coverage) of using the device [43].

Unlike the studies on the use of ATIS, the state-of-the-art literature provides scant information on the socioeconomic characteristics of people who are willing to pay for getting travel information [22,35,44], although those characteristics could help us to understand which part of the population is a potential target. Only two studies analyse the socioeconomic characteristics of potential users who are willing to pay for getting information. The first one deals with radio traffic info and variable message signs. The results show that the WTP was higher for male drivers under 45 years old on business trips and for people with a good experience of variable message signs [29]. The second study assesses the WTP for services offered by a multimodal platform and shows gender differences in the rating of such a platform and its use [45].

To this end, it is important to investigate the users' characteristics as well as their perceptions and opinions about the usefulness of high quality real-time information to understand which kind of business model can be effective to maintain, in a permanent way, the ATIS developed so far.

This paper aims at analysing the willingness to pay (WTP) of potential users of multimodal real-time information and at defining market segments to determine precisely who can find an added value in and is willing to pay for multimodal travel planning tools using real-time information. The transport modes included in the analysis are those covered by the smartphone application developed within the Optymod'Lyon project: car (including information about parking availability, congestion and road works alerts), car sharing, public transport (both local trains and urban public transport), bike, bike sharing, and walking. The WTP can be a good proxy of users' propensity to become multimodal and, thus, geared to the better sustainability of their mobility.

The next section focuses on the methodological approach used in the survey and the data analysis design. Then, the results are described and the discussion compares those results with others in state-of-the-art literature; conclusions and suggestions to policy-makers are then put forward.

2. Materials and Methods

The research was conducted in the metropolitan area of Lyon (France), which covers 512 km^2 (58 municipalities) with a 1.3 million resident population. Lyon is an important centre of economic development and it is the second French metropolitan area after Paris.

The aforementioned Optymod'Lyon project developed a smartphone application helping users to optimise their journeys through real-time multimodal information, thanks to GPS functionalities. The ultimate goals were to understand the effect of the information provided by the app on travel behaviour and to define how the maintenance of the app could be funded. To this end a survey in the Grand Lyon area on a sample of the population was carried out.

A convergent mixed method was adopted to design the survey along the three steps of the research, as depicted in Figure 1. The survey administered to the sample followed a quali-quantitative approach based on two tools—the web-questionnaire and the focus group—which were designed to work in an integrated way.

The ex-ante phase aimed at investigating mobility patterns, attitudes and requirements of users to properly design the Optymod'Lyon app. The in-itinere phase focused on the test of the app developed

so far to eliminate problems and to remove bugs as well as to monitor the participants' reactions to the use of the app on their journeys. The ex-post phase aimed at assessing potential changes in travel behaviour as well as changes in perception, expectations, and preferences spurred by use of the app.

The web-questionnaire, created with the Google form platform, was addressed to the participants in two stages: in February 2013 (ex-ante survey) and five months after testing the application (from June to October), in October 2013 (ex-post survey). Just a few days after the administration of the ex-ante questionnaire six focus groups were organised to discuss the issues tackled in the questionnaire, thus allowing a cross-reference. The same individuals participated in the three stages, except three who dropped out of the survey and did not participate in the second stage. During the test of the application, an on-going survey was undertaken to test and evaluate its functionalities. To properly involve the panel throughout the survey period, a smartphone (Samsung Galaxy S3 mini) was presented as an incentive.

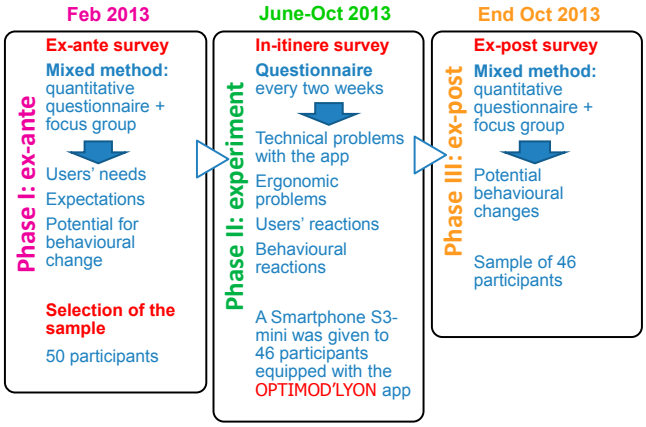

Figure 1. The three steps of the research.

The ex-ante and ex-post questionnaires consisted of six sections and the focus group followed a similar pattern. (Figure 2).

Questionnaire	Focus group
Ex-ante phase	
Section I: Travel habits - Your most frequent trip Section II: Attitudes towards mobility Section III - Transport and pollution Section IV: Familiarity with technological tools Section V: GPS / Multimodal Real-Time Navigator OPTIMOD'LYON Section VI - Personal details	Presentation Section I: Personality traits Section II: Travel habits and attitudes towards mobility Section III: Technology Section IV: Real Time information on mobility OPTIMOD'LYON application (Multimodal Urban Navigator) Willingness To Pay Challenges, barriers, doubts
➢ Self-administered using Google Drive platform ➢ 5 points Linkert-scale	➢ 6 focus groups (7-9 participants) ➢ Discussion about 3 hours each
Ex-post phase	
Section I: Part I: Travel habits - Your most frequent trip (during the experimentation) Section II - Attitudes towards mobility Section III - Transport and pollution Section IV - Familiarity with technological tools Section V - GPS / Multimodal Real-Time Navigator OPTIMOD'LYON Section VI - Personal details	Presentation (possible changes in personal characteristics) Section I: OPTIMOD'LYON application (Multimodal Urban Navigator): - ergonomics, functionalities; - change of travel behaviour; - strengths and weaknesses of Optymod'Lyon; - Willingness To Pay - Possible change in attitude towards Optimod'Lyon
➢ Self-administered using Google Drive platform ➢ 5 points Linkert-scale	➢ 6 focus groups (7-9 participants) ➢ Discussion about 3 hours each

Figure 2. The survey design.

The ex-ante focus groups followed a layout that started with a short presentation of the participants (name, occupation, household composition, residence, work destination and transport mode used) and consisted of four sections:

- personality traits and behaviour towards infrequent trips: how people get information, their emotions and sense of direction, and the way they use the information during their trips;
- travel habits: understanding of most frequent travel behaviour, emotions, attitude towards modes, attitude to changing route during the most frequent trips;
- technological habits: ownership of a smartphone, trust in online purchases and technologies, use of technology in their everyday life, ownership of a GPS;
- willingness to use Optymod'Lyon: their interest in the technology and if they would change behaviour by using it; willingness to pay for Optymod'Lyon.

Ex-post focus groups also started with a short presentation of the participants' lifestyles (e.g., house/work location, etc.) and investigated if a behavioural change occurred as a follow-up of their perception about the performance of Optymod'Lyon. Finally, the willingness to pay for Optymod'Lyon and the attitude towards its use were discussed.

Socio-economic variables (gender, age, education, income, household composition, car ownership, bike sharing and public transport subscription) were collected through the questionnaires administered before and after the test.

The sample was selected per quota, 25 men and 25 women split by the number of children under 14 years' old in the household, age, travel patterns (preferred mode, origin and destination), income, occupation and education. Fifty participants were recruited by a specialised agency following the sampling plan showed in Table 1.

Table 1. The variables used in the sampling plan.

N°	Variables	Levels of the Variables	
1	**Gender**	**F** **M**	Female Male
2	**Children in the household**	**K** **NK**	Kids < 14 years old. No kids < 14 years old
3	**Age**	**L** **M** **H**	Young 18–30 Medium 31–50 High 51–70
4	**Most frequent mode of transport**	**C** **PT** **B** **F**	Car Public Transport Bike Foot
5	**Origin (Household location)**	**C** **SU**	City Sub-urban
6	**Most frequent destination**	**C** **SU**	City Sub-urban
7	**Income**	**L** **M** **H**	Low Medium High
8	**Occupation**	**A** **I-H** **I-U** **I-R**	Active Inactive (housework) Inactive (Unemployed) Inactive (retired)
9	**Education**	**L** **M** **H**	Low Medium High

The sample was designed to represent different individuals' typologies in order to cover the widest possible spectrum of situations: People living alone, in a couple, or in households with children as well as those living in the city centre or in suburban areas and having different needs and constraints; age and educational level can influence attitudes towards mobility [46], and occupation and income can play a role in modal choice. Thus, intentionally, the sample was not designed to represent the Lyon or French population. However, the comparison with data coming from the French National Institute of Statistics INSEE showed that the sample is not quite alien to the average values of the Grand Lyon area, with the differences concerning a higher educational level, a lower number of single persons and a higher number of households without children [47]. More details will be given in the results (Table 2).

Table 2. Characteristics of the population of Grand Lyon and the OPTYMOD'LYON sample.

	Grand Lyon Metropolitan Area	Optymod'Lyon Sample	
Gender of the Total Population [1]			
Male	47%	50%	
Female	53%	50%	
Education for Citizens Older than 15 Years [1]			
N: <High school diploma	51.4%	28.6%	
H: High school diploma	15.7%	11.9%	
U: >high school diploma	33.1%	59.5%	
Household Size [1]			
1	39.3%	23.8%	
≥2	60.7%	76.2%	
Children in the Household [1]			
0	45.2%	57.1%	
1	22.9%	11.9%	
2	20.3%	23.8%	
≥3	11%	7.1%	
Cars in the household [2]			
0	26.4%	9.5%	
1	49.9%	42.9%	
≥2	23.7%	47.7%	
Public Transport Subscription [3]			
No	62.4%	71.4%	
Yes	27.6%	28.6%	
Mode Used [2]		**Autumn/Winter**	**Spring/Summer**
Car	41.9%	52.4%	35.7%
2 wheels motorised	0.6%	-	4.8%
PT	19.4%	28.6%	14.3%
Bike	1.7%	-	14.3%
Walking	35.3%	7.1%	9.5%
Others	1.1%	-	-
PT + soft modes	-	7.1%	11.9%
PT + auto	-	-	14.3%

[1] Data referred to 2008. http://www.urbalyon.org/AffichePDF/Chiffres_cles_-_De_Albigny-sur-Saone_a_Corbas_-Partie_I-_-3060; [2] Data referred to 2015. Enquête déplacements 2015 de l'aire métropolitaine lyonnaise—Résultats sur le Scot de l'agglomération lyonnaise. Agence d'urbanisme aire métropolitaine lyonnaise, 2016. http://www.urbalyon.org/AffichePDF/Enquete_Deplacements_2015_-_cahier_Scot_agglomeration_lyonnaise-23173; [3] Data referred to 2010 Observatoire partenarial déplacements. Transports et déplacements, les chiffres clés. Agence d'urbanisme aire métropolitaine lyonnaise, 2011. Les chiffres clés mis à disposition par l'INSEE pour les communes du Grand Lyon et du Sepal (Recensement de la population 2008, Pôle emploi, DARES, DADS . . .). Agence d'urbanisme pour l'agglomération Lyonnaise, 2011. http://www.urbalyon.org/AffichePDF/Observatoire_Deplacements_-_Publication_n-6_-_les_chiffres-cles_en_2010-3136.

Five out of the 47 respondents were excluded since they did not participate in the ex-ante or ex-post analysis or did not express any opinion about the WTP. The remaining 42 people allowed

us to maintain a feasible number of focus groups (about 6–9 people in each of the 12 focus groups, before and after the test). Two interviews were carried out individually as respondents were not available to participate in the focus groups: the same pattern of the focus groups was followed during the interview.

This article is focused on the data gathered during the focus groups organised in the ex-ante and ex-post phases of the project. The focus group method relies on the interactions between the participants [48] and fits well with the objectives of the research, reducing costs as the sample used is smaller, but giving an in-depth analysis of the key aspects related to the design of the tool and to the results of the test.

The focus groups' discussions were recorded (audio and video) and transcribed verbatim. The transcriptions were carefully read in order to draw a synoptic table including the main subjects and sub-subjects, thus creating the structure for the content analysis, following an inductive analysis as described by Blais and Martineau [49]. This work was carried out iteratively, to organize raw data in a defined structure [50]; an Excel sheet was prepared including all the data related to the WTP expressed by participants. Such an approach supported the textual analysis and gave precise figures about WTP, allowing a comparison with other studies in literature that generally use quantitative questionnaires. The questionnaire purposely avoided specific questions related to WTP, transferring the issue to the discussion, thus providing a more respectful approach to such a sensitive issue.

A convergent mixed-method design was adopted to analyse the data gathered from the focus groups and those taken from the online questionnaires (socio-economic and travel habits data). The convergent method for this research consists in matching data analysis with data information gathered during personal discussions in order to derive quantitative data from qualitative data obtained from the focus group discussions [51]. To this end, the ex-ante opinions about the WTP for multimodal real-time information were compared in order to define groups of people with similar opinions. The socio-economic characteristics and travel habits of each group were then analysed alongside data gathered by the ex-ante web-questionnaire. The acceptable level of charge and the method of payment declared during the focus groups were likewise analysed. Finally, the evolution of the participants' opinions after the use of the device was investigated to figure out how the use of Optymod'Lyon affected their willingness to pay.

3. Results

The participants were gender balanced and well-educated (59.5% hold a university degree and 11.9% have a high school diploma), even though 28.6% did not attend high school.

52.4% of participants had an average gross household income of 1500–3000 €/month and 35.7% earned 3000–5000 €/month. Those with an income greater than 5000 €/month increased from 2.4% (one person) to 9.5% after the test. Concerning the household composition, the majority of participants lived as a couple (33.3%), 23.8% lived alone, and 28.6% had a large family (four people minimum). Moreover, people living with children represented nearly 43% of the sample. After the test, some changes concerning household size occurred, but they are not significant.

Almost all respondents had a driving license (90.5%) and a low percentage did not own a car (9.5%). Considering the travel behaviour before the test, 7.1% had a bike-sharing subscription and 28.6% a PT subscription. Soft modes were barely used all year round, and always in combination with PT. Car (52.4%) was the preferred mode during the autumn/winter period, followed by PT (28.6%). During spring/summer, the car use dwindled down to 35.7% and PT reached 50%. In fact, during the warm season, people relied on bikes (14.3%) or the combination of PT and car (14.3%), never used during autumn/winter time, or the combination of PT and soft modes (7.1%). In Table 2 a comparison between our sample and the population of the Grand Lyon metropolitan area is reported, showing that our sample is biased in terms of educational level and household size and, thus, the number of children. While car ownership is higher than in the Grand Lyon area, notably for households with

more than two cars, the mobility patterns are not so diverse. The most obvious difference is due to more cyclists and less walkers in our sample.

In the third phase of the research (ex-post phase, see Figure 1), following the test of the application, a few changes towards more sustainable behaviour could be observed in regard to the travel habits of participants. The number of PT users slightly increased (two participants in autumn/winter and three in spring/summer) as well as the number with a bike sharing subscription (two more); on the other hand, a decrease in the multimodal option "PT + soft modes" occurred (one less in autumn/winter and four less in spring/summer). The use of the car as the single mode recorded scant variation in both seasons before and after the test (just one journey less), trips involving both PT and car declined by 50% in the spring/summer (three less).

Travel to work, both before and after the test, ranked as the most popular purpose among participants, respectively 73.4% and 71.4%, while leisure trips slumped from 11.9% to 4.8% and shopping trips climbed from 2.7% to 7.1%. Before the test, 69% made their most frequent trip five times a week, decreasing to 59.5% after the test. Finally, the rate of people making detours during their most frequent trip rose from 50% to 61.9% after the test.

Table 3 shows an overview of the socio-economic characteristics and travel habits of the participants before and after the test allowing a better understanding of participants' profiles. Participants are split by gender and, within the gender, listed by decreasing age. When participants changed their travel habits and/or their socio-economic characteristics after the test, the values before and after are reported in the cells of each column, coloured in grey.

The textual analysis of the reactions towards the introduction of a charge to use multimodal real-time information allowed us to define four homogeneous groups. Such groups have been labelled according to the statements expressed by the participants during the discussion and represent their feelings and attitudes towards their WTP:

- the *idealists* (n = 12, 28.6%) showing a strong negative attitude towards the introduction of a fee to use real-time information. *"I have been used to not paying anything to use applications for 20 years, so it is a problem for me to pay [Didier]". "I'm talking about my experience, what I have seen abroad, applications which are not so complete, but which are closer to this application and usable for free" [Jérémie];*
- the *pragmatics* (n = 11, 26.2%) expressing a moderate negative willingness to pay. *"The same for me [. . .] Because we already pay for so many things each month" [Géraldine]. "The problem is that you already pay the toll for the ring road, the car park because you want to park your car, the public transport when you use it; why should you have to pay to know how to use them (transport systems)? Do you understand what I mean? You already use them [Pierre-Luc];*
- the *ambiguous* (n = 9, 23.8%) representing people not taking a clear stance on their own WTP but not opposed to the introduction of a charge. *"The traveller is bit logical, isn't it?" [Frédéric]. "I have this application, I can benefit from it, I am going to pay, OK, but in the end maybe there will be a benefit, maybe later, in the meantime I am waiting for a benefit if it will come ..., I do not know, we will see". [Fabrice];*
- the *opportunists* (n = 9, 21.4%) willing to pay for the tool. *"That said, I am willing to pay much more ... twice as much if there is a radar detector" [Brice]. "In fact, for me to be willing to pay 4–5 Euros, maximum, it really has to be effective, and it should allow me to save time" [Nouzha].*

Table 4 displays an overview of the socio-economic characteristics of each group, as well as their travel habits. It is interesting to observe how groups are featured differently as regards gender, household size and travel habits.

Table 3. Socio-economic characteristics and travel habits of participants before and after the test.

Name	Age	Education [4]	Income Level [5]	Household Size	Children in the Household	Cars in the Household	Public Transport Subscription [3]	Bike Sharing Subscription	Duration	Purpose [6]	The Most Frequent Trip			
											Mode Aut/Wint [7]	Mode Spring/Summer [8]	Route Changes	Weekly Frequency
WOMEN														
Yvette	65	N	1	1	0	1	N	N	40	3	2 7	7	N	3 1
Annick	65	N	2	1	0	1	Y	N	40	3	5 2	2	Y	3 2
Martine	62	U	3	2	0	0	Y	Y	30	1	2	2	Y	5 4
Michelle	56	U	2	1	0	1	N	N Y	10	1	1 4	4 7	Y	5 4
Chantal	55	N	2	1	0	1	N	N	45	1	1	3 1	Y	5
Agnès	53	U	2	1	0	1	N	N	20	1	1	1	N	5
Evelyne	51	H	3 2	2 1	0	2 1	N	N	30	1	1 6	7 6	N	3
Odile	50	U	3	≥4	2	1	Y	N	30	1	2	3 2	Y	5
Géraldine	44	U	2	≥4	2	2	N	N	5	1	3 1	1 4	Y	5 2
Nouzha	43	U	2	3	2	1	Y N	N	52	1	5 1 2	7 1	Y	5
Karyne	42	N	2	≥4	≥3	1 [2]	N N	30	3	2	2 1 7	2 N	2	1
Laurence	41	N	0	≥4	≥3	1	N Y	N	5	1	3	3	Y	5
Carine	37	U	2	0	1	0	0 Y	N	90	1	5	5	N	5
Marjorie	36	U	2 3	2	0	1	N	N	10	1	3	7 3	Y	5
Anne-Sophie	34	N	0 2	≥4	2	1	N	N	42	5	5 2	4	Y	4 5
Malika	30	U	2	3	1	2	N	N	20	1	1	1 7	N	5
Sabrina H.	30	H	2	≥4	2	2	N	N	30	1	1	1	N	5
Sabrina P.	30	U	3	≥4	2	1	Y	Y	30	1	2	5	Y	5
Olivia	27	U	3	2	0	2	N	N	30	1	1	1	N	5
Camille	25	U	2	2	0	2	Y	N	10	2	1 2	4 2	N	5 2
Charlotte	23	U	1	1	0	0 [2]	N Y	N	20	4	1 5 2	5 2	Y	5 4
MEN														
Gilles	68	N	3	2	2	0	2 N	N	30	3	2 2 1	2 1	Y	2 1
José	65	H	2 1	1	0	1	N	N	40	2	5 1	7 1	N	3 2
Alain [1]	60	U	3 2	2	0	1 [2]	Y	N	40	3	2	2	N	1
Pascal S.	55	H	3	2	0	≥3	N	N	30	1	1	1	Y	2
Pascal V.	53	U	2 3	3	1	2	N	N	10	2	1	6	N	5
Jean-Claude	53	U	4	2	0	2	N	N	40	1	1	1	N	5
Mark	52	N	2	3	1	1	N	N	12	1	1	4	N	5
Pascal R.	49	U	3 4	4	2	2	Y N	N	45	1	2 1	4	N	5
Philippe	48	U	3	≥4	2	2	N	N	45	1	1	1	Y	5
Didier	48	N	2	3	1	2 1	N	N	22	1	1	1	N	5
Mohamed	44	U	2	≥4	≥3	1	N	N	45	3	2	2 3	Y	2 3
Pierre-Luc	42	U	3	≥4	2	2 1	N	N	60	1	1	1	Y	5
François	41	U	3	2	0	1	N	N	30	1	1 2	2	N	2 4
Rezki [1]	39	U	2	3	1	2	Y	N	40	1	1 2	1	2	N 5
Fabrice	38	N	2 0	≥4	2	2	N	N	10	1	1	1	Y	5
Frédéric	38	U	3 4	2	0	≥3	N	N	25	1	1	1	Y	5
Brice	35	U	3	2	0	2	N	N	20	1	1	1 3	Y	4 3
Cédric	34	N	3 4	2	0	2	N	N	30	1	1	1	N	5
Sébabstien	32	N	2	2 1	0	2	N	N	15	1	1 6	6	Y	5
Jérémie	30	U	2	1	0	0 [2]	Y	N	25	1	5 2	3	Y	5
Julien	30	H	2	1	0	1	Y	Y	22	1	2	4	N	4

[1] People with a handicap; [2] People without a driving license;[3] Y: Yes/N: No; [4] Education: N = less than high school diploma; H = High school diploma; U = More than high school diploma; [5] Income level: 0 = no answer; 1 ≤ 1500 €/month; 2 = 1500–3000 €/month; 3 = 3000–5000 €/month; 4 ≥ 5000 €/month; [6] Purpose: 1 = work; 2 = to pick someone up and drop someone off; 3 = leisure; 4 = study; 5 = shopping; [7] Mode used in autumn/winter; [8] Mode used in spring/summer.

Table 4. Socio-economic characteristics and travel habits of identified groups.

		Idealists n = 12, 28.6%	Pragmatics n = 11, 26.2%	Ambiguous n = 10, 23.8%	Opportunists n = 9, 21.4%
Gender	**Male**	66.7%	27.3%	50.0%	55.6%
	Female	33.3%	72.7%	50.0%	44.4%
Age	**Average**	47.2	41.3	45.6	41.9
Education	**NH**	25.0%	36.4%	30.0%	22.2%
	H	8.3%	9.1%	20.0%	11.1%
	U	66.7%	54.5%	50.0%	66.7%
Income Level €/Month	**<1500**	7.7%	11.1%	-	-
	1500–3000	38.5%	55.6%	60.0%	66.7%
	3000–5000	46.2%	33.3%	40.0%	22.2%
	>5000	-	-	-	11.1%
	NtR *	7.7%	-	-	-
Household Size	**1**	25.0%	27.3%	30.0%	11.1%
	2	33.3%	27.3%	40.0%	44.4%
	3	16.7%	-	10.0%	33.3%
	≥4	25.0%	45.5%	20.0%	11.1%
Children in the Household	**0**	58.3%	4.,5%	70.0%	55.6%
	1	16.7%	-	10.0%	22.2%
	2	16.7%	45.5%	20.0%	11.1%
	≥3	8.3%	9.1%	-	11.1%
Cars in the Household	**0**	8.3%	18.2%	10.0%	-
	1	50.0%	36.4%	40.0%	44.4%
	2	33.3%	45.5%	40.0%	55.6%
	≥3	8.3%	-	10.0%	-
Public Transport Subscription	**No**	58.3%	81.8%	60.0%	88.9%
	Yes	41.7%	18.2%	40.0%	11.1%
Bike Sharing Subscription	**No**	91.7%	100.0%	80.0%	100.0%
	Yes	8.3%	-	20.0%	-
Trip Duration	**Average**	32.3	31.6	23.9	31.4
Trip Purpose	**Work**	63.6%	63.6%	90.0%	77.8%
	Take/drop someone	9.1%	9.1%	10.0%	11.1%
	Leisure	27.3%	9.1%	-	11,1%
	Study	-	9.1%	-	-
	Shopping	-	9.1%	-	-
Mode Used in Autumn/Winter	**Car**	50.0%	36.4%	60.0%	66.7%
	PT	41.7%	18.2%	40.0%	11.1%
	Pedestrian	0.0%	18.2%	-	11.1%
	PT + soft modes	8.3%	27.3%	-	11.1%
Mode Used in Spring/Summer	**Car**	33.3%	36.4%	20.0%	55.6%
	PT	33.3%	9.1%	10.0%	-
	Pedestrian	8.3%	18.2%	10.0%	-
	Bike	-	9.1%	50.0%	-
	PT + soft modes	8.3%	18.2%	-	-
	Moto	8.3%	9.1%	-	-
	PT + car	8.3%	-	10.0%	44.4%
		Idealists n = 12, 28.6%	**Pragmatics** n = 11, 26.2%	**Ambiguous** n = 10, 23.8%	**Opportunists** n = 9, 21.4%
Route Changes [1]	**No**	50.0%	27.3%	50.0%	66.7%
	Yes	50.0%	72.7%	50.0%	33.3%
Weekly Frequency	**Once**	8.3%	-	-	-
	Twice	25.0%	9.1%	-	11.1%
	3 times	16.7%	-	10.0%	11.1%
	4 times	-	9.1%	10.0%	11.1%
	5 times	50.0%	81.8%	80.0%	66.7%

[1] Route changes: if people deviate from their route at least three times per week for their most frequent trip.

The *idealists* and the *pragmatics* are different in terms of age and gender: the *idealists* are mainly females (72.7%) and are the youngest group (41.3), while the *pragmatic*s are the oldest group (average age 47.2) and mainly males (66.2%). However, those two groups are similar in terms of travel purpose (63.6% travel for work, considerably less than the other two groups). The *pragmatics* live mainly in large households (≥4 persons) with two children (45.5%), unlike the *ambiguous* who are mainly childless (70%).

The *idealists* have the highest rate of PT subscription (41.7%): they use it for their most frequent trip (41.7% in autumn/winter) and record the lowest travel frequency (50% have a frequency less than three times per week). However, the *pragmatics* and the *ambiguous* show the most sustainable behaviour: they record the lowest use of car or PT + car, respectively in autumn/winter (36.4%) and in spring/summer (30%); the *ambiguous* also record the highest use of bike (50%). The *opportunists* do not change route during their most frequent trip (66.7%), unlike the pragmatics (27.3%), and prefer using the car for their most frequent trips (66.7% in autumn/winter; 55.6% in spring/summer up to 100% including PT + car). Finally, the *opportunists* record the highest level of education (66.7% have a university degree) unlike the *ambiguous* (50%).

3.1. The Acceptable Level of Charge and Form of Payment

The forms of payment considered acceptable by the participants vary according to the groups, as shown in Figure 3. As the app was still not ready to market and, hence, not considered reliable, the WTP after the test was largely different from the initial one; for this reason, the values declared before the test were used.

As already hinted, the *idealists* prefer an app free of charge (six participants), while the *pragmatics* were in favour of a monthly or annual subscription (nine participants). The subscription was also largely chosen by the *ambiguous* and the *opportunists*. Generally speaking, those who accepted a charge did not explain why. Participants rejecting the subscription—notably the *opportunists* (six participants)—were inclined to choose a flexible offer allowing them a degree of freedom in choosing the information related to the mode they would use and only when they need it. A small fraction in each group—except for the *pragmatics*—would prefer a one-time payment, which is the usual payment method for apps in the Play Store.

Figure 4 depicts the acceptable level of the monthly subscription charge as declared by the participants before the test; 19 out of 42 participants did not consider any charge acceptable or did not suggest any value. Excluding those people, more than the half of participants (24) favoured a subscription: six would prefer the annual subscription while 18 would prefer the monthly one. The charges span from 0.2 to 12.5 €; the majority opted for 0.2–3 € (14) with a prevalence of the *pragmatics* (6).

Table 5 reports the average and median value of the acceptable monthly charge of the four clusters—before the test. Not surprisingly, the *idealists* record the lowest values, desiring to use the app free of charge. It can be observed that the *opportunists* have similar average and median values for monthly charges while the *ambiguous* show the highest average, but the median equals zero. Such a value is due to the attitude of a few members of the *ambiguous* group towards high charges, considering people should pay a lot to get information even though they never professed themselves as willing to pay.

Table 5. Average and median values for acceptable monthly charge before the test ("zero" included).

	Average (€)	Median (€)
Idealists	0.8	0
Pragmatics	2.5	1.7
Ambiguous	3.9	1.6
Opportunists	3.3	3

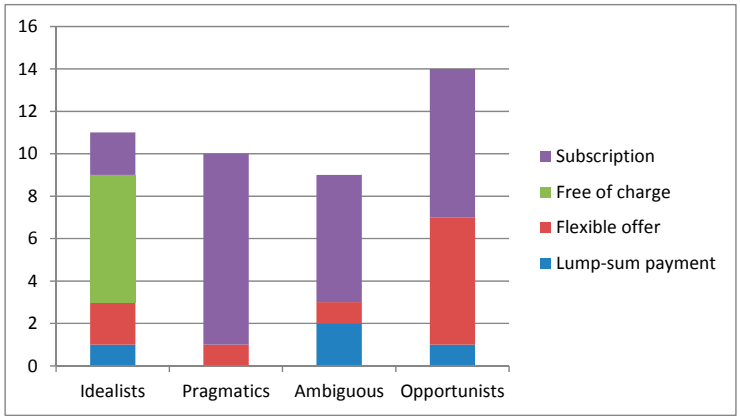

Figure 3. Forms of payment considered acceptable by the participants, before the test.

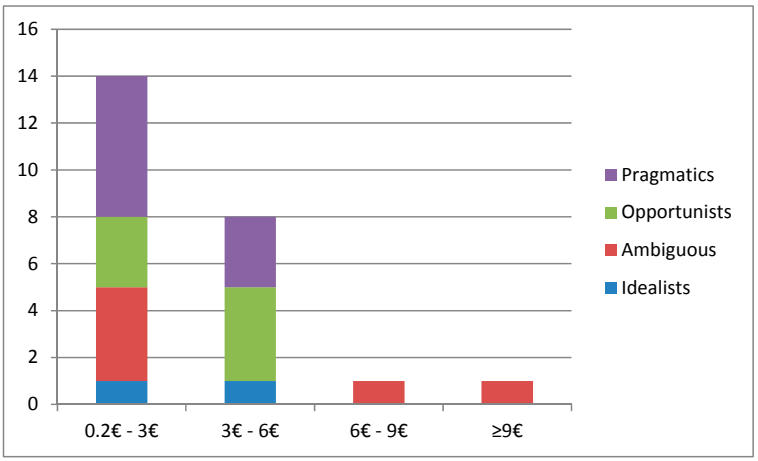

Figure 4. Acceptable monthly charge (no "zero"), before the test.

3.2. The Evolution of Attitudes and Opinions After the Test

Figure 5 provides an overview of prevailing opinions in each group as well as showing how those opinions changed after the test period. One participant (in the *opportunists* group) did not express his opinion during the ex-post focus group.

The *idealists* oppose the charge to use the app for ideological reasons. On the one hand, those individuals are strongly in favour of gratuity, arguing the app should be free of charge to be "*accessible to a maximum of persons*" (Pascal S.), or because their socio-economic situation usually prevents them from paying for services (Yvette, retired). On the other hand, some argue they are not used to paying for travel information since it is usually available for free and they will always prefer to *use* it or *find* it that way.

In contrast, the *pragmatics* are unwilling to pay for personal reasons. The majority of them (seven out of 11) claim they do not need to use the app since they consider it not *useful* for their travels, arguing they have already *optimised* their most frequent trip. Some of them also explain their unwillingness to pay by economic arguments (four out of 11): not enough money to spend (Charlotte, student), too many expenses (Géraldine, Sébastien) or have already paid to optimise their travel (Sabrina H.).

Although the *ambiguous* did not express their willingness to pay to use information offered by Optymod'Lyon, they never rejected the introduction of a charge. In fact, the majority of them supported the idea that users should contribute to the funding of the device (six out of 10).

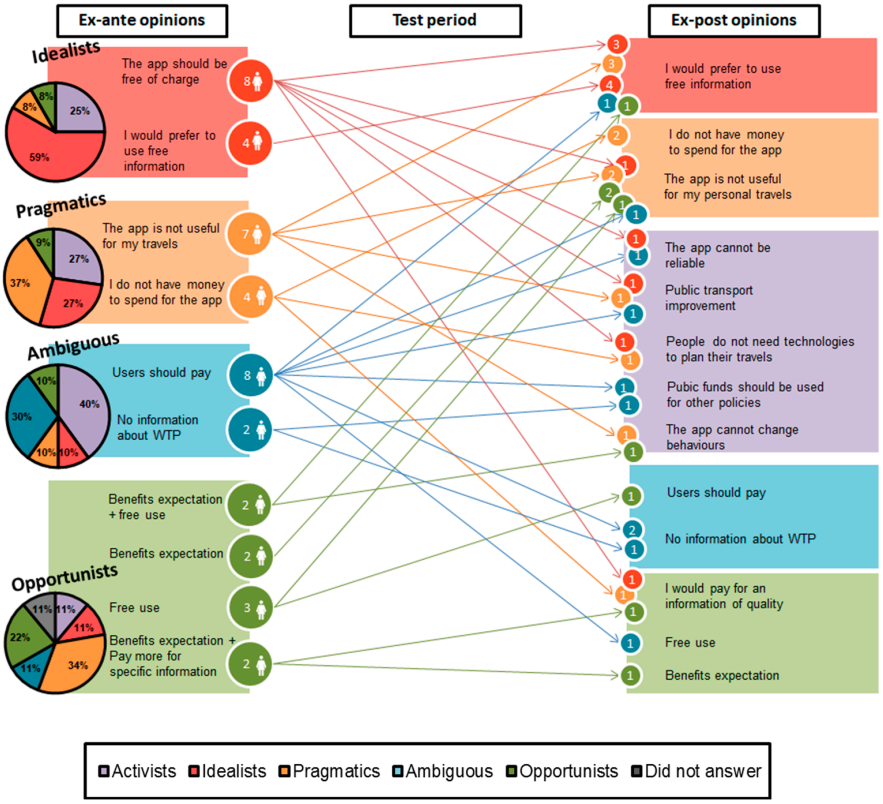

Figure 5. Evolution in opinions for each group after testing the Advanced Traveller Information Systems (ATIS).

The *opportunists* clearly expressed their willingness to use the app but they think they should get benefits from its use (six out of nine) in terms of time, stress or cost savings. Two participants out of nine were willing to pay more if some specific information, related to their travel, was added to the tool. Others revealed they would prefer to pay only for using travel information as they demand it, not accepting to be constrained by a permanent commitment.

Figure 5 shows the percentage of individuals who changed opinion after the test period. Most of the *idealists* (59%) upheld their view and three of those who thought Optymod'Lyon should be free of charge expressed their preference for using other free apps. 34% of *opportunists* shared the view of the *pragmatics*, being unwilling to pay for an app they did not consider useful for their travels. In fact, only 27% of the *opportunists* expressed their WTP for the tool, but only if information is reliable and they can draw actual benefits from it.

It is also interesting to observe that, even though the *pragmatics* thought the information was not useful for their travels, after the test 27% declared they were willing to use it for free.

Finally, a few individuals in each group—mainly the *ambiguous* (40%)—changed their mind following the test of the device as depicted by the lilac box in Figure 5 (right side). The new opinions highlight that the app is not a suitable "policy" to modify users' behaviour; in fact, people consider the app as a "waste" of public funds and would have preferred an investment in something more tangible, like the improvement of the public transport system (e.g., higher frequency).

4. Discussion and Conclusions

Four clusters of participants—*idealists, pragmatics, ambiguous and opportunists*—are reviewed in the results, classified according to their willingness to pay for getting multimodal real-time information, a key aspect for defining a potential business model to maintain the Optymod'Lyon app.

Out of the 37 participants who expressed an opinion about WTP (i.e., the *idealists*, the *pragmatics* and the *opportunists*), a strong majority were unwilling to pay (62.2%: *idealists* and *pragmatics*) and gave economic reasons to justify their position and the availability on the market of free information. It is impossible not to associate those results with the current economic crisis—prompting people to cut their expenses (e.g., the *pragmatics*)—as well as with the emergence of new business models allowing companies to propose services for free, as observed by the *idealists*.

Moreover, in accordance with the state-of-the-art literature [40], those willing to pay (37.8% *opportunists*) expect reliable information and are mainly drivers. They are educated (high school graduates) car users (66.7% in autumn/winter; 100% in spring/summer, including PT + car), mainly travelling to work, and they are in general willing to pay a low monthly charge level (0.2–3 €/month), although some of them might be willing to pay more (3 to 6 €/month).

On the other hand, *idealists* and *pragmatics* (not willing to pay) record a lower share of trips to work and a higher share for leisure, shopping and study. The absence of a definite stance about WTP of the *ambiguous* could be explained by the fact that they do not think they need information for their most frequent trip, probably due to its having the lowest travel time and being a currently sustainable travel behaviour, or an already optimised trip.

Before the test, the most preferred form of payment was an annual or monthly subscription (seven *opportunists*, although a flexible offer would also be appreciated (six *opportunists*). However, it was difficult to agree on a common position about an acceptable level of charge and form of payment since the app was still in a prototypal phase and the information not entirely reliable as yet.

During the focus group discussions, however, the low performance drawback was surmounted, as participants were presented with the hypothetical scenario of correct app operation.

One person in each group of *idealists* and *pragmatics* changed their mind towards a willingness to pay. All the *idealists* who preferred free information upheld their view and some of the *pragmatics* (three out of seven), who thought that the app was not useful for their travels, realised that they definitely would search for information, but for free. Gilles, who changed groups from *pragmatics* to *idealists* after the test, said: "*Compared to services that are available for free, we will not pay, I mean myself, I will not pay*" Pierre-Luc who also changed from *pragmatics* to *idealists* stated that: "*Well, you can have other information for free. You know what I mean, it's not ... Then, you have to develop something else to make people pay and the application has to work very well*".

The majority of the *ambiguous* changed their mind after the test; in fact, only 30% confirmed their previous position, while 40% strongly rejected the app as a useful tool. The test allowed us to experiment with what the daily use of the device might mean prior to its actual introduction, and thus to take a more realistic position about both its usefulness and the WTP. In fact, a new group (11 participants) emerged and the participants challenged the usefulness of the app to modify travel behaviour. Evelyne, who was among the *ambiguous* before the test, switched to the new group together with Jeanne who argued: "*The money to be used to maintain Optymod'Lyon should be given to public transport to allow the transport company to lower the ticket price*". Frédéric (*According to me, if thousands of millions [euros] need to be invested, they should not be spent on such an application*) and Martine were in the *ambiguous* group before the test. Odile was in the group of pragmatics and said that the application "*will not induce any change in travel behaviour*" and that "*it will become like a toy afterwards, to use and blend, once everything is properly installed*". Martine agreed with them (*voilà that will be the case*).

The results above show how discussions in the ex-post focus groups provided opportunities to the participants to reflect on their opinions prior to the use of the app, as well as on their own expectations and disappointments.

The mismatch between opinions and facts often occurs for any kind of product and the more technologically advanced a product is, the higher people's expectations are, and the greater their subsequent disappointment. People's reactions are a key element in technology development.

Since the goal of ATIS was to prompt more sustainable behaviour, it is crucial to understand whether the introduction of a charge could hold back the use of the app and its likely beneficial effects

on travel choices. The current study highlighted the fact that people included in the two groups who are basically unwilling to pay will forsake the app, because they are not interested in putting money into such a service. These groups are not key targets either for the app or for analogous transport policies, as their current travel behaviour is already eco-friendly.

The real and most important target for the app were all those who drive a lot, in terms of time and distance. Since they bear a consistent cost for their current mobility habits, the introduction of a moderate charge for the use of the app should not substantially affect their mobility. Furthermore, the *opportunists* (mainly drivers)—before the test—were willing to pay for using a multimodal app. Nevertheless, the crucial drawback is that after the test only two people still declared their willingness to pay. This outcome reveals that the introduction of a charge would not contribute to the desired goal of a more sustainable and optimised urban mobility.

Arguably, a certain contradiction became obvious, since both people who admitted their willingness to pay for a satisfactory app also declared being particularly interested in all car-related features: a clear sign of unwillingness to change their current travel behaviour in favour of a more sustainable pattern.

The results presented so far may lessen the expectations of local administrations, often too high in terms of the ability of new technologies to solve mobility and ecological issues. In fact, as in several other studies [19,52–54], these results prove that new technologies alone are not powerful enough to change travel behaviour unless coordinated actions by policy makers for the improvement of transport networks (and notably the alternatives to cars) and the introduction of policies for reducing car use are put forward at the same time.

To compare the above results with state-of-the-art literature, Table 6 includes a summary review of the WTP for existing ATIS or for information systems investigated in several studies providing travel information. The results show that there is limited literature concerning WTP for multimodal devices and reveals how such systems are diverse, also in terms of the level of charge. In addition, no existing or studied system is similar to Optymod'Lyon, which is the only one to propose multimodal real-time options integrating different transport modes in a trip chain; this makes the comparison even more difficult.

Furthermore, it can be observed that several studies only investigate the disposition to pay for ATIS, but do not give any precise figure in terms of WTP. Moreover, the WTP is seldom requested in terms of monthly charge, but is often expressed per trip or per call to get travel information. Notwithstanding the difficulty of comparisons, it can be observed that the WTP is usually quite low, in line with our results; however, there is no insight into the socio-economic characteristics of respondents who are limited to drivers and, sometimes, to public transport users and drivers, not considering all transport modes.

Thus, even though the size of our sample does not allow us to extend the results to a larger population, it represents a complete and diversified range of individual profiles. Moreover, a focus group approach has never been used in the literature to investigate the willingness to pay for ATIS, but it has been used to better understand people's expectations about the purpose of ATIS, as well as the usefulness of such tools [25,39]. There is only one study [13], as reported in Table 6, using a focus group approach to derive quantitative information, similar to WTP. Our research has shown how a great deal of information can be collected, even quantitative information, if the debate is aimed at investigating not only the aspects involved in the use of the product, but also emotions, points of view, feelings and attitudes that help shape the behaviour. Such an insight is not possible using only quantitative questionnaires. Focus groups provided a better understanding of people's WTP and of the motivations behind it, which is useful for future research.

Finally, the interest of the results lies in the fact that users have experienced the app in a real context showing how such tests had an effect on the attitudes and preferences towards WTP. These findings should be taken into account by policy-makers if a fee to maintain ATIS were introduced, paying attention also to the nature of the clusters reported. Understanding the above characteristics and attitudes of travellers is a key point when implementing new technologies, interventions and policies and the paper has tried to bridge the existing gap in the literature about the conditions for people's willingness to pay to use ATIS.

Table 6. Review of the ATIS Willingness To Pay (WTP) in literature and comparison with Optymod'Lyon.

Survey	Sample	Attitude Towards Payment and WTP	References	Comparison with OPTYMOD'LYON: Real-Time Multimodal Navigator. Test on 150 Travellers
Existing ATIS				
WISETRIP: International Multimodal Journey Planner				
Laboratory simulation of user acceptance and WTP	425 people	• WTP increases as the quality of the information is higher • 43.3% would pay €0.80 without dynamic information • 89.8% would pay €1 with dynamic information: €1	[37]	Optymod'Lyon proposed dynamic information. However, some people willing to pay (*opportunists*, 22.2%) expressed their resolve to pay more if it integrated specific information such as radar localisation, highlighting a desire to improve the quality of the device.
TravInfo: A Real-Time Traveller Advisory Telephone System Providing Traffic and Transit Information				
Questionnaire to investigate the use and the WTP per call	511 persons using the service	• The number of calls depends on the charge per call • The WTP decreases when the charge level increases • Drivers' WTP is $2 per month while transit users stand at about half ($1) • Greater WTP is associated with longer trips, work trips, customised services and radio traffic updates • WTP is cost-sensitive	[32,54]	Some participants willing to pay were ready to accept a higher monthly charge (55.6% of the *opportunists)* of between €3 and €6. In case of Optymod'Lyon car drivers are more willing to pay (66.7% in autumn/winter; 100% in spring/summer, including PT + car), are highly educated (>66.7% high school graduates) and mainly travelling for work (77.8%).
	69 persons using the service	• 57% of the total sample were willing to pay • Occasional users are more inclined to pay for customised services but they are less inclined to pay than people having the habit to use TravInfo	[38]	Percentage of people willing to pay was lower (21.4% of the total population) than in the study under comparison. Some people willing to pay expressed their resolve to pay more if Optymod'Lyon integrated specific information such as radar localisation (*opportunists*, 22.2%).
Survey	**Sample**	**Attitude Towards Payment and WTP**	**References**	**Comparison with OPTYMOD'LYON: Real-Time Multimodal Navigator. Test on 150 Travellers**
Existing ATIS (Continued)				
TravInfo: A Real-Time Traveller Advisory Telephone System Providing Traffic and Transit Information *(continued)*				
Questionnaire to investigate the use and the WTP per call *(continued)*	Persons from SF area: 658 persons (accepted form of payment) 481 persons using ATIS in general (WTP)	• Acceptable payment form: 17% monthly charge, 56% per-call, 22% no fee, 5.2% are not sure or they do not know • WTP: 52% would pay $1 per call, 39% would pay $7 per month	[33]	Monthly charge was the most popular subscription among groups (72.7% of the *pragmatics*; 66.7% of the *ambiguous*; 77.8% of the *opportunists*), a part of the *idealists* (50%) who strongly expressed their preference for a free of charge app.
BayernInfo: A Supra-Regional Multimodal Traffic Information System Provided through a Portable Mobility Planner for Public Transport and Car Users				
Questionnaire mainly investigating the use	866 persons using the service	• 12% are willing to pay while 39% are undecided	[44]	Percentage of people willing to pay for Optymod'Lyon was also low (21.4% of the total population).
ARTIMIS: A Telephone Information System Providing Traffic Information				
Questionnaire to investigate the WTP per call	779 persons using the service	• 65% are willing to pay if the service is satisfactory • The maximum WTP is $0.25 per call	[34]	In accordance with those results, panellists willing to pay after the experiment would pay (n = 3) for reliable information.
SMARTWAY: A Public Transport Real-Time Information Navigator for Smartphone				

Table 6. *Cont.*

Survey	Sample	Attitude Towards Payment and WTP	References	Comparison with OPTYMOD'LYON: Real-Time Multimodal Navigator. Test on 150 Travellers
Questionnaire and focus groups to understand user needs	21 Italian and 21 German participants in focus groups and 19 in the questionnaire	• WTP is different for users of different socio-economic/demographic categories and from different countries • German participants would prefer to pay once (about €30) and only for the service while Italians would pay a monthly fee (from €5 to €10 • Disabled people have a higher WTP while retired people are unwilling to pay	[13]	Only 9.5% of participants expressed a positive opinion about a fixed fee and only 11% among the *opportunists* (n = 1). A monthly charge was the most popular subscription among groups (72.7% of the *pragmatics*; 66.7% of the *ambiguous*; 77.8% of the *opportunists*), and for a part of the *idealists* (50%) who strongly expressed their preference for an app free of charge.

Survey	Sample	Attitude Towards Payment and WTP	References	Comparison with OPTYMOD'LYON: Real-Time Multimodal Navigator. Test on 150 Travellers
EXISTING ATIS (Continued)				
SmarTraveler: A Real-Time Location-Specific Providing Traffic Information and Transit Information Per Telephone				
Two questionnaires investigating use and WTP of users and non-users of the service	220 including actual and potential users of the service	• WTP is correlated to the expected benefits (reliability, relevance and coverage) • Number of calls and monthly subscription are correlated to the charge level • Non-users are willing to pay more ($0.1/2.3 calls) than users ($0.1/3 calls)	[43]	In accordance with the results in the present study, panellists willing to pay after the experiment would do so for reliable information (n = 3). Before the experiment, they also indicated they expected benefits from the use of the service (*opportunists*, 66.7%). Moreover, after the experiment, a new opinion expressed by 2 participants indicated that they doubt of the possibility to implement a reliable service.
Potential Services to Be Provided by ATIS				
Review				
Multi-dimensional study on the state of the art		• WTP is related to the perceived benefits of the use of the information	[42]	Before the experiment, panellists willing to pay, also indicated they expected benefits from the use of the service (*opportunists*, 66.7%).
Real-Time Transit Information				
Stated preference survey on WTP	110 public transport users	• WTP is greater for reliable information	[40]	In accordance with those results, panellists willing to pay after the experiment would do so for reliable information (n = 3).

Survey	Sample	Attitude towards payment and WTP	References	Comparison with OPTYMOD'LYON: Real-Time Multimodal Navigator. Test on 150 Travellers
Potential Services to Be Provided by ATIS (Continued)				
Multimodal Information Platform				
Stated preference survey on WTP	398 commuters	• Real-time information is the most valued attribute of the service • Men in the habit of using pre-trip information are less willing to pay than those currently using en-route information • Women show a greater WTP for real-time information and women with high income are less interested in a service-locating option and multiple-itinerary proposal • Women WTP depends on children-related constraints	[45]	Gender characteristics are not significant to distinguish the groups; however, the *idealists* and the *pragmatics* are opposed in terms of age and gender: the first are females (72.7%) and have the lowest average age (41.3) while the second ones are the oldest group (average age 47.2), mainly males (66.2%).

Table 6. *Cont.*

Survey	Sample	Attitude Towards Payment and WTP	References	Comparison with OPTYMOD'LYON: Real-Time Multimodal Navigator. Test on 150 Travellers
Pre-Trip Travel Time Information for Drivers				
Field experiment and stated preference survey on WTP	113 persons	• 35% are inclined to pay and their WTP is $1 per trip • 70% think the information should be provided for free by the public sector and 19% by the private sector with a charge • WTP is higher for commuting, events and congested trips than for recreational ones	[35]	Percentage of people willing to pay for Optymod'Lyon was also low (21.4% of the total population). 19% of participants (some of the idealists) thought the app should be provided for free.
Information at Bus Stops				
Stated preference survey on WTP	470 students using public transport	• People are more willing to pay for a better frequency or reliability of transport services than for ATIS • Information is the last attribute that people would pay for to improve their travel experience	[36]	Ex-post focus groups revealed that some participants would have preferred an improvement of public transport and other policies to the deployment of Optymod'Lyon.

Survey	Sample	Attitude towards payment and WTP	References	Comparison with OPTYMOD'LYON: real-time multimodal navigator. Test on 150 travellers
Potential Services to Be Provided by ATIS (Continued)				
Web-Enabled Public Transport Information Services				
Stated choice experiment on WTP	184 public transport users	• People are more willing to pay for real-time information and in a lower proportion for additional trip planning, fares information and timetable schedules	[30]	Only, 21.4% of the panellists of Optymod'Lyon were willing to pay.
Review				
Cross-Cutting study on the state of the art		• People are willing to pay as long as they perceive the value of the information provided	[41]	Before the experiment, willing- to- pay panellists, indicated they expected benefits from the use of the service (*opportunists*, 66.7%).
Stated preference survey to examine the roles of psychological factors	99 Chicago-area commuters	• Average WTP is $36.9 per ride	[19]	Only one participant in the ex-ante focus groups proposed to pay per ride. A monthly charge was the most popular subscription method among groups (72.7% of the *pragmatics*; 66.7% of the *ambiguous*; 77.8% of the *opportunists*) and for some of the *idealists* (50%) who strongly expressed their preference for an app free of charge.
Other Services				
Radio Traffic Information and Variable Message Signs Information				
Questionnaire on the impact on route choice behaviour and WTP	826 participants	• WTP is highest for male drivers under 45 years on business trips and for people having a good experience of variable message signs	[29]	Results of Optymod'Lyon pointed out that car drivers are more willing to pay (66.7% in autumn/winter; 100% in spring/summer, including PT + car), while gender is not a significant issue. Results also indicated that participants in our study are highly educated (>66.7% high school graduates) and mainly travelling to work (77.8%).

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References

1. European Commission. *Proposal for a Directive of the European Parliament and of the Council*; 2008/0263 (COD); Commission of the European Communities: Brussels, Belgium, 2008.
2. European Parliament and Council of the European Union. *Directive 2010/40/EU*; Official Journal of the European Union: Bruxelles, Belgium, 2010.
3. Potoènik, J. Making the European transport industry "greener, safer and smarter" to boost our industrial competitiveness. In Proceedings of the Transport Research Arena Opening Ceremony, Ljubjana, Slovenia, 21 April 2008.
4. Abdel-Aty, M.; Vaughn, M.K.; Kitamura, R.; Jovanis, P. Investigating effect of advanced traveler information on commuter tendency to use transit. *Transp. Res. Rec.* **1996**, *1550*, 65–72. [CrossRef]
5. Gan, H.C.; Sun, L.J.; Chen, J.Y.; Yuan, W.P. The Advanced Traveler Information System for Metropolitan Expressways in Shanghai, China. *Transp. Res. Rec.* **2006**, *1944*, 35–40. [CrossRef]
6. Schofer, J.L.; Khattak, A.; Koppelman, F.S. Behavioral issues in the design and evaluation of advanced traveler information systems. *Transp. Res. C Emerg. Technol.* **1993**, *1*, 107–117. [CrossRef]
7. Asakura, Y.; Hato, E.; Kashiwadani, M.; Katsuki, S. The simulation study of traffic information strategies using the computer for data collection on drivers' responses to ATIS. *WIT Trans. Built Environ.* **1999**, *44*, 10. [CrossRef]
8. Chorus, C.; Molin, E.; Van Wee, B.; Arentze, T.; Timmermans, H. Responses to Transit Information among Car-drivers: Regret-based Models and Simulations. *Transp. Plan. Technol.* **2006**, *29*, 249–271. [CrossRef]
9. Levinson, D. The Value of Advanced Traveler Information Systems for Route Choice. *Transp. Res. C Emerg. Technol.* **2003**, *11*, 75–87. [CrossRef]
10. Abdalla, F.; Abdel-Aty, M. Modeling travel time under ATIS using mixed linear models. *Transportation* **2006**, *33*, 63–82. [CrossRef]
11. Toledo, T.; Beinhaker, R. Evaluation of the potential benefits of advanced traveler information systems. *J. Intell. Transp. Syst.* **2006**, *10*, 173–183. [CrossRef]
12. Jou, R.C. Modeling the impact of pre-trip information on commuter departure time and route choice. *Trans. Res. B Methodol.* **2001**, *35*, 887–902. [CrossRef]
13. Pronello, C.; Camusso, C. User requirements for the design of efficient mobile devices to navigate through public transport networks. In *ICT for Transport: Opportunities and Threats*; Thomopoulos, N., Givoni, M., Rietveld, P., Eds.; Edward Elgar Publishing: Cheltenham Glos, UK, 2015; pp. 55–93, ISBN 978-178-347-128-7.
14. Caulfield, B.; O'Mahony, M. An Examination of the Public Transport Information Requirements of Users. *IEEE Trans. Intell. Transp. Syst.* **2007**, *8*, 21–30. [CrossRef]
15. Monzon, A.; Hernandez, S.; Cascajo, R. Quality of bus services performance: Benefits of real-time passenger information systems. *Transp. Telecommun.* **2013**, *14*, 155–166. [CrossRef]
16. Taylor, B.D.; Fink, C.N. *The Factors Influencing Transit Ridership: A Review and Analysis of the Ridership Literature*; UCLA Department of Urban Planning Working Paper; UCLA Institute of Transportation Studies: Los Angeles, CA, USA, 2003.
17. Tang, L.; Thakuriah, P. Will Psychological Effects of Real-Time Transit Information Systems Lead to Ridership Gain? *Transp. Res. Rec.* **2011**, *2216*, 67–74. [CrossRef]
18. Abdel-Aty, M. Using ordered probit modeling to study the effect of ATIS on transit ridership. *Transp. Res. C Emerg. Technol.* **2001**, *9*, 265–277. [CrossRef]
19. Tang, L.; Thakuriah, P. Ridership effects of real-time bus information system: A case study in the City of Chicago. *Transp. Res. C Emerg. Technol.* **2012**, *22*, 146–161. [CrossRef]

20. Gotzenbrucker, G.; Kohl, M. Sustainable Future Mobility by ICTs. The impacts of Advance Traveler Information Systems on mobility behavior. In Proceedings of the 8th ITS European Congress, Lyon, France, 6–9 June 2011; pp. 1–15.
21. Chorus, C.; Molin, E.E.; Van Wee, B. Use and Effects of Advanced Traveller Information Services (ATIS): A Review of the Literature. *Transp. Rev.* **2006**, *26*, 127–149. [CrossRef]
22. Williams, B.M.; Hu, H.; Khattak, A.J.; Rouphail, N.M.; Pan, X. *Effectiveness of Traveler Information Tools*; North Carolina State University: Raleigh, NC, USA, 2008.
23. Khattak, A.J.; Schofer, J.L.; Koppelman, F.S. Commuters' en-route diversion and return decisions: Analysis and implications for advanced traveler information systems. *Transp. Res. Board A* **1993**, *27*, 101–111.
24. Adler, J.L.; Blue, V.J. Toward the design of intelligent traveler information systems. *Transp. Res. C Emerg. Technol.* **1998**, *6*, 157–172. [CrossRef]
25. Kenyon, S.; Lyons, G. The value of integrated multimodal traveller information and its potential contribution to modal change. *Transp. Res. F Traffic Psychol. Behav.* **2003**, *6*, 1–21. [CrossRef]
26. Chorus, C.G.; Walker, J.L.; Ben-Akiva, M.E. Traveler decision making under conditions of knowledge limitations and information provision. In Proceedings of the 86th Transportation Research Board, Washington, DC, USA, 21–25 January 2007.
27. Kollmuss, A.; Agyman, J. Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ. Educ. Res.* **2002**, *8*, 239–260. [CrossRef]
28. Pronello, C.; Veiga-Simão, J.; Rappazzo, V. Can The Multimodal Real Time Information Systems Induce a More Sustainable Mobility? *Transp. Res. Rec.* **2016**, *2566*, 64–70. [CrossRef]
29. Emmerink, R.H.; Nijkamp, P.; Rietveld, P.; Van Ommeren, J.N. Variable message signs and radio traffic information: An integrated empirical analysis of drivers' route choice behaviour. *Transp. Res. A Policy Pract.* **1996**, *30*, 135–153. [CrossRef]
30. Molin, E.J.; Timmermans, H.J. Traveler expectations and willingness-to-pay for Web-enabled public transport information services. *Transp. Res. C Emerg. Technol.* **2006**, *14*, 57–67. [CrossRef]
31. Dziekan, K.; Kottenhoff, K. Dynamic at-stop real-time information displays for public transport: Effects on customers. *Transp. Res. A Policy Pract.* **2007**, *41*, 489–501. [CrossRef]
32. Ygnace, J.L.; Koo, R.; Yim, Y. *User Response to the Telephone Advisory Traveler Information System in the San Francisco Bay Area*; Publication UCB-ITS-PWP-2000-8; California Partners for Advanced Transit and Highways (PATH): San Francisco, CA, USA, 2000.
33. Wolinetz, L.; Khattak, A.J.; Yim, Y. *TravInfo Evaluation: Traveler Response Element Willingness to Pay for Traveler Information: Analysis of Wave 2 Broad Area Survey*; Publication UCB-ITS-PWP-2001-5; Partners for Advanced Transit and Highways (PATH): San Francisco, CA, USA, 2001.
34. Clemons, J.; Aultman-Hall, L.; Bowling, S. *ARTIMIS Telephone Travel Information Service: Current Use Patterns and User Satisfaction*; Publication KTC-99-24; Kentucky Transportation Center: Lexington, KY, USA, 1999.
35. Zhang, L.; Levinson, D. Determinants of route choice and value of traveler information: A field experiment. *Transp. Res. Rec.* **2008**, *2086*, 81–92. [CrossRef]
36. Eboli, L.; Mazzulla, G. Willingness-to-pay of public transport users for improvement in service quality. *Eur. Transp. Trasp. Eur.* **2008**, *38*, 107–118.
37. Zografos, K.G.; Androutsopoulos, K.N.; Apospori, E. User Acceptance and Willingness to Pay for the Use of Multimodal Trip Planning Systems. *Procedia Soc. Behav. Sci.* **2012**, *48*, 2405–2414. [CrossRef]
38. Mehndiratta, S.; Kemp, M.; Pierce, S.; Lappin, J. Users of a regional telephone-based traveler information system–A study of TravInfo™ users in the San Francisco Bay Area. *Transportation* **2000**, *27*, 391–417. [CrossRef]
39. Peirce, S.; Lappin, J. Evolving awareness, use, and opinions of Seattle region commuters concerning traveler information: Findings from the Puget Sound Transportation Panel Survey, 1997 and 2000. In Proceedings of the 82nd Annual Meeting of the Transportation Research Board, Washington, DC, USA, 12–16 January 2003.
40. Zito, P.; Salvo, G. Latent class approach to estimate the willingness to pay for transit user information. *J. Transp. Technol.* **2012**, *2*, 193–203. [CrossRef]
41. Noonan, J.; Shearer, O. *Intelligent Transportation Systems Field Operational Test Cross-Cutting Study: Advance Traveler Information Systems*; Publication FHWA-JPO-99-038; Department of Transportation: Washington, WA, USA, 1998.

42. Balakrishna, R.; Ben-Akiva, M.; Bottom, J.; Gao, S. Information impacts on traveler behavior and network performance: State of knowledge and future directions. In *Advances in Dynamic Network Modeling in Complex Transportation Systems*; Ukkusuri, S.V., Özbay, K.M.A., Eds.; Springer: New York, NY, USA, 2013; pp. 193–224. ISBN 978-146-146-242-2.
43. Polydoropoulou, A.; Gopinath, D.; Ben-Akiva, M. Willingness to pay for advanced traveler information systems: SmarTraveler case study. *Transp. Res. Rec.* **1997**, *1588*, 1–9. [CrossRef]
44. Neuherz, M.; Patz, V.; Pischner, T.; Keller, H. User acceptance and impacts of new multimodal traffic information services in BAYERNINFO. In Proceedings of the 7th ITS World Congress, Turin, Italy, 6–9 November 2000; pp. 6–9.
45. Dantan, S.; Bulteau, J.; Nicolaï, I. Hurried or risk-adverse travelers: Who will pay more for multimodal information? *Procedia Eng.* **2015**, *115*, 61–68. [CrossRef]
46. Pronello, C.; Camusso, C. Travellers' profiles definition using statistical multivariate analysis of attitudinal variables. *J. Transp. Geogr.* **2011**, *19*, 1294–1308. [CrossRef]
47. Agence d'Urbanisme Pour le Développement de l'agglomération Lyonnaise. Les Chiffres clés mis à Disposition par l'INSEE (Recensement de la Population 2008, Pole Empli. DARES, DADS ...) Pour les Communes du Grand Lyon et du Sepal. 2011. Available online: http://www.urbalyon.org/AffichePDF/Chiffres_cles_-_De_Albigny-sur-Saone_a_Corbas_-Partie_I-_-3060 (accessed on 18 August 2017).
48. Kitzinger, J. Qualitative research. Introducing focus groups. *Br. Med. J.* **1991**, *311*, 299. [CrossRef]
49. Blais, M.; Martineau, S. L'analyse inductive générale: Description d'une démarche visant à donner un sens à des données brutes. *Rech. Qual.* **2006**, *26*, 1–18.
50. Krueger, R.A.; Casey, M.A. *Focus Group, a Pratical Guide for Applied Research*, 3rd ed.; Sage Publication: London, UK, 2000; ISBN 978-148-336-524-4.
51. Creswell, J.W.; Clark, V.L.P. *Designing and Conducting Mixed Methods Research*, 2nd ed.; Sage Publication: London, UK, 2011; ISBN 978-141-297-517-9.
52. Mackett, R.; Edwards, M. The impact of new urban public transport systems: Will the expectations be met? *Transp. Res. A Policy Pract.* **1998**, *32*, 231–245. [CrossRef]
53. Schweiger, C.L. *Real-Time Bus Arrival Information Systems*; Synthesis 48; Transportation Research Board: Washington, DC, USA, 2003.
54. Khattak, A.J.; Yim, Y.; Prokopy, L.S. Willingness to pay for travel information. *Transp. Res. C Emerg. Technol.* **2003**, *11*, 137–159. [CrossRef]

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