

FROM SHORT TERM LEASING TO CAR SHARING

CAR SHARING PROJECT

RESULTS FROM THE MARKET STUDY

(first draft)

by
Benoît Robert B. Sc.
May 1994

FOREWORD
TO THE ENGLISH TRANSLATION

October 6, 1994

Dear Benoit:

It was very good to talk to you. I am delighted at the progress you have made. It appears you have the most advanced car sharing organization in North America at the present time. Congratulations.

On the enclosed disk I have put the English translation of your marketing study. You may use it however you like. You may want to let me know if the translation is adequate. It was done by a student at a nearby university who was born in France and speaks French fluently.

In the meantime, keep me posted of your project. I hope it continues to grow and that others will be motivated to start similar organizations in light of your success.

Cordially,

Richard Katzev

Richard Katzev, Ph.D.

January 9, 2006

Please take note that this PDF version of the document contains only the basic text and does NOT contain the figures, bibliography and appendices found in the French version. Also the page numbers found in the Table of Content are not to be relied upon.

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APPENDICES

Appendix 1 Documents inclosed in the first mailing

- Exhibit 1-1 Letter #1
- Exhibit 1-2 Article

Appendix 2 Documents inclosed in the second mailing

- Exhibit 2-1 Letter #2
- Exhibit 2-2 Description of the car sharing concept proposed in Quebec
- Exhibit 2-3 Questionnaire

Appendix 3 Documents used for the phone interviews

- Exhibit 3-1 Questionnaire (interviewer's version)
- Exhibit 3-2 Interviewer's notes

Appendix 4 Database

Appendix 5 Variables specification

FROM SHORT TERM LEASING TO CAR SHARING

RESULTS OF THE MARKET STUDY

1.0 INTRODUCTION

Concerned by the magnitude of the environmental and urban problems generated by automobile proliferation, German and Swiss environmentalists created, in the late 80's, a new form of short term leasing, more flexible than the conventional services: car sharing.

Based on the premise that "the ownership of a car fosters its use", the first objective of the environmentalists was to present the leasing idea as a true alternative to the ownership of a car. In addition, there were two underlining objectives: fostering the reduction of the number of cars, and reducing the use rate of the personal car.

For a long time hypothetical, these assumptions are now confirmed as realistic by the present research and analysis. Short term leasing is thus a new tool to promote the rationalization of the automotive use while favoring the other current transportation means.

At the present time, 80 European cities offer car sharing services. The relative European success of this concept in recent years, as well as its benefits as a urban tool, urged us to assess the relevance of the car sharing service in the Quebec market.

This process resulted in analyzing what could be the nature of the transportation system in Quebec after the introduction of car sharing. In order to structure our analysis, two general research objectives were initially defined:

1. Assess the car sharing success factors abroad,
2. Determine the potential for car sharing implementation in Quebec and its consequences.

The present report presents the market study results obtained after the analysis of both the foreign experience and of the Quebec market. These results will be further used in the planing of a pilot car sharing project that will be implemented in Quebec. A detailed description of the service, as defined for the present study, is available in Exhibit 2.2.

2.0 OBJECTIVE OF THE RESEARCH

The general objectives of this research are the following:

- To determine the size of the potential car sharing market in the targeted neighborhood of Quebec.
- To assess the impact that this service will have on the vehicle use rate of the population studied, as well as on the use rate of other transportation means.
- To identify the major discriminant characteristics in order to determine the profile of the potential adopters.

The targeted area for the study is the Saint-Jean Baptiste neighborhood (Fig. 1). This area is composed of the sections 263 to 284 of the electoral district number 11.

This area was selected on the basis of its socio-demographic characteristics. Foreign experiences have demonstrated that the first adopters of this service are generally 25 to 45 year old, single, childless, and have an above average educational level. In addition, this group is composed of individuals who are more sensitive to, and somewhat idealistic about, environmental issues (StadtteilAUTO e. V. Aachen, 1992).

The population of the Saint-Jean Baptiste area meets the above socio-demographic characteristics. This neighborhood is well known for both the dynamism of its inhabitants and the presence of large community organizations. It is also one of Quebec's more densely populated neighborhoods. These are the reasons why we considered this area as the best location to introduce the car sharing service.

3.0 METHODOLOGY

3.1 Data Collection Method

The method used for data collection was a mailing with follow up calls. Because of the novelty of the service, and the large quantity of information to be understood by the respondent, the documentation was split into two distinctive mailings. Each respondent thus received two letters, each one containing a set of information that s/he had to understand before responding to the questionnaire.

The first mailing's (Exhibit 1.1) purpose was to interest the respondent by describing to her/him the nature of the service. The copy of a French article (Exhibit 1.2) describing a similar service operating in Germany was included with the first letter. The article's purpose was to provide the respondent with a comparison set before asking her/his opinion on the car sharing concept proposed.

The second mailing included a presentation letter, a detailed description of the car sharing concept that we would like to implement (Exhibit 2.2), as well as a copy of the questionnaire (Exhibit 2.3). At this point, the respondent had the choice of either returning the questionnaire to us (either by post or in person), or to wait for one of our representatives to call and answer it by phone.

3.2 Sample population

The sample population was defined as the residents of the previously described area between the ages of 18 and 64 inclusively. The names of the respondents were randomly selected from the municipal election list of October 1993. The respondent and not the household was our studied target.

Systematic sampling was used as our selection method. As a general rule, one name was retained every 10 names. In order to minimize non-response, the phone number of the selected individual was immediately checked in a phone book listed by streets¹. The respondent whose phone number could not be found was rejected and replaced by another randomly selected among the 10 following names on the election list.

3.3 Determination of the sample size

As we did not have a preconceived idea of the results we would obtain, the sample size

was determined by the following assumption: the responses obtained will be distributed on a 50/50 ratio in the case of binomial variables. This hypothesis gives us the maximal size for the sample at a given level of confidence (Perrien and al., 1984).

The formula used for the determination of the sample size was the following:

$$n = \frac{z^2 \cdot p \cdot q}{d^2}$$

where:

- z: standard normal random variable which represents the distance between the sample mean and the population mean
- p: proportion of the respondents who answered "yes" at a hypothetical question
- q: proportion of the respondents who answered "no" at this question (q = 1-p)
- d: margin error

For the chosen values, namely p = 50%, d = 5%, and a level of confidence of 95%, we obtain:

$$n = \frac{(1,96)^2 \cdot (0.5) \cdot (0.5)}{0.05^2} = 384 \text{ respondents}$$

3.4 Response rate

We issued 480 questionnaire including the pretest. Ideally, based on an expected 50% response rate for this type of study, a greater number of questionnaires should have been sent in order to reach the 384 respondent-objective. However, because of the limited available resources, it was impossible to increase the number of questionnaires issued. Thus, we relied on the follow-up calls to foster the response rate.

At this time, after more than a thousand follow-up calls made between February 12 and April 12, 1994, the results obtained are distributed as follows:

- 223 completed questionnaires²
- 99 respondents could not be contacted
- 22 respondents moved
- 39 wrong phone numbers or numbers that could not be found
- 17 persons not fitting the sample³
- 69 persons refused to answer
- 11 other

Total: 480

For the needs of the present work and because of the delays encountered, for most of the questions only the first 193 questionnaires were analyzed . The margin of error defined previously was modified because of the present circumstances, it is now 6.89%.

However, for the questions 5, 7, and 83, the data of the 223 questionnaires were analyzed in order to minimize the error margin. The answers to these questions were analyzed in the section dealing with the potential penetration level of the service proposed (Section 7.1).

Because the number of respondents varies from one question to another, the error margin related to the different variables was determined whenever this information was judged pertinent.

3.5 Limits to the study

Four error origins were identified:

1. sample errors,
2. novelty of the concept,
3. limits related to the retained hypothesis type ,
4. sample size.

3.5.1. Sample errors

These limits were generated by the chosen selection method, the sample source choice (election list), and the fact that we selected only the individuals whose phone numbers were found in the phone book.

Indeed, though frequently used, the systematic sampling method does not respect the random sampling principle, namely each unit is independently selected. However, because of the nature of the data analyzed for this study, it would be surprising that this issue had a significant impact on the results.

In addition, for many reasons, some individuals are excluded from election lists. This issue, as well as the selection of only the individuals whose phone numbers were found in the phone book, could have led to a certain bias in the composition of our sample.

As we do not know if the individuals excluded from the sample and the individuals

belonging to it have similar characteristics, it is impossible to assess the significance of this error factor on the present research results.

3.5.2 Novelty of the concept

It is generally difficult to determine the validity of the results when assessing the demand for a service which does not exist yet and for which respondents do not have experience. Do the expressed intentions really represent what will happen after implementation of the service? Will the demand become real? Because of the above considerations, we were extremely careful when interpreting the results, especially as regards to the potential penetration level in the studied area, and when elaborating the customer growth scenarios.

3.5.3 Limits related to the retained hypotheses type

The hypotheses retained were mainly related to economic variables. Though Newton (1986) demonstrated that the values and attitudes of the individuals greatly influenced their adoption or rejection of the service, because of both the pragmatic aspect of the study and processing and interpretative difficulties, we did not study behavioral variables. This decision implies that the selected variables explain only one part of the results analyzed.

3.5.4 Sample size

Due to a response rate of 46% and the questionnaire segmentation, we could not draw conclusions on the influence of some socio-economic variables on the interest in the service proposed because of the low number of respondents. This is particularly true for the section on the differential characteristics of the respondents (Section 7.3).

4.0 SPECIFICATION OF THE VARIABLES

Because of the descriptive nature of the data, the majority of the variables constituting the database are nominal (Appendix 4). However, most of the variables are numerically coded (Appendix 5).

Around twenty variables related to the socio-economic characteristics of the respondents (age, income, ...), their households' characteristics (number household members, number of licenses, ...), and, if relevant, their vehicle(s) information (year, kilometres per annum, ...) were created.

The questionnaire also included about six questions measured with ordinal variables. In order to analyze the data, later on in the process, another ten new ranking variables were created by joining into categories some data first gathered as interval variables (age, income, kilometres per annum, ...).

5.0 PROFILE OF THE RESPONDENTS

These data are based on the information gathered from the 193 questionnaires returned at the time of writing this report.

5.1 Socio-demographic characteristics

Sex and age

The sample is composed of 51% of men and 49% of women. The ages of the respondents ranged from 18 to 58 years. The average age is 32.7 years. The skew to the right represents extreme values greater than 50.

Education level

College graduates account for 46% of the respondents. 51% of the men are college graduates as compared to 40% of the women. However, the number of women having a high-school degree is 17% versus 14% for the men. There were few non-educated respondents.

Net income of the household

Household income ranges from less than \$5,000 to more than \$40,000. The \$40,000 and more income class was the mode with a frequency of 21%. However, more than half of the respondents earn less than \$20,000 yearly.

Employment situation

68% of the respondents had a job at the time of the study. Students account for 26% of the sample. 6% of the respondents are neither students nor employed.

Housing situation

72% of the respondents are tenants, 18% are owners, and 9% live in cooperative housing.

Household type

42% of the households are single parent households. The second largest group is childless couples (24%). The households composed of several adults with no family linkages (most of the time they are roommates) account for 18% of the sample. Lastly, couples with young children account for 10%, and single parent households with minor(s) account for 5% of the sample.

5.2 Vehicle use rate and transportation habits

Driver license

80% of the respondents have a driver's license. This figure is significantly greater than the results obtained from the last STCUQ (the urban public transportation service of Quebec) study for the selected area (1991). At this time, 72% of the inhabitants had a driver's license.⁴ The respondents have had their licenses for an average of 12.75 years.

Access to a vehicle

59% of the respondents own a vehicle, 47% of them own a least one vehicle. Among the individuals who do not have a vehicle, 50% owned one in the past. Among these respondents, a majority (62%) declares not to have access to a vehicle when needed. This percentage reaches 75% if we add the respondents who seldom have access to a family member's or a friend's vehicle.

Kilometres per anon

The owners of a vehicle drive around 17,000 kms yearly. According to CAA Quebec (1993), this average is lower than the province average (22,500 kms).

Transportation habits

A significant number of the individuals interviewed (57%) walk, bike, ride buses, or carpool to go to work or to school. 24% of the respondents use only their personal vehicles, whereas 9% use both their vehicles and other transportation means. The last 10% do not travel regularly and extensively.

STCUQ frequency use rate

68% of the respondents use the services provided by the STCUQ for some of their travels. 31% of the respondents ride buses several times a week, whereas a same percentage never uses this service.

As regards the monthly pass, 32% of the respondents bought at least one in the two previous months of the study. Only 11% bought a pass every month of the last year.

Number of car rentals per year

44% of the respondents rented a car in the past. However, only 28% of the interviewees rented a vehicle in the last 12 months.

Because of the high rate of respondents who did not rent a vehicle in the last year, the average rental number per person only accounts for 0.5. If we analyze this data with the number of persons who rented a car recently, we notice that each of them rented, on average, 2 vehicles over the last year.

Allo-Stop memberships

Almost 30% of the respondents belong to this carpool organization, either as a driver or as a passenger. In addition, several respondents mentioned during the phone interview that they had been members in the past. This last consideration underlines the exceptional penetration level of Allo-Stop in the Saint-Jean-Baptiste neighborhood. All the individuals interviewed knew this organization.

6.0 REPRESENTATIVITY OF THE SAMPLE

The sex and age were used to assess the representativity of the sample by comparing the results obtained with data from the 1991 Statistique Canada census⁵. Figures 9 and 10 indicate that the age and sex distributions are globally similar to the ones obtained in 1991. As regards to age, the 25 to 45 years categories are slightly over-represented whereas the above 45 years category is under-represented.

We notice also in Figure 10 that the 18 and 19 years old respondents are not represented. This is due to their integration into the 15 to 19 years old class by Statistique Canada. As we could not isolate the individuals younger than 18 years old, we could not compare our results with the census data⁶.

7.0 RESULTS OF THE STUDY

7.1 Assessment of the potential penetration level of the service in the next years

7.1.1 Notes on the method used

Achievement of the objectives presented several difficulties. The first one was related to the service novelty (Section 3.5.2). The second difficulty was related to the issue of not only assessing the immediate or spontaneous demand, but also estimating the probability for an individual to become a customer in a given time period.

If we had tried to assess the demand by a single closed question such as “Are you interested in becoming a customer for this service?”, we would have underestimated the real interest of the population. As a consequence, the questionnaire was designed to measure:

1. the spontaneous adoption of the service (question 7),
2. the probability of becoming a customer in the next two years (question 5a),
3. the trend over the long term, namely 24 months (question 5b).

The questions 5b and the “why?” of the question 5c are aimed at identifying the motivations of the respondents.

7.1.2 Handling of the non-responses

The results presented in this section are based on the 223 completed questionnaires available when writing this report. We took the following decision as regards to the processing of the non-responses:

Two types of non-responses were recorded: the ones with known disinterest (46 of a total of 69 respondents), and the ones with an unknown disinterest (23 of 69). This distinction is meant to distinguish the individuals who expressly indicated their non-interest from those who simply refused to respond. For the later ones, we could not know if they had knowledge of the information sent.

In order to minimize the demand overestimation risks, the individuals who refused to respond will be considered as not interested in the service.

69 of the individuals we contacted refused to answer our questions. They account for 24% of the sample.

7.1.3 Results

7.1.3.1. Spontaneous adoption

7.6 % of the respondents answered “yes” or “rather yes” when asked if they would be interested in becoming a member of the service proposed if it were to be implemented next May.

288 respondents (including the non-responses) answered this question. The error margin at the 95% level is about 3%.

If we assume that our sample is representative of the neighborhood population, extrapolation of these results to the whole population between 18 and 51 years old (around 5,000 individuals), projects that 380 +/- 150 individuals would spontaneously adopt such a service.

7.1.3.2. Adoption in the next 24 months

The results of question 5a related to the adoption probability are presented Figure 11.

In order to simplify the discussion, the respondents were classified in 3 categories:

- The first group is composed of individuals who answered that it is probable (4, 5, or 6 out of 10) or almost certain (9, or 10 out of 10) that they will join the service proposed in the next 24 months. These individuals are identified as potential adopters.

- The second group includes the individuals who indicated that there is a certain probability (4, 5, or 6 out of 10) that they will join the service in the next 24 months. These individuals are eventual adopters.

- The remaining respondents, namely the individuals whose probability of adopting the service are 3 chances or fewer out of 10 are considered non-adopters.

These results are presented Figure 12.

* **The potential adopters**

16.1% of the respondents are included in this category. The error margin for the response rate is 4.2%.

The following reasons are the most frequently mentioned to explain the individuals' hesitations to join the service:⁷

- this new service has not proved its performance yet,
- the price or the lack of financial resource,
- a potential move.

Long term adoption

If we add the individuals who answered "yes" or "rather yes" to the question 5c, 57.4% of the potential adopters would likely join the service in the term (24 months) (Figure 13).

The reasons most frequently mentioned to explain such a situation are the following:

- the possibility that the respondent does not replace her/his present vehicle,
- the service would have proved its performance,
- the potential increases of the respondent's income.

Impact of a potential cooperation between the service offered and the STCUQ on the respondent's probability to join the service.

65% of the potential adopters indicated that their probability to join the service will increase if their memberships allow them to save \$12 on the purchase of a monthly STCUQ pass.

* **The eventual adopters**

20.5% (+/- 4.6%) of the respondents belong to this category. The main motivation for respondents' hesitations is, by far, the present ownership of a car (15 of the 50 respondents).

Long term adoption

55% of the eventual adopters might adopt the service in the long term (Figure 14). The respondents explain this situation by:

- the possibility that the respondent does not replace her/his present vehicle,
- the service would have proved its performance,
- the potential increases of the respondent's income.

Impact of a potential cooperation between the service offered and the STCUQ on the respondent's probability to join the service.

50% of the eventual adopters indicated that their probability to join the service will increase if their memberships allow them to save \$12 on the purchase of a monthly STCUQ pass.

*** The non-adopters**

185 of the 292 respondents, (63.4 % +/- 5.5%) had an adoption probability less than 3 out of 10. This number includes the 69 non-responses. The individuals who refused to answer the questionnaire were considered as individuals who will not join the service (0 chance out of 10).

78 respondents justified their low interest in the service by the following motivations:

- ownership of a vehicle (39 respondents above 78),
- no perceived need to have access to a vehicle (10 respondents above 78),
- access to a vehicle when needed (6 respondents above 78),
- need of a vehicle to go to work (6 respondents above 78).

Only 8 of the 78 respondents indicated that they will not use the service because they prefer to own their personal vehicles.

Long term adoption

Only 17% of the respondents indicated that their adoption probability will increase in the long term (the non-responses were not taken into account when calculating this percentage). This result demonstrates that these individuals do not see themselves as potential customers.

Most of the non-adopters who answered that their probability to join the service will increase in the long term are individuals who expressed a probability of 3 out of 10 to join the service. These respondents could be considered as eventual adopters.

Impact of a potential cooperation between the service proposed and the STCUQ on the respondents' membership probability

Contrary to potential and eventual adopters, the majority of the non-adopters would not be influenced by a cooperation between the two services. Only 27% of the non-adopters said that their probabilities to join the service will increase if they save \$12 on the purchase on a monthly STCUQ pass.

7.1.3.3. Potential penetration level in the selected neighborhood

The above results indicate that there is a significant market for the service offered in the selected neighborhood. If we only take into consideration the expressed intentions, 36.6% (+/- 5.53%) of the residents aged between 18 and 64 years would be potential or eventual adopters. Thus of the 5,000 residents, given the interval of confidence, there are between 1,553 and 2,107 individuals that would be interested by the car sharing service in the Saint-Jean-Baptiste neighborhood.

The difference between the percentage of spontaneous adopters and this number confirm that we were correct not to restrictively define the interest in the service. The results obtained indicate that a significant penetration could be achieved in a few years. This delay would allow the population to become familiar with the service. In addition, it would allow the present owners of a vehicle to judge if the service is an attractive alternative to the ownership of a vehicle.

The results estimate the effective demand and demonstrate that almost 1 respondent in 3 considers the possibility of substituting the service for the ownership of a vehicle. Although it is difficult, at this time, to predict what would be the customer's preference when the service is implemented, the data greatly challenges the popular believe that people are too attached to their cars to change their behaviors. Accordingly, we are certain that the penetration level of the service will rely on the quality of the service and the confidence that the managers would create.

7.1.3.4. Customer growth scenarios

Although one should be careful when interpreting the results, the available data allows us to determine two growth scenarios for the service. These scenarios are illustrated in Figures 15a and 15b.

Figure 15a

The first scenario (A) represents the spontaneous demand, the potential adopters trend, and the eventual adopters trend if these individuals adopt the service. The dotted line and the abscissa axis represent the confidence interval and the operation years, respectively.

Figure 15b

By definition, the percentage of spontaneous adopters defines the penetration level after the first operating year, whereas the percentage of the potential adopters determines the penetration level after 2 or 3 years⁸. The percentage of the combined potential and eventual adopters represents the penetration level after 4 or 5 years. The number of years between the service operational start and the penetration levels achieved for both scenarios are purposely imprecised in order to emphasize the uncertainty of the hypotheses.

This optimistic scenario is not likely to happen. Though it may to estimate the potential penetration level after several years, it is risky to use it as the basis for a realistic growth scenario in the first years of the project.

Scenario B is more prudent. It is based on the lowest confidence intervals of the previous scenario. The percentage obtained is then divided by two for the spontaneous and potential adopters, and by four for the eventual adopters. The underlying hypothesis being that only a fraction of the individuals who show an interest will join the service.

The above results are presented in Figures 15a and 15b. If this scenario becomes reality, around 100 individuals after the first operating year, 300 after 2 or 3 years, and 500 after 4 or 5 years would participate in the car sharing service.

7.2 Potential impact of the service on the vehicle use of the population studied and on the use of other transportation means.

7.2.1 Impact of the service on the vehicle use of its members.

The available data only gives a basic idea of the service impact on the vehicle use rate of the population studied. One of the fundamental objective in implementing this service is related to this potential impact. Therefore, it would be pertinent to present the impact the service would have on its users.

These data were calculated for the 3 previously defined categories: spontaneous adopters, potential adopters, and eventual adopters.

Spontaneous adopters

This group counts 22 respondents. Five of them owned a vehicle at the time of the study. Two respondents who do not own a vehicle but who might purchase a car in the next year indicated that they might not purchase it because of the service introduction. If we add these results, 7 of the 22 spontaneous adopters (namely 32%) will sell their vehicles or not purchase a vehicle because of the service introduction.

Potential adopters

For the 25 potential adopters, the service would have the following impact:

Number of vehicles that would be sold: 5/25

Number of potential purchasers who would not purchase of a vehicle: 1/25

Consequently, 6 of the 25 respondents, 24%, would sell their vehicles or not purchase a vehicle because of the service introduction.

Eventual adopters

If the 60 eventual adopters join the service, the impact would be as follows:

Number of vehicles that would be sold: 22/60

Number of potential purchasers who would not purchase of a vehicle: 2/60

Therefore, 24 of the 60 respondents, 40%, would sell their vehicles or not purchase a vehicle because of the service introduction.

The differences between the impact percentages of the three groups are not significant at the level of 95%. However, the trend expressed by such results might indicate that the service impact on the vehicle use rate of the members increases with the group type. This hypothesis is all the more plausible because it is reasonable to expect that the vehicle use rate of the first members will be less than that of the members who will join the service when replacing their present vehicles.

The impact of the service can be compared with the results obtained from similar projects in other areas. In San Francisco, the impact of the STAR project (Short Term Auto Rental Project) led to a significant 15.4% reduction of its member's vehicle use rate at the end of the first operating year (Walb & Loudon, 1986). In addition, the report mentioned that 43.1% of the households postponed or canceled the purchase of a vehicle because of their memberships in STAR.

A 1992 survey on a car sharing service in 5 cities of Northwest Germany⁹ indicated that 54% of the respondents sold their vehicles before joining the service. Another 23% of the respondents decided not to purchase a vehicle (1993).

7.2.2 Impact of the service on the use of other transportation means

A large majority of the potential or eventual adopters already regularly walk, bike, ride buses, or carpool to go to work or school (question 16). We previously pointed out the strong relationship between the probability to join the service and the use of the public transportation system (section 5.2).

Because of its price structure, this service would not significantly modify the behaviors of the individuals who are already independent of a car. Since the cost of the vehicle use is more noticeable with car sharing rather than ownership (lower fixed costs, higher variable costs), the opposite might be true.

This hypothesis is reinforced in our results by the relatively large number of respondents (64% of the potential adopters, 50% of the eventual adopters) who indicated that the \$12 savings on a monthly STCUQ pass due to the membership to the car sharing service will increase their probabilities to adopt the service.

In addition, 43% of the potential adopters (n=47) and 38% of the eventual adopters (n=60) show that this savings motivates them to buy a STCUQ monthly pass more often. This leads to the conclusion that the respondents understood the benefits of combining car sharing and the existing public transportation system.

7.3 Determination of the differential characteristics of the respondents depending on whether or not they are potential adopters of the service.

7.3.1 Study hypotheses

This last step in the market study process is aimed at isolating the factors which will allow us to better determine the targeted customers. Due to the large number of nominal and ordinal data that we had to analyze, the most appropriate statistical tool is the contingency analysis.

In order to help us in choosing the variables to compare, three hypotheses groups based on the potential user characteristics were defined after studying the literature available on this subject:

1- Hypotheses related to the socio-demographic characteristic of the respondents

- . Sex: adoption probability is higher for men
- . Age: adoption probability decreases with age
- . Education level: adoption probability increases with the education level
- . Income: adoption probability is higher for low income individuals
- . Employment situation: adoption probability is higher among students and unemployed individuals
- . Household type: adoption probability is greater for individuals who live in a non familial household or who do not have children.

2- Hypotheses related to transportation behavior of the respondents

- . Adoption probability is higher for the individuals having a driver's license but not having access to a vehicle in their households
- . Adoption probability of individuals who already own a vehicle decreases with the increase in annual mileage

. Adoption probability is greater for persons who regularly use the public transportation services

. Adoption probability is greater for persons who generally use another means of transportation (no car) for their regular travels

3- Hypotheses related to the life style and experience of the respondents

. Adoption probability is greater for individuals who carpool

. Adoption probability is greater for individuals who live in cooperative housing

. Adoption probability is greater for individuals who have already experienced short-time leasing.

7.3.2 Contingency analysis results

7.3.2.1 Hypotheses related to the socio-demographic characteristics of the respondents

Adoption probability is greater for men

Contrary to this hypothesis, there is no relationship between the respondent sex and her/his propensity to join the service. In addition, the results of the Chi² Test (Figure 16) indicate that there is no significant difference between male and female responses.

Adoption probability decreases with age

The age of the respondents is not a criteria to distinguish the adopters from the non adopters. In Figure 17 we observe a trend suggesting that the number of potential and eventual adopters decreases with increasing age. However, this trend is not statistically significant.

Adoption probability increases with the education level

Education level does not explain the variation in the population's interest. The potential adopters proportion is constant about 25% regardless of education level.

Adoption probability in higher for the low income individuals

In order to facilitate the analysis and to respect the 5 minimum observations per cell contingency condition, we clustered the income classes. The income class interval is now \$10,000.

Contrarily to previous results, there are large differences between the different income classes (prob. > $\chi^2 = 0.0150$ for the Pearson Test).

We noticed that the most interested individuals are the ones whose households have a net income ranging between \$10,000 and \$29,000. There are few potential adopters among the low income households (net income under to \$10,000). However, a significant percentage of these respondents indicated that their adoption probabilities will increase in the long run (more than 24 months) in that they expect their incomes will increase.

These results are very interesting as they demonstrate that the service could target the niche composed of the households whose incomes are high enough to increase their transportation expenses, but low enough to make the purchase of a car prohibitive.

Adoption probability is higher among students and unemployed individuals

The respondent's employment situation is not a discriminant factor because the results vary only slightly with respect to whether the respondent studies, works, or is unemployed.

Adoption probability is greater for individuals who live in a non familial household or who do not have children

The results in Figure 21 modify this hypothesis. Indeed, first we did not notice any significant differences at the 95% level, however, after further analysis, we notice that the household type is a discriminant factor.

Indeed, we have to distinguish the results for the couples with children from the childless couples. In accordance with the first part of the hypothesis, the proportion of potential adopters is lower for the first category. The proportion is, however, superior to the couples with children average .

The above consideration implies that we have to reject the second part of the hypothesis. Although the results obtained do not support a definitive conclusion, the trend observed indicates that the interest in the service is higher for the households with children. This is

particularly the case for the single parent households. Indeed, 4 of the 11 respondents in this group are potential adopters, and 2 other respondents are eventual adopters of the service.

7.3.2.2 Hypotheses related to the transportation behavior of the respondents

Adoption probability is greater for individuals having a driver's license or not having access to a vehicle in their households

The individuals who do not have access to a vehicle in their households could be excellent customers for the service (Figure 22). 41% of the respondents of this group are potential adopters compared with 10% for the individuals who have a vehicle in their households. However, more than a third (35 of the 97 respondents) of the individuals having a vehicle are potential or eventual adopters. More than half of the respondents said that their adoption probabilities will increase over in the long run. These considerations reinforce the impact on the vehicle use rate (Section 7.2.1).

Having or not having a driver's license does not influence the interest in the service (Figure 23).

Adoption probability decreases with the increasing annual mileage

Contrarily to our expectations, the respondents who drive between 20,000 and 29,999 kms per year have a different adoption probability compared with the overall sample probability. However, this difference is not statistically significant at the 95% level.

These results might be surprising as we first assume that the most interested individuals would be the persons who are not driving enough to depreciate the vehicle fixed costs. Further future analysis of the respondents characteristics in Figure 24 could explain such results.

Adoption probability is greater for respondents who regularly use the public transportation services

As expected, the respondents who use the public transportation system are more interested in the car sharing service than others (Figure 25).

First, we were surprised to notice that the "regular bus" users were less interested than the "not as regular" bus users. Further analysis pointed out that this difference is due to the

respondents' incomes.

Indeed, individuals with an income ranging between \$10,000 and \$30,000 are more numerous in the second group than the first group. This is partly due to proportion of students in each groups. Students account for 54% in the second group, whereas they account for only 28% in the first one.

Adoption probability is greater for individuals who generally use another means of transportation (no car) for their routine travels

The class of respondents who do not exclusively use the car as transportation means has a high proportion of potential and eventual adopters. These results are statistically significant.

7.3.2.3. Hypotheses related to the life styles and experience of the respondents

First this section was designed as a series of behavioral hypothesis. However, because of the considerations presented in Section 3.5.3 and the necessity to limit the questionnaire length, only three of these hypotheses were kept.

The following hypotheses indirectly assess some individual characteristics of the respondents. Such an approach is based on the assumption that carpooling and cooperative housing could be associated with some personal characteristics that might influence the interest in the service offered.

The last hypothesis' purpose was to verify if, as concluded by Newton (1986), the individuals who experienced short term leasing were predisposed to adopt the service.

Adoption probability is greater for individuals who carpool

Contrary to the hypothesis, there are not more potential adopters among the Allo-Stop members. However, there is a large number of eventual adopters. In total, more than a half of the members of this organization might join the car sharing service in the next two years. The Allo-Stop customers are thus customers to target. These results are significant at the 95% level.

Adoption probability is greater for individuals who live in cooperative housing

If we consider the respondents according to their housing situations, there is no significant statistical difference between groups. However, we noticed a decrease in interest among the individuals who owned their housings. In addition, contrary to our expectations, there is not a higher interest among individuals who live in cooperative housing.

It first appeared logical that the individuals familiar with the cooperative concept would be predisposed to adopt the service, yet, their interests are not different from that of tenants. However, one should be careful when analyzing these results because of the small number of respondents. Indeed, only 18 individuals live in cooperative housing.

Adoption probability is greater for individuals who already experienced short term leasing

Contrary to this hypothesis, there is no difference between the individuals who rented vehicles in the past and the individuals who did not (Figure 29). The trend pointed out by Newton (1986) was not observed in the present study. The difference between these two studies might be explained by the sociologic and ideological characteristics of both samples. Indeed, Newton's study was conducted in a non-urban environment whereas the present study was done in one of most urban neighborhoods of Quebec.

8.0 CONCLUSION

The major conclusions from the study are the following:

There is a significant market for the car sharing service in the studied neighborhood. Careful analysis and interpretation of the results reveal the following:

- about 8% of the respondents will be willing to join at the beginning of the operations
- about 16% of the respondents are potential adopters
- 20% of the respondents are eventual adopters.

In total, 36% of the respondents consider that they might adopt the service in the next two years. Half of them indicate that this probability will increase in the long term.

Although the adoption probability is higher for individuals who do not have access to a vehicle in their households, the expectation to reduce the vehicle use rate is likely to be achieved.

As regards to transportation cooperation, the respondents understood the benefits of combining car sharing with the services offered by the existing public transportation system. For half of the potential and eventual adopters the \$12 savings on the monthly SDTCUQ pass increases their probabilities to adopt the service.

Concerning the targeted customers in the Saint-Jean-Baptiste neighborhood, the most significant elements are the following:

- Adoption probability is higher for individuals having a yearly income ranging between \$10,000 and \$30,000 (prob. > $\text{Chi}^2 = 0.0061$)

- A child in a household increases the adoption probability (this is particularly true for the single parent households)

- Adoption probability is higher for individuals who do not have access to a vehicle in their households (prob. > $\text{Chi}^2 = 0.0000$)

- Adoption probability is higher for the individuals who regularly use public transportation (prob. > $\text{Chi}^2 = 0.0000$)

- Adoption probability is higher for individuals who usually use a transportation means other than a car for their routine travels (prob. > $\text{Chi}^2 = 0.0000$)

- Adoption probability is higher for individuals who are reluctant to purchase or replace a vehicle.

The absence of a relationship between the age, sex, and education level of the respondents is positive because it enlarges the potential targeted population.

FOOTNOTES

- ¹ These phone books are largely used by telemarketing firms. Vermon phone book was used for this study
- ² 78 persons of these 223 sent or brought us the completed questionnaire, 35% of the total responses. The other respondents answered the questionnaire on the phone.
- ³ In most of the cases these persons were too old to be part of the sample
- ⁴ Source: Jocelyn Côté, SRCUQ, Personal communication
- ⁵ Source: Statistique Canada - Cat. No. 95-332
- ⁶ Only 9 respondents among 193 were less than 20 years old, namely around 5% of the sample.
- ⁷ Given the low number of potential adopters who answered question 5b (n=23), one should view the results as being trends rather than precise figures. The results obtained for potential and eventual adopters are more significant.
- ⁸ As the spontaneous adopters are all included in the group of the potential adopters (all these respondents indicated a probability to join the service greater or equal to 7 chances out of 10), the data from these two groups are not cumulative.
- ⁹ Franken, Düsseldorf, Aachen (Aix-la-Chapelle), Kiel, Hamburg, and Lübeck.