

PAY AS YOU DRIVE CARSHARING

FINAL REPORT

Bealtaine Ltd. (Taylor Lightfoot Transport Consultants)

With the International Ecotechnology Research Centre at Cranfield University (UK),
Verkeersadviesburo Diepens en Okkema (transport consultancy in The Netherlands)
ECS - European Car Sharing (Germany).

EU SAVE CONTRACT NO: 4.1031/Z/95-025

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0. Background to the project

- 0.1 This two year project, which commenced on 1.11.95, closely fits the EU SAVE Programme's priorities for transport. The project was co-ordinated by the Irish partner organisation, Bealtaine Ltd. (Taylor Lightfoot Transport Consultants). The other partner organisations were the International Ecotechnology Research Centre at Cranfield University (UK), Verkeersadviesburo Diepens en Okkema (transport consultancy in The Netherlands) and ECS - European Car Sharing (Germany).
- 0.2 Pay-as-you-drive carsharing (PAYDC) has been developed as an alternative mode of transport for towns and cities in three member states (Ireland, the UK, the Netherlands) by transferring experience from Germany. PAYDC encourages the traveller to use a mix of modes including rail, bus and car on a fare paying basis. It has the potential to cut down peak time car travel and on-street parking. These and other factors contribute positively to reduced energy consumption and pollution at a local and a system level through reduced congestion.
- 0.3 Private and neighbourly car sharing has been in existence since the invention of the automobile. Car sharing in its organised form developed during the eighties as a reply to the economic and ecological problems of private car ownership. Over the past ten years, mainly in Germany and Switzerland a number of carsharing schemes have been established. Instead of individuals owning a car, they join a club and have access to a range of cars located at a number of local "car stations" in their town or city. The growth of the individual schemes takes them from 'altruistic' behaviour to a fully economic transport mode, which meets the needs of users for a mix of transport (rail, bus, car) without locking them into a single mode as occurs with conventional car ownership. There are reciprocal arrangements between schemes and joint ticketing/hiring arrangements have been agreed with regional public transport authorities and German Railways.
- 0.4 A European Car Sharing association (ECS) has also been established with member schemes in over 300 towns and cities in Germany, Austria, Switzerland, the Netherlands, Denmark, Sweden, Italy and Ireland. The schemes in Germany range in size from 2 cars with 18 members to 120 cars with over 3,000 members; there are over 15,000 members in the main Swiss scheme. Typically the ratio of cars:members seems to be in the range from 1:10 to 1:25. Such schemes are the point at which public and private modes of transport overlap.
- 0.5 Car sharing simply means a shared keeping and use of motor vehicles, whereby drivers unite in order to be able to make better and more efficient use of "car" resources, as well as save costs and contribute to a type of mobility that helps the environment. Carsharing does not refer to "ride-sharing", which is where two or more people share a car to travel together on the same journey, although carsharing does not of course exclude "ride sharing" from taking place as part of carsharing use.
- 0.6 Car sharing can principally be divided into three categories:
Private Car Sharing
Within the family, informally organised, no contracts.
Neighbourhood Car Sharing

In the neighbourhood, among friends; organised in a simple way, contractual agreements.

Organised Car Sharing in Professional Car Sharing Organisations

Car sharing organisations administer a centralised/supported network of large-scale user groups and vehicles for shared use. Variations on this structure include:

- Communal use of private vehicles owned by the members
- Car is owned and maintained by a small group, which may also use other Car Sharing Organisation vehicles. Accounts, and possible also booking procedures, are handled by the Car Sharing Organisation.
- Use of Car Sharing Organisation cars by companies instead of having their own company cars.

0.7 In order to achieve a consistent standard of service amongst its members, European Car Sharing (ECS) has adopted a set of criteria for its members to adhere to or evolve towards. These are:

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- 24 hour booking service and car availability
- spontaneous booking less than one hour before use
- bookings for as little as one hour is allowed
- cars parked close to members' homes
- limited liability for members in case of accident or delay
- no minimum use requirements
- charges relate to distance driven as well as length of use
- cars meet EU emission standards
- members have a say in the running of the service
- cars are well maintained and kept in use for several years
- the service reports on its environmental effects
- regular review of members' opinions and satisfaction with the service

1. Aims of the project

- 1.1 To identify the best practice in the German carsharing schemes and to replicate such schemes in Ireland, The Netherlands and the UK taking account of local operational issues of marketing, servicing, insurance and vehicle availability. Social attitudes or barriers and legal issues have also been examined in each participating country.
- 1.2 To quantify the transport effects and energy savings made through the present use and potential extension of this mode of transport.
- 1.3 To test and refine a level of service model for PAYDC, already developed in the UK, in existing schemes in Germany.
- 1.4 To target people at specific life stages, such as elderly people and parents with school age children, for which PAYDC may have particular application. It can enable elderly people to give up exclusive car ownership at an earlier age; it can reduce the number of school chauffeur runs at peak congestion times.

2. Activities undertaken

- 2.1 The project work programme had seven elements:
 - A study tour of Carsharing schemes in Germany
 - A series of seminars in partner states
 - Research, surveys and literature review
 - Preparation of pilot schemes in partner states
 - Implementation of pilot schemes in partner states
 - Dissemination of results
 - Project co-ordination

2.1.1 Study tour of Carsharing schemes in Germany

- 2.1.1.1 The study tour to Germany was held in December 1995 and comprised a two day visit to Berlin and a two day visit to Dortmund. The study tour group consisted of three delegates from The Netherlands, two delegates from the UK and one delegate from Ireland. In Berlin the StattAuto Berlin scheme was visited and delegates met also with the co-ordinator of ECS-European Car Sharing. In Dortmund, delegates visited the main office of Nachbarschaftsauto, which co-ordinates schemes in 25 towns and cities in Germany, most of which are in Nord Rhein Westfalen.

2.1.1.2 Key points from the Study Tour

Although membership of the German city schemes have grown rapidly averaging 50% increase per annum, this has been achieved by constant promotion and development to offset a 10% annual loss of members.

Promotion is a key task of the organisation and staff responsibility for this should be clear.

Administration of small town schemes should be self-organising, i.e. by the members themselves, as they are not economic for a commercial enterprise to support. A consequence of this is that new city start-ups may be best kept on a self-organising basis for as long as possible before reaching economic viability.

The way in which the schemes are structured seems automatically to result in the reduction of car trips by members and an increase in their use of public transport or non-motorised modes. Overall motorised travel by members appears to decrease by about 10% per annum. This confirms claims by car sharing organisations and previous research.

Both schemes visited have sophisticated computerised management systems. These systems are vital not only for recording activity but also for using historical data to provide the basis for future planning; in particular for assisting in decisions regarding increases in the fleet, allocation of cars to car stations and the location of new car stations.

2.1.2 Seminars in partner states

- 2.1.2.1 The project co-ordinator produced a Powerpoint presentation and placed an English language voiceover onto a video presentation of the Study Tour and the StattAuto Berlin scheme information video. These were then sent to the UK and Netherlands partners for use in their seminars and dissemination activities. The video and Powerpoint presentations were then used by the Irish partner as the core of its presentations.
- 2.1.2.2 Ireland:
Seminars were held in Dublin on 21 March 1996 and 11 November 1996 and in Sligo on 20 April 1996 during the Irish Rural Link annual conference. A practical workshop was also held in Dublin on 9 November.
- 2.1.2.3 The UK:
Presentations were given in Blackpool as part of the 1995 Community Transport Event, in Edinburgh as part of a Car Free Cities Conference in 1996 and in Leeds as part of Green Transport Week in 1996 and 1997.
- 2.1.2.4 The Netherlands:
Presentations were made to the associations of carsharing schemes in the country during 1996 and 1997.
- 2.1.2.5 *Key points from the seminars and workshops*
General regional seminars as originally proposed in the project submission may not be the best way to get interest or raise awareness. The more successful approach has been a more closely targeted one and one which involves key people in the areas where the pilot schemes might be located. This is particularly important when trying to identify people and organisations who might be involved in the setting up of the pilot schemes. This has been a successful approach in Dublin, Edinburgh and Leeds.

2.1.3 Research, surveys and literature review

This phase of the project consisted of testing the level of service model, research into the attitudes of users and non users of schemes and research into the participation of elderly people in carsharing schemes.

2.1.3.1 *Key points on the level of service model*

2.1.3.1.1 Initial runs of the model indicate that 3-4 car clusters are the most efficient because gains after this level are small and more than offset by distance or time members take to reach the cluster of cars.

2.1.3.1.2 The Dortmund CarSharing scheme has collaborated to supply data for the project. Analysis of the February 1996 data showed that car use efficiency peaked at stations with 3 cars.

2.1.3.1.3 Data on 'overbooking' was recorded in February and September 1996; this measures the limit to the number of users each car can have but also indicates where unmet demand is occurring.

2.1.3.2 *Key points from the survey of non participants*

2.1.3.2.1 CarSharing is OK, but still needs more professionalism and enterprising spirit.

2.1.3.2.2 Substantial motivation not to participate obviously includes the costs. Limitations in personal mobility are also feared, as well as the associated lack in availability and access to cars (no close locations, desired car is unavailable). A noteworthy 50% of the respondents see CarSharing as "complicated and impractical" as well as "time-consuming."

2.1.3.2.3 CarSharing is ok, but not available widely enough; it must be less expensive with a better availability of locations; it does not offer enough services for current car owners; it offers "too much mobility" for current Non-car owners.

2.1.3.2.4 Main hurdles to participation are clearly financial concerns. CarSharing is indeed more cost-efficient than a privately owned car, but on the average still 4 times more expensive than public transport. Those who already own a car are often less aware of its real costs, and possibly feel CarSharing therefore is more expensive. To dispel unfounded concerns, CarSharing firms must be able to clearly show the financial advantages.

2.1.3.2.5 The second important conclusion of this study makes clear that CarSharing is frequently still felt as a sacrifice, which produces limitations in the personal mobility and/or a higher time expense. If the CarSharing firms succeed in communicating that the undeniable advantages of their system is a gain in mobility, then the market opportunities in the important leisure time area will rise.

2.1.3.3 *Key points from the survey of elderly people*

2.1.3.3.1 Amongst all age-groups, "elderly" people reacted in the most reserved way regarding Car Sharing. As regards their significant and still rising share within the group of car drivers in general, "elderly" Car Sharing participants are completely under represented.

2.1.3.3.2 Personal characteristics:
Typical characteristics of "elderly" people already using Car Sharing are:
-a very high disposable income,
-a remarkably high level of education, related with

- an often mentioned aversion to "publicity".
- a tendency not to innovate
- 2.1.3.3.3 The results summarised in the "personal characteristics" show that under current conditions the potential of "elderly" Car Sharing participants is very limited or at least very hard to reach. This is the case out of a general perspective as well as in comparison with other age groups.
- 2.1.3.3.4 The conclusions concerning scepticism of old people towards Car Sharing, as well as the encouragement of friends and acquaintances, lead to the following publicity proposals:
 - trial periods and
 - publicity gifts,together with a high level of customer care.
- 2.1.3.4 A Literature Review was also undertaken by the UK and German partners. Brief analysis of the review is set out below.
- 2.1.3.4.1 Public car systems (now called CarSharing) have been experimented with over the past 25 years mainly in Europe but also USA. Only in the 1990's has this form of car tenure generated viable businesses and co-operatives.
- 2.1.3.4.2 Commercial CarSharing is an urban phenomenon with dominant participation by people in the 25-40 age group who pay on average 100 ecus for membership , 375 ecus refundable deposit, 12 ecus per month fee, 0.12 ecu per km and 1 ecu per hour of hire. Rural schemes are more informal, co-operative and particularly substitute the second household car and have higher female participation.
- 2.1.3.4.3 Urban based CarSharing integrates well with bicycle and public transport trips and reduces personal car km from 7000/yr to 4050/yr with an increase of 1540 km by public transport (Baum & Pesch 1994). Non-owners did not substantially increase their car mileage as this replaced lifts, borrowed vehicles, taxi or car hire and they combined trips more efficiently.

2.1.4 Preparation of pilot schemes in partner states

- 2.1.4.1 *Ireland*

A number of locations for the pilot scheme were considered and following brief discussions with relevant agencies, it was decided to locate the pilot scheme in Dublin. The pilot scheme was planned in conjunction with the Dublin Transportation Office, which also provided financial support towards the cost of setting up the pilot scheme.
- 2.1.4.2 *The UK*

Initial preparation was undertaken for a pilot scheme to be set up in a small village near Bedford, but this proved to be inappropriate and the scheme was established on the campus of Cranfield University. The UK partner was also involved in the preparation of a second pilot scheme, which has been planned for Edinburgh in Scotland and is due for commencement in April 1998.
- 2.1.4.3 *The Netherlands*

The situation in The Netherlands changed considerably between the time that the PAYDC project was originally devised, the time that the project

commenced and the planning phase for the pilot scheme. In contrast to the situation in the UK and Ireland where no such schemes existed, a wide range of carsharing schemes have been established during this period. Many of these have involved commercial car hire companies as well as community based initiatives. The pilot scheme was established in Delft, primarily as a network of people putting their own cars into the scheme.

2.1.4.4 *Key points from the preparation phase*

- 2.1.4.4.1 The original intention for the pilot schemes was to effectively transplant models from Germany. The lesson learned from the process of preparing the pilot schemes in the UK and Ireland (effectively “green field” sites) was that a similar development path has to be followed and that it is very difficult to miss out the very early stages of locating actual individuals who will be the first participants and building upon their personal participation.
- 2.1.4.4.2 Similarly in the Netherlands, where there has been a mushrooming of small schemes, it is important to identify those schemes which have a potential to move along the appropriate development path and work closely with them.
- 2.1.4.4.3 This resulted in the preparation phase taking longer than was originally intended, though not necessarily requiring more working time but rather more elapsed time.

2.1.5 Implementation of pilot schemes in partner states

- 2.1.5.1 As a result of the preparation phase taking longer than originally anticipated, the implementation phase of the project was reduced in all three partners’ pilot schemes. The original plan was for the pilot schemes to operate from July 1996 for one year. In the end the pilot schemes actually operated for about six months in total up to the end of the project in October 1997. The detailed reports on each pilot scheme are contained in Appendix A.
- 2.1.5.2 The pilot schemes established during the PAYDC project were:
- CampusCars at Cranfield University, UK
 - Carsharing Delft, The Netherlands
 - Co-op Car Club, Dublin, Ireland
- 2.1.5.3 Preparatory scheme design was also undertaken for a start-up in Edinburgh, which is due to commence operation in April 1998. Brief details of this scheme are also contained in Appendix A.

2.1.6 Dissemination of results of the PAYDC Project

- 2.1.6.1 Project Reports:
An Interim Report was produced at the end of the first year and covered the study tour, national seminars, literature review, results of the German pilot scheme and the plans for the pilot schemes in Ireland, the UK and the Netherlands.

- 2.1.6.2 This Final Report contains the results of the pilot schemes and focuses particularly on the energy savings achievable from the system applied in the partner states; a review of the most successful techniques to introduce such schemes and identification of any barriers to implementation; the validity of the levels of service model; a review of the overlap between car sharing and other policy areas on which it impinges.
- 2.1.6.3 Concluding seminar and workshop: A seminar on Carsharing in Europe was held in Leeds, England on 24 October 1997 followed by a workshop on how to set up a carsharing scheme on 25 October also in Leeds, England.
- 2.1.6.3.1 The seminar was attended by 72 delegates, mostly from Britain, though there were delegates from Germany, The Netherlands and Austria also in attendance. Delegates came from a variety of organisations including local government, community organisations, commercial companies, consultancies, universities and NGOs. One of the outcomes of the seminar was the establishment of an embryonic British section of ECS-European Car Sharing.
- 2.1.6.3.2 The workshop was attended by 12 people including members of three groups currently exploring the establishment of carsharing schemes in their areas. The workshop used the Handbook (see below) as the basis for its discussions.
- 2.1.6.4 Handbook: A Handbook on setting up and operating car sharing schemes has been prepared and was used in the workshop. The Handbook will be published for general sale early in 1998.
- 2.1.6.5 The partners have also published articles on the PAYDC project and the pilot schemes in various publications. These include *Community Transport Magazine* in the UK, the *Irish Times*, *Co-op Contact*, *Linkline*, *Report on Energy Efficiency Opportunities for Transport in Ireland*, *Earthwatch Newsletter*, a paper presented to a seminar entitled *Energy Conservation and the Urban Traveller* in Ireland, *Stadskrant Delft*, *WWW site and newsletter of the Stichting Gedeeld Autogebruik* in the Netherlands. There are also articles due to be published in early 1998 in *Linkline* in Ireland, *Community Transport Magazine* and *Traffic Engineering & Control* in the UK and in *Verkeerskunde* in The Netherlands.

2.1.7 Project co-ordination

- 2.1.7.1 The project partners held five partner meetings during the Project. A pre-project meeting was also held prior to the award of the Contract in September, 1995 and was hosted by the Project co-ordinator in Ireland. Two meetings were held during the Study Tour to Germany in December 1995. The third meeting was held in September 1996, hosted by ECS, the German partner, in Bremen. The fourth partner meeting was held in Delft, The Netherlands, in April 1997, hosted by Verkeersadviesburo Diepens en Okkema. The final partner meeting was held in October 1997 prior to the Seminar and Workshop in Leeds, England hosted by the International Ecotechnology

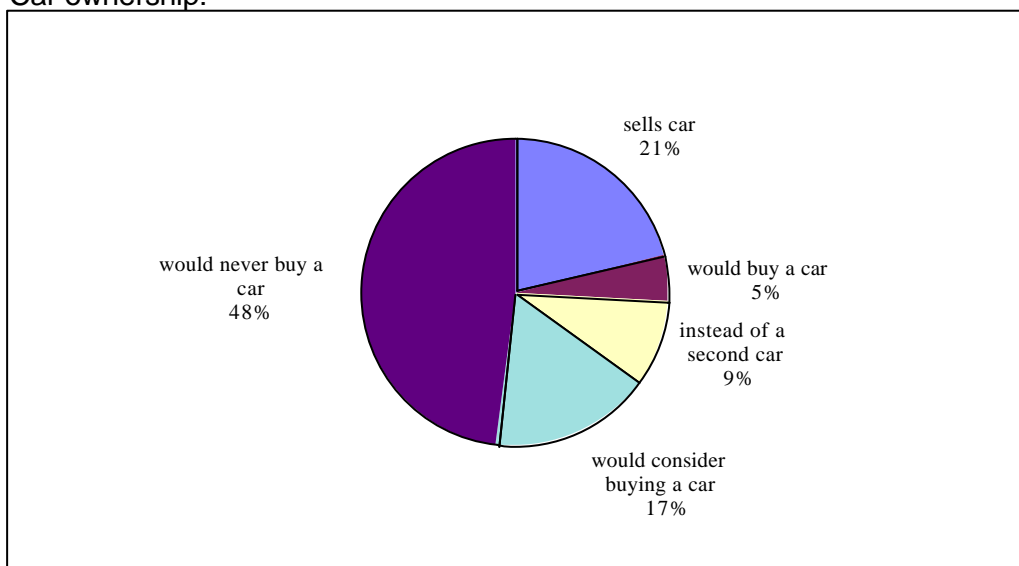
Research Centre. All the partner meetings were operated as part of the monitoring and evaluation processes of the project.

- 2.1.7.2 The project co-ordinator also attended a meeting in Madrid of the transport contractors in the SAVE Programme in January 1996.

3. Energy savings achievable

- 3.1 Various academic studies, the Swiss Ministry of Energy and the German Ministry of Transport have estimated that every Car Sharing vehicle means 4 cars less on the road with an average saving of 28,000 car-kilometres per annum and that the total energy used for the mobility of a former car owner can be reduced through Car Sharing by almost 50%, and that of a non car owner by 4%. Crude calculations on the amount of fuel saved would indicate a saving of 1,000 litres per annum per car and therefore 4,000 litres per year per Car Sharing vehicle.
- 3.2 The potential reductions at the EU level would indicate at least 6 million private cars could easily be replaced without any restriction on personal mobility giving a reduction in car travel of 35,000 million kilometres annually.
- 3.3 These reductions can be achieved as a result of using shared cars which generally are of a higher technical standard and newer than the average cars in Europe’s car fleet.
- 3.4 At present, there are approximately 70,000 people in The Netherlands involved in the various forms of carsharing (50,000 private carsharers and 20,000 commercial carsharers).
- 3.5 The Ministry of Transport, Public Works and Water Management in The Netherlands investigated the effects of the shared car on the mobility of the participants. Four commercial carsharing projects (neighbourhood cars) in three big Dutch cities with a total of 847 participants were studied to this purpose. The most important results are presented below (source: Technical University Delft, “Evaluation programme carsharing in The Netherlands”, June 1997).

3.5.1 Car ownership:



Carsharing: effects on car ownership (Source: Evaluatieprogramma de Deelauto in Nederland, Ministerie van Verkeer en Waterstaat, June 1997)

- An autonomous growth in the number of car owners among the 847 participants without the carsharing scheme; going from 269 to 311 car owners (17% increase).
- Decrease of the number of car owners among the 847 participants through the carsharing scheme; going from 311 to 173 (**44% decrease**).

3.5.2 Car use:

Decrease in the amount of car kilometres per participant:

- per year: from 8,500 to 5,700 kilometres
- for those who had abandoned their own car: from 15,900 to 10,000 kilometres
- for those who did not own a car before: from 5,400 to 3,800 kilometres.

Percentage of kilometre reduction:

- all participants 33%
- participants who had abandoned their car: 36%
- participants who did not own a car before they started carsharing: 29%

3.5.3 Other means of transport:

Increase in use:

- bicycle: +5%
- train: +7%
- bus: +18%

A small shift in the participants' car use in favour of public transport took place. This effect was stronger for former car owners than for people who did not own a car before. The availability of good public transport proved to be an important factor when considering participation in a carsharing project.

3.6 Private carsharing

The investigation into private carsharing, which was undertaken during the preparation of the Delft pilot scheme, proves that this form of carsharing also results in energy savings. Forty-nine households were studied in the autumn of 1996. The results of this investigation are briefly presented below.

3.6.1 Car ownership:

- Decrease in the amount of cars among the 49 participating households through carsharing: from 31 to 14 (**45% decrease**)

3.6.2 Change in car use before and after carsharing:

km./year	car-use by car owners before carsharing (%)	car-use in carsharing (%)
< 10,000 km	16.1	55.5
10,000-20,000 km	74.2	42.3
20,000-30,000 km	6.5	2.2
> 30,000 km	3.2	-

3.6.3 Other means of transport:

Fifty-six percent of private carsharers indicated that they made less use of the car and more use of public transport because they participated in a carsharing project. Public transport in the neighbourhood is available for 96%. The average distance to the nearest stop measures approx. 420 metres. The distance to train or metro stops is approx. 2,450 metres.

3.7 Conclusions

- car ownership and car use decrease through carsharing
- the use of environmentally friendly means of transport like the bicycle and public transport increases because of carsharing
- the emission of harmful substances is lower when people share cars than it is without the carsharing schemes
- the need for parking space decreases through carsharing and the available space can be used for other activities

3.8 Savings on the project in Delft

3.8.1 Considering the modest scale of the project and the short period in which cars were shared within the project, energy savings were obviously small and, moreover, hard to determine in quantitative terms. Data was assembled from the participants of the project in Delft indicating the change in their mobility through carsharing. There are two systems distinguishable within the project in Delft: private carsharing and the Centre-Car.

3.8.2 When looking at possible savings we can distinguish the following aspects:

- use of a car before and after
- car ownership before and after
- intention of buying before and after

3.8.3 The use of the cars was accurately registered from the very start of the system. It would in theory be possible to compare this data with data collected from the participants before they started sharing a car and thereby compare the use of a car before and after were it not that:

- the usage data of the Centre-Car only encompass a few months. A comparison on a yearly basis would result in too inaccurate an interpretation.
- the data of the cars used before entering the carsharing scheme (rented cars, borrowed cars) were roughly estimated on a yearly basis.

This means that if this simple comparison were made, potential positive or negative findings would be the result of one of the factors mentioned above rather than the result of the fact that people started sharing a car. A reliable quantitative comparison is therefore impossible to make. When looking at qualitative aspects it is, however, possible to indicate from a logical perspective whether potential savings can be achieved in the carsharing scheme.

3.8.4 It is expected that the savings will not become apparent during usage, since the participant is offered a flexible system, which is easy to use. This in fact indicates a stimulus in car usage. The flexibility and simplicity of car use is, however, not as extreme for carsharing as they are when owning a private car. After all, owning a car means using a car. Once purchased, a car has to be used in order to keep the costs relatively low. This implies that trips that can also be taken with other means

of transport (bicycle, foot or public transport) will probably be taken with the private car. This results in unnecessary usage.

- 3.8.5 Within the three groups formed in the private carsharing scheme, participants, excluding the car owners, did not own a car before they started carsharing. Two participants (households), however, were seriously considering the purchase of a car. These participants indicated that the possibility of using a car owned by someone else had led them to abandon their plans. Practically this means that the carsharing scheme made the use of two cars redundant. Preventing car ownership is preventing unnecessary use of a car and saving parking space. The three groups of private carsharers have made parking space for two extra cars unnecessary.
- 3.8.6 The advantage of private carsharing compared to the Centre-Car system is that the barrier to enter the scheme is also low for car owners. One can start sharing a car without necessarily having to abandon one's own car. A number of car owners that had gained experience with carsharing, however, indicated that they would probably not buy a new car in due course. They would rather opt for a system like the Centre-Car.
- 3.8.7 Although the participants of the Centre-Car system did not own a car before entering the scheme, half of them were seriously considering the purchase of a private car at that time. They indicated that the establishment of the Centre-Car had led them to abandon their plans. Practically, this means that the Centre-Car made the use of two extra cars unnecessary and probably prevented unnecessary use of private cars. The Centre-Car was used selectively, since high usage resulted in high costs. Preventing car ownership is preventing unnecessary use of a car and saving parking space. The small Centre-Car system saved one parking place.
- 3.8.8 Conclusions on the results of the Delft pilot scheme:
- 3.8.8.1 Energy savings regarding the decreased usage measured in kilometres are difficult to determine because of the small scope of the system. Too many assumptions would then have to be made. It can, however, be gathered from the qualitative descriptions above that the Centre-Car system can play a part in preventing car ownership on a local scale and in saving parking space. It can be assumed that when one owns a car one uses it more often than when one shares a car. This way carsharing results in energy savings. It is not possible to determine the scope of the savings in a reliable way.
- 3.8.8.2 For car owners, private carsharing can be a step towards eventually selling their car and applying for a system like the Centre-Car. Guidance and help while setting up a private carsharing initiative can therefore be of vital importance while making the carsharing scheme attractive for car owners. One does not have to abandon one's own car to start sharing a car.
- 3.9 In the UK evidence relevant to the energy savings and potential growth in energy savings from Car Sharing has been estimated from the experience in Renhold and Cranfield areas in Bedfordshire.
- 3.9.1 The savings from quite modest levels of car sharing in Bedford town were estimated assuming that a target car sharing of 2 cars for each 1,000 households could be reached in 5 years. Bedford has 90,000 population and 36,000

households giving a target of 72 cars. Calculations of energy and emissions savings were made on a 100 household unit. This was on the basis that housing density was such that this was a sensible unit and provided the households with access to the vehicle within 5 minutes walk of 600 households.

- 3.9.2 The purpose of the model is not to make an estimate in absolute terms but to indicate the order of magnitude of savings that could be made with car sharing to Bedford itself. Cold starts and mileage driven in Bedford was therefore the focus of the study. By taking typical car age structure, catalyst, non-catalyst and diesel proportions, then applying these to UK trip lengths gave a clear picture of the number of cold starts in the town of Bedford and journey lengths above and below 3 miles (representing the border of the town).
- 3.9.3 The initial state of car ownership in the town per 1,000 households was 280 no cars, 440 one car, 280 two cars. With car sharing this reduced to 988 cars + 2 shared cars with 10 cars sold or scrapped. Taking into account that it is low mileage and often older cars that are replaced by the carsharing cars the 2 cars (0.2% of the car population) resulted in 0.25% to 0.32% energy saving and between 1.0% and 1.5% CO, NO_x and hydrocarbons where the sensitivity to cold starts is to be seen. On this basis for every 1% of households using shared cars there is a 1% reduction in urban fuel consumption and a 4% reduction in urban car based pollution.

4. SUCCESSFUL TECHNIQUES TO SETTING UP SCHEMES

- 4.1 People wishing to operate a car sharing scheme are immediately aware of a number of potential difficulties as well as opportunities. In this situation they do not want to 're-invent the wheel' and they do want to go to an authoritative source of experience.
- 4.2 The German schemes have certainly provided much of this experience for the activities of the PAYDC project. However, it has become apparent that because the German schemes have grown from autonomous start-ups there is little or no experience in setting up car sharing with any kind of public support.
- 4.3 The Handbook produced by the PAYDC project fills this gap as well as presenting the experience from the German and other carsharing schemes. The setting up of national car sharing organisations also gives a clear focus to advice tailored to national conditions. The national sections of ECS-European Car Sharing, BOVAG and the Foundation in the Netherlands, and the newly formed UK car sharing association provide this support. An Internet car sharing interest group is also a forum for advice internationally with much traffic on it from Canada and the USA.
- 4.4 It is clear that groups wishing to implement a car sharing scheme take a long time to implement such schemes. This period is spent learning about how car sharing has operated elsewhere, deciding which type of car sharing to adopt, surveying the market, costing the project, interfacing with local authority departments, trying to get financial support, planning the location of the cars and getting planning permission for them, and many other topics.
- 4.5 After this comes the period of creating and sustaining business growth to the extent that people can be employed to operate the scheme. Thus it could be five years before the business can be said to be viable.
- 4.6 Census data can be useful in determining the best areas for the introduction of a carsharing scheme. Experience has shown that the bulk of members in carsharing schemes are in the 25-45 age brackets. It is useful to target areas of high levels of car ownership. The main purpose of carsharing is to reduce the number of privately owned vehicles and carsharing is ideally suited to replace the second or more cars in households.
- 4.7 In many cases the initial members of carsharing schemes have been people involved in environmental action or who are environmentally aware. It would be useful to identify areas which have elected "green" politicians or which have a high incidence of environmental activity within the community.
- 4.8 Suitable areas are those which experience restrictions on parking or where there is little or no on street parking, for example apartment complexes.
- 4.9 Other relevant characteristics would include areas, which support a good mix of housing, leisure, shopping and business facilities and which would be considered to be self-contained.

- 4.10 In the start-up phase it is strongly recommended that potential car sharers pay to join a car sharing club in which they are encouraged to share the ownership of single vehicles. This demonstrates to others that car sharing works. The club should also negotiate terms for its members with car hire firms, including half day hire and low cost off-peak hire. Both these activities get the car sharing organisation going while planning can continue. This prevents loss of interest over the 1 to 2 years that it seems to take to get car sharing schemes going. It will also provide a base of customers for when it does start.
- 4.11 It is important to identify the 'entrepreneurial' centre of the project. The project can be organised as a conventional business or as a not for profit business. Either way it has to be clear where the 'drive' to grow the activity will come from and how it will be resourced. If there are not individuals who wish to take on this role, then it may be possible for related organisations such as local transport companies, taxi firms, car hire companies, garage owners to act as scheme entrepreneurs who provide the management, vehicles and booking capacity. These existing businesses can support such a scheme without committing a whole employee. However, it remains important for the typical car sharers to retain a significant role in order for the 'culture' of car sharing to be promoted. The 'culture' is about reducing environmental impact, not about generating more car based mileage.
- 4.12 Strategic alliances with some of the organisations mentioned in 4.11 above are an essential ingredient in the development of successful carsharing schemes. Potential allies also include local authorities, environmental organisations and small businesses.
- 4.13 In addition to liaison with public authorities in order to secure financial assistance from them there are two good reasons to liaise closely with them. One is that they can be encouraged to consider carsharing as part of their urban planning process, in particular where they are trying to discourage individual car use in order to reduce congestion and on street parking; to promote the use of public transport; to promote sustainable transport policies and strategies. The second good reason is that they may be the source of suitable locations for car stations or have responsibility for legal regulations (by laws) which need to be passed in order for car stations to be sited.
- 4.14 Public transport operators might be encouraged to participate in joint marketing campaigns with real benefits for the members of carsharing organisations such as reductions in season tickets or multi-trip tickets. They might also be the source of locations for car stations; for example in Dublin, Irish Rail has given permission for the Co-op Car Club to locate its first two car stations at stations on the DART, Dublin's light rail system.
- 4.15 Taxi companies are often employed by carsharing organisations to provide their booking service and are also used by members as part of the mix of available transport modes.
- 4.16 Environmental organisations have shown an increasing interest in practical alternatives to individual car ownership and played an important role in assisting carsharing to become established in many European countries. Carsharing

features in their campaigns as part of the process to reduce congestion and air pollution.

- 4.17 Small businesses are potential members of carsharing schemes as they enable them to have access to vehicles for short term hire rather than tying up capital in having to purchase their own vehicles.
- 4.18 Car stations should be located close to good public transport services/facilities, especially at points where bus, tram or rail services intersect. They should be close (ideally within walking distance) to the members and they should be close to each other so that alternative booking possibilities are feasible, should the cars at the nearest car station be unavailable.
- 4.19 A mix of vehicles should be available at each car station. Experience and the results of testing a level of service model in the PAYDC Project appear to indicate that there should be a minimum of three cars of a different class or size at each car station. A typical mix might be one 3-door car/1000cc; one 5-door car/1400cc; one estate car/1800cc. Vehicle types also depend upon the nature of the membership; so for example it may be appropriate to include small vans or minibuses in the fleet. Close monitoring of the operational data collected will soon identify which vehicles are more popular.
- 4.20 The two most common methods of acquiring cars for new schemes are purchase and leasing. In some cases it has been possible to have them donated and in other cases the basis of the initial phase of a scheme has been the members own vehicles. In terms of back up or unavailability of the scheme's own cars it has been possible to make arrangements with local car hire companies for preferential rates for members.

5. BARRIERS TO INTRODUCING SCHEMES

- 5.1 The name Car Sharing is a barrier in itself. This is helped and hindered by each scheme calling itself something different. Helped because the new name is designed to fit local conditions and to overcome any difficulty with the concept of 'car sharing'. Hindered because Car Sharing as a concept is not promoted specifically. This barrier will fall in time.
- 5.2 Car sharing does not have credibility with the general public in Ireland and the UK because they think it is about giving shared lifts which is not seen as practical in many situations. Using a car in car sharing mode to replace a household car is also not seen as credible. There is a lack of experience of this type of car usage and ownership in Ireland and the UK. In the Netherlands car sharing has come to mean such a wide variety of activity that it is now called "cardating".
- 5.3 In order to overcome the lack of understanding or misunderstanding of the term, ECS-European Car Sharing has attempted to develop a set of standard criteria, which more accurately describes the services offered by Car Sharing organisations. These criteria, which all schemes regarding themselves as car sharing schemes aspire to or try to meet, are included in Paragraph 0.7 on Page 3 above.
- 5.4 Insurance can be a major problem for new schemes in areas where no such schemes already exist. Carsharing is an unknown quantity to many insurance companies. They will invariably consider that carsharing is car hire, the premiums for which are very high and for which rates are usually based on the hirer paying for insurance cover at each hiring. As in all dealings with insurance companies, it is essential to be very clear about what the carsharing scheme wishes to do and the methods being used. With regard to the level of premium levied, the only thing to do may be to ensure that your rates are able to meet the costs involved.
- 5.5 The location of car stations can be difficult to secure and without car stations car sharing is virtually impossible. In the UK some form of planning permission is required for the location of car sharing vehicles if they are used by a significant number of people. This is seen as a potential problem if people are coming and going from a car station at any hour. In Bremen the planning authority gave permission under a particular class of street furniture that could be removed easily. In Dublin, the Corporation is in the process of seeking a way to allow a car station to occupy spaces currently used for metered parking bays. This might require changes or additions to local regulations.
- 5.6 The number of cars that are required in conventional ownership changes during a person's life time and is also dependent on key aspects of their life, relationships and employment activity. These factors in car ownership choice (and therefore in their decision to participate in car sharing) as with car purchase itself occur in periods of 3 to 10 years. Thus there is an inertia which stops car sharing finding its full potential very quickly. This is also reflected in the change in attitude to car ownership and use which is needed for car sharing to be seen as a viable option for their personal mobility.

- 5.7 The transformation from interest in what is seen as a “good idea” to actual membership of a car sharing club can prove to be very difficult. In Ireland there is a very high level of home ownership and the culture of ownership rather than rental pervades through to people’s perception of car use. In addition, Ireland’s level of car ownership is lower than the EU average, which, coupled with a Government programme to replace older cars with new ones through an assisted purchase process, has also militated against the concept of shared car ownership.
- 5.8 The lack of appropriate public transport often prevents the vision of car sharing being seen or operating as “mobility insurance”, i.e. to provide mobility when other forms of transport are not able to. Certainly, in Britain and Ireland, the image of public transport as the transport option for poor people does not inspire people to consider it as the complement to car sharing.
- 5.9 Car sharing requires considerable business acumen. There is a gap between the enthusiasm of the environmentalist wishing to promote alternatives to conventional car based transport and the level of business activity required to realise this objective. Organising a scheme which has 1000 members requires major skills in marketing and administration. It will also require constant updating of technology and innovative solutions to growing the business. Staff who meet this challenge are often under paid compared to other industries.

6. LEVELS OF SERVICE MODEL AND ITS APPLICABILITY

6.1 Introduction

6.1.1 From the users' viewpoint success of a car sharing scheme is dependent on getting a car easily when they want to use one. From a service providers position they wish to meet their users needs from a minimum inventory of vehicles. This benefits users as well through reduced fixed costs of the vehicle fleet. These aspects come together in the form of the car:user ratio. In practice this ratio ranges from 1:30 for a major city scheme such as Berlin Stattauto with 5000 members, to 1:5 for start-up schemes such as at Cranfield which are at an early stage of development. The actual ratio is dependent on many factors, most importantly, the level of local services in walking distance and public transport service quality. However the ratio is also dependent on the size of the scheme itself. As schemes become larger the variation in demand is smoothed and the supply of vehicles can be matched to the average demand of the user pool. Under these conditions far fewer cars are idle and the maximum number of users can be supplied with a car when required. This is defined here as the *scale efficiency* of car sharing. Gaining this scale efficiency is the core business of car sharing in extracting value from the use of fewer cars and is the subject of this paper.

6.2 Change In Scale Efficiency

6.2.1 In its simplest form a car may be owned (shared) between two households giving a car: user ratio of 1:4 assuming there are two persons of driving age in each household. Four cars between eight households would also have a car : user ratio of 1:4 on the same assumption of two persons in each household. However the probability of a car not being available is 'smoothed' in the larger scheme giving a lower failure rate for a given level of demand. Conversely by targeting a particular level of scheme performance this can be achieved with fewer vehicles per head in a larger scheme with the possibility that the supply of cars can in theory be matched accurately to the demand in a large scheme.

6.2.2 The probability that an individual can get (or cannot get) a car when required can be calculated using the the binomial equation. This requires that the members can be divided into two parts, p , who want to use a car during a specific time period, and q , the remainder of the members who do not, i.e., $p+q=1$.

6.2.3 In the binomial, the probabilities of individual events are summed, the probability of a unique event being the product of the individuals' probabilities of wishing to use the car, $p_1 \times p_2 \times p_3 \dots p_r = p^r$ and similarly for $q \dots$ to $q_{n-r} = q^{n-r}$.

6.2.4 Thus for one car, four people sharing it, then in any one session, the possible states are:

0000	no car needed
x000, 0x00, 00x0, 000x	one car needed
xx00, x0x0, x00x, 0xx0, 0x0x, 00xx	more than 1 car needed
xxx0, x0xx, xx0x, xxx0	more than 1 car needed
xxxx	more than 1 car needed

By calculating the number of possible states in larger schemes, and summing over the available number of cars, the probability that any one individual will fall into the category of insufficient cars available.

The number of states is given by $n!/[r!(n-r)!]$

where n is the total number of individuals active in the scheme and r is the number of cars required in the session. The probability of each state is equal $p^r q^{n-r}$ which is the product of all members who want a car and those who do not

$$p_1 \times p_2 \times p_3 \dots p_r \times q_1 \times q_2 \times q_3 \dots q_{n-r} = p^r q^{n-r}$$

The probability that r cars are needed in a session is

$$n!/[r!(n-r)!] \cdot p^r q^{n-r}$$

If m cars are randomly distributed to people who want them, then given that there are not enough cars to go round ($r > m$), a particular individual will not get a car ($r-m$) / n of the times exactly r people want one.

The probability, b, that any one person does not get a car when they want one is given by

$$b(m, n) := \frac{1}{p} \cdot \sum_{r=m+1}^n \frac{r-m}{n} \cdot \left(\frac{n!}{r! \cdot (n-r)!} \right) \cdot p^r \cdot q^{n-r}$$

We can use the above equation for b to model the effects of changing the operational conditions of car sharing schemes and in particular see how scheme size affects these.

6.3 Scale Efficiency Model

- 6.3.1 The equation for b was programmed using MATHCAD and the solutions found for b given by varying the different parameters of the equation. Outputs of the model had the form of Figure 2 from which values were read off and plotted in Excel.
- 6.3.2 First it is important to know how scheme size affects the success rate experienced by an individual member in a scheme where the ratio of members to cars is held constant but only the size of the scheme is varied. This is plotted in Figure 1 below.

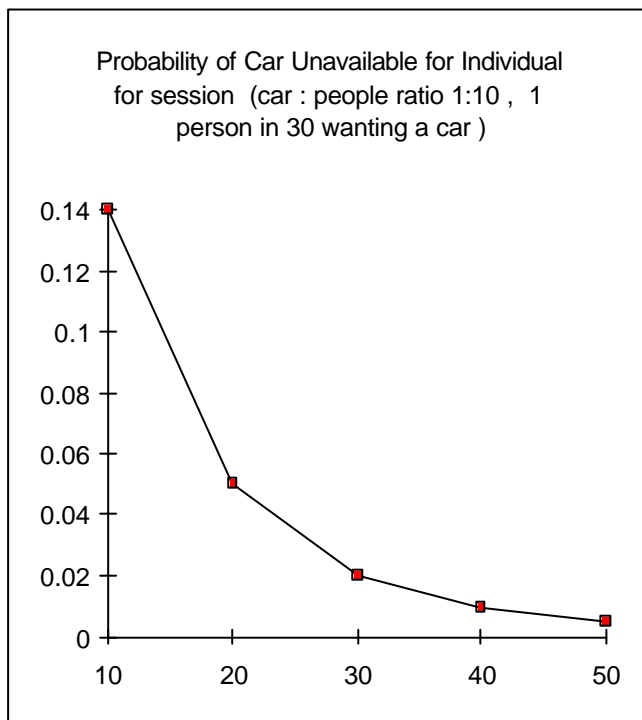


Figure 1 The probability, b , that a car is unavailable for a session when 1 in 30 people want a car and the number of cars per person in the scheme is 1:10.

- 6.3.3 This result shows several things. The main result is that the probability of a car not being available for an individual decreases rapidly as this particular scheme increases in size. The failure rate of $b = 0.14$ which represents a car not being available once in every seven attempts to use the scheme, reduces to $b = 0.03$, or one in every 33 attempts as the scheme increases from one car to 5 cars, all else being held equal.
- 6.3.4 The other aspect illustrated by figure 1 is that the demand in the session had to be specified in terms of the number of people wanting to use a car during that session and the supply of cars available, which is one car for every ten persons. In this particular example the rapid improvement in the service level provided by a 1:10

ratio of people to cars is caused by the supply of cars being well in excess of the average demand for their use which is given as 1:30.

6.3.5 This set of factors, the failure rate, the demand for travel in a session, the supply of vehicles to meet that demand, and the total size of the scheme form a 4-dimensional problem. A further view of the instance where the average demand for travel per individual in the scheme is also once in 30 sessions ($p=1/30$) is given in Figure 2 below.

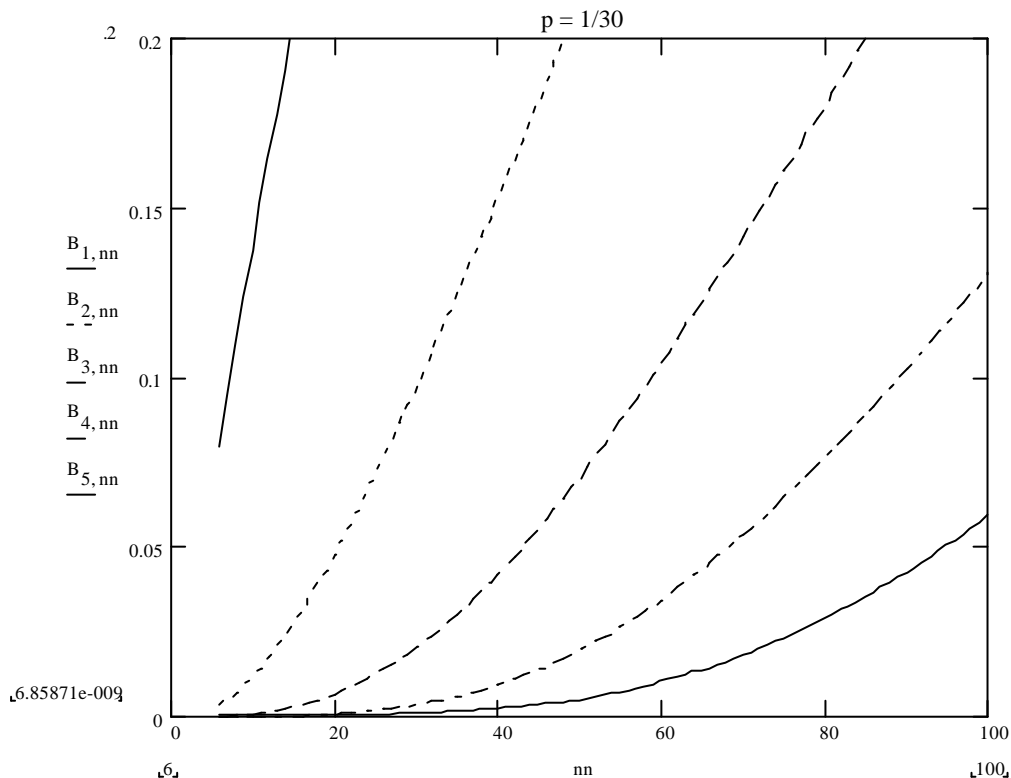


Figure 2 The probability, B_x , that a car is unavailable for a session where there are x cars available ($x = 1$ to 5) as a function of the number of people in the scheme, nn , all wanting to use a car once in 30 sessions.

6.3.6 From figure 2 the number of users that can be supported at a particular service level using a fleet of 1 to 5 cars can be calculated for this overall demand level $p=1/30$. In this case with 2 cars and a 5% failure rate, 20 people can be served (car:people 1:10); if a 10% failure rate was acceptable, 30 people could be served (1:15). Doubling the fleet size to 4 cars, then 88 people could be served at a 10% failure rate (1:22). A 5% failure rate in the latter case results in a 1:17 car to people ratio under these conditions.

6.3.7 Similar outputs to Figure 2 can be produced for different values of p , the probability that a member will want a car in the session. To determine the useful range of p ,

in real schemes, the session has to be more carefully defined. Here the session is taken to be the peak hour of use during the day and for simplicity this is assumed to be the same every day of the week. The other assumption is that the hour is fully used, then the range of $p = 1/4$ to $p = 1/30$ embraces the range of car:active member ratios that exist in observed schemes.

- 6.3.8 As we see from the discussion of Figure 2, more users can be supported per car by either increasing the scale of the scheme or by tolerating greater failure rates. Whereas the potential scale of the scheme will be dictated by the local conditions and customer density, the level of service (failure rate) can be targetted by the supplier.
- 6.3.9 Figure 3 provides the final concept, maximum sharing efficiency, required for selecting a path through this multi-dimensioned problem. In this case it is the level of service that is held constant and is set at $B = 0.01$, thus in 10% of the peak sessions an individual will not get a vehicle when one is requested. The level of demand is high $p = 1/4$. This means that the individual will want to use the car during the peak hour twice a week, and will not get a vehicle once every five weeks on average.
- 6.3.10 When we fix the level of service and the level of demand, then the efficiency with which the cars are shared increases as the size of the scheme increases. However it does this asymptotically and converges on a ratio of cars : users at peak equalling the average demand per user at peak. This can be seen simply as convergence on a maximum efficiency which is where supply exactly meets demand, with no unused time at the peak but no excess demand either, this is given for a large scheme, by

$$p = r/n_{max}, \text{ or } n_{max} = r/p$$

- 6.3.11 However, figure 2 showed that it is inefficient to achieve a zero failure rate since even very small failure rates, going from 1:200 to 1:100 can double the number of people served in the 5 car case. Quite small failure rates have a significant effect on the overall efficiency of the schemes. The values used to explore this effect range from 1 time in 20, to, 1 in 5 times when wanting to use it at the peak time. These results are expressed in percentage of maximum efficiency. Under conditions where a specific failure rate is targeted, the maximum efficiency is changed to take into account the increase in the demand that is allowed, knowing that not all will be met,

$$n_{max} = (r / p) \cdot (1+b)$$

Using equation for b to determine the actual number of people, n_n , served by an actual number of cars to a given service level, this can be compared to n_{max} to determine a percent maximum efficiency.

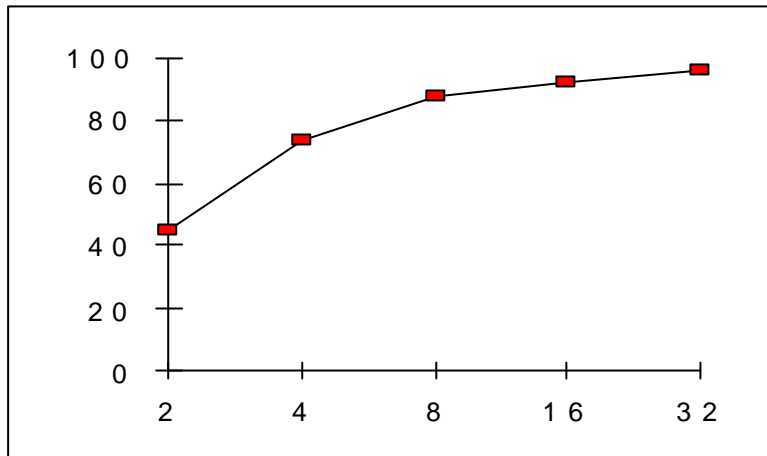


Figure 3 Scheme % maximum efficiency as a function of scheme size and assumes a hire failure rate of 10% at peak hour and a demand level of $p = 1/4$.

6.3.12 From figure 3 the major efficiency gains are possible by scaling up to around 8 cars under the conditions specified after that the gains are small. In this instance 88% of maximum efficiency had been achieved at 8 cars and 31 users had been estimated as using while the maximum number of users is calculated at $(8/0.25) \times 1.1 = 35.2$.

6.3.13 Finally, the estimate of percentage maximum efficiency at the peak for a range of demand rates from $1/4$ to $1/30$ can be compared to the two failure rates of 5% or 10% per member wishing to hire at the peak. These relationships are explored in figure 4, for the number of cars (2,4,8,16,32) available to users. Only some 2 and 4 car cases were examined due to calculation limits but the nature of the scale changes are clear.

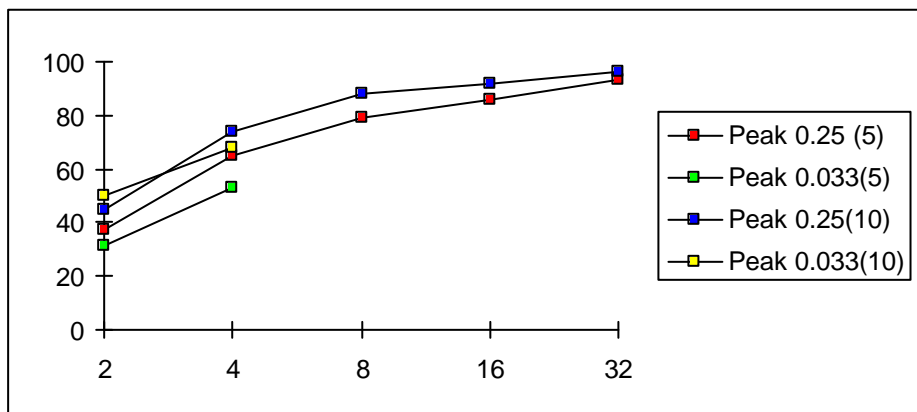


Figure 4 a

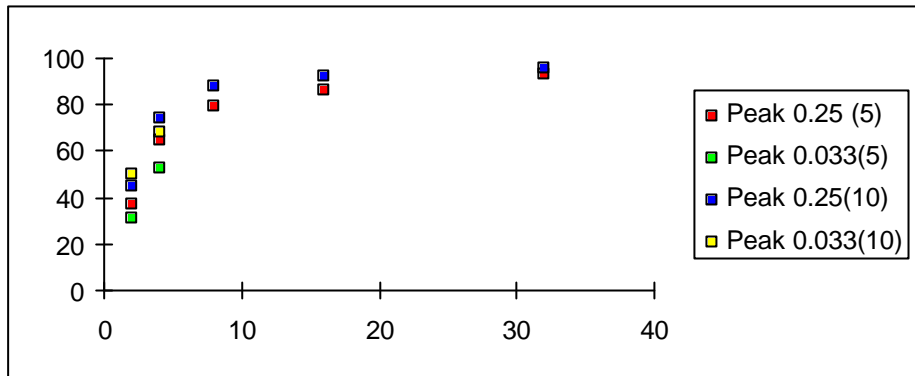


Figure 4 b The percent maximum efficiency of schemes of different numbers of cars, different demand rates, p , per peak session and different failure rates, 5% and 10%.

The two figures above present the same data but scaled logarithmically in the case of figure 4 a. Figure 4 b more clearly shows the saturation of efficiency gains as schemes reach 8 cars for 10% failure rates and 12 to 16 cars for 5% failure rates where the higher figure refers to the lower average demand eg $p = 1/30$. As we will see from the Dortmund example below, this scheme size actually refers to the operational size of the scheme, since not all cars in the scheme are in practice available within the convenient reach of the user. We now consider this with an actual case.

6.4 Dortmund Data : Application Of Model

6.4.1 The Dortmund car sharing scheme grew from an initiative which began on a car free day sponsored by German friends of the earth. In this initiative one or two cars owned by Greenpeace members formed the basis of a car sharing scheme called neighbourhood cars. This idea of members putting under-used cars into the scheme and having others pay for using them and themselves paying to use them but at a different rate is still in use in the Dortmund scheme today. However as the scheme has professionalised it has increased the number of cars bought new and also the number of cars owned by the organisation outright, rather than leased to it by members. Again with professionalisation the identity of the scheme has changed from a green organisation to still a green organisation but not exclusively so, and the services sold by the organisation are sold on their general appeal to the public of which greenness is only a part.

6.4.2 This background is important to the understanding of the scheme since as will become apparent from the data we obtained about the operation of Stadtmobil Dortmund there were more cars in the scheme than was calculated for the level of demand when the observations were made. From a larger perspective of members wishing to have some, but perhaps not massive, use of their cars in the scheme, this may not be a bad thing. However if we were to assume all the cars

were owned by the central organisation, then far fewer vehicles are predicted to be necessary to meet the existing demand during the study period which was two weeks in September 1996.

- 6.4.3 Dortmund is a city of 600,000 inhabitants, located in the eastern edge of the Ruhr industrial region. The traditional industries of coal and steel making have undergone reorganisation and downsizing. The central city is a prosperous administrative, shopping area and also features a large brewery. Public transport is of a high quality and includes trams and subways. A reciprocal arrangement exists with the transportation authority such that members of the car sharing club get reduced monthly public transport passes and holders of those passes get reduced car club membership fees.
- 6.4.4 Although the total size of the car sharing scheme may embrace a region containing several towns and cities the scale of scheme that any individual experiences is dependent on how convenient it is to reach a car when it is needed. The Action radius is the region an individual will travel to obtain a car. This will vary dependent on how convenient the car stations are for tram stops, for cycle facilities and for pedestrians. The cars of Stadtmobil Dortmund are located at car stations, which are positioned to maximize accessibility of the cars to the user community by being close to a tram or subway stop.
- 6.4.5 There were 40 cars located in 17 stations in September 1996 in the Dortmund scheme. These were used by 147 people in the last two weeks of the month. However, not all these stations were accessible to each individual wanting to travel. In practice it was found that 120 individuals used 1 station only, 14 used two stations and only 4 individuals using more stations than this. Thus the scale at which the scheme was operating was at a maximum of two stations. A maximum scale was therefore 9 cars with most station pairs having far fewer cars.
- 6.4.6 During two periods of the year, January 1996 and September 1996 the number of booking failures was monitored. A failure occurred when a request to use a vehicle at a particular location for a particular period was not possible because of a pre-booking. The booking centre could then offer an alternative place, or alternative vehicle, or see if it is possible to change the time of the journey.
- 6.4.7 When a 'failure' occurred then the person booking the journey was asked at the end of the booking procedure how much of a problem it was. This would include how much of a problem was it not getting a car at all or how much of a problem was it to have some other solution provided by the booking centre such as getting a different sized car or car from a different station.
- 6.4.8 In January very low levels of booking failure were recorded with only one failure generating a significant problem for the user. To check if this was a consequence of the winter season the booking process was checked again in the last 2 weeks of September 1996. In the two weeks of the study 4 booking failures were recorded and 25 reassignments where the vehicle of choice was not available in 14 days observation.

Total number of bookings as required	271	90.3%
number of bookings made as reassignments	25	8.3%
number of bookings failed completely	4	1.3%
Total number of booking attempts	300	

6.4.9 A further method of measuring the level of service provided by the car sharing system was to measure the pre-booking time for each booked journey. It is hypothesised that if a user regularly has difficulty to get a car when it is wanted, then the period of prebooking will be extended. Conversely if there is always a car available when required it would be expected that pre-booking time would drop to zero. It may be also expected that long trips or trips with particularly high importance would also lengthen the pre-booking time.

6.4.10 The pre-booking time was determined by the booking centre which recorded the time at which the booking was made as well as recording the required car out and car back times that were requested. The commonest pre-booking time, the mode, was below one hour, the median was 2hrs 35 mins and the average, which is weighted by day and weekend trips was 1 day 18 hours. Similarly the average length time taken for a trip was 9 hours 30 mins, the median was 4 hours 30 mins and the mode was 3 hours.

6.4.11 Considering the size of car station there was a clear pattern:

number of cars at station	1	2	3	4	5
mean % time on hire	10	10	19	18	20
mean pre-booking time in hours	15	11	3	1	1

This data indicates that the size of the station was the most important factor in determining the pre-booking period. By inference the size of station influences the perceived level of booking security. The real supply of cars was high in all cases, and highest at the small stations but this did not determine the pre-booking time under conditions of excess car supply.

6.4.12 **Station usage at peak travel demand.** In order to investigate the scheme at the scale that it operates, we took the action radius of two car stations near the centre of town. These had 9 cars. To simplify the calculation and avoid different users having the cars during the session under consideration, the session chosen was the peak hour of the day. This was selected by counting how many cars were out each hour of the day, irrespective of weekends. From the above data that the modal trip time was 3 hours, it was a reasonably robust assumption to assume that the number of cars on hire during the peak hour equalled the number of users

active. During the study period the peak hour was 18.00 hours for the two stations considered as a single unit.

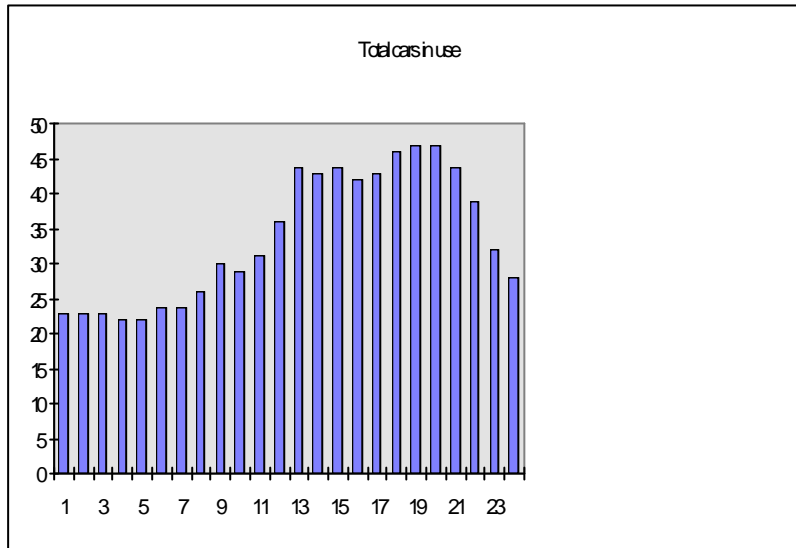


Figure 5. Car use during the day at two car stations near central Dortmund Sept 1996

Over the 14 days there were 14 peak hours per vehicle and 9 vehicles giving 126 hours available at the two stations during the peak. At the peak 47 vehicle hours were logged giving a peak use efficiency of $47/126 = 37\%$

58 people used the 9 cars at the two stations giving a car : user ratio of 1 : 6.4 . On any one day during the peak $47/14 = 3.4$ users were active on average out of the 58. This gives a probability that a user will want the car of $3.4/58 = 6\%$ or one time in 17 days.

Thus we have the probability, p , that an individual will want a car at peak, of $p = 1/17 = 0.06$

The size of the scheme is 58 members and 9 cars

The observed failure rate for these 9 cars was only one failed booking at the peak, which gives a 2% booking failure rate given 45 bookings covering the peak.

6.4.12 Model predictions. At maximum efficiency r_{min} the minimum number of cars required allowing for a chosen failure rate, is $r_{min} = N.p / (1+b)$. Using the graph of b for $p=1/15$ the estimate of numbers of cars needed for 60 people at the following values of failure rate b

b	2%	5%	10%
cars	8	6	5
r_{min}	3.9	3.8	3.6

Thus even allowing for a little growth in membership and a higher demand rate this should be satisfied by 4 cars at peak efficiency at the two stations combined and still deliver a high level of service.

By almost doubling the size of the action radius, to say include 16 cars, would enable the reduction of cars from the existing 9 at the two stations to 5 without any reduction in the level of service. At present it would be possible to reduce from 9 to 6 and only increase the failure rate slightly from the present level by targetting a 5% failure rate without changing the size of the action radius.

One other aspect that figure 5 illustrates is the relationship between the peak and the other demand levels during the day. The business success of the scheme will depend on many factors but minimising the size of the troughs is the other major aspect of scheme management once the scheme size and action radius has been set by dealing with the peak demands.

6.4.13 Conclusions. Runs of the model have shown that where demand for car use is high, with users wanting a car one time in four during the peak, the efficiency of the scheme saturates at quite a small scale and most of the efficiency gains have been obtained by schemes of 4 to 6 cars. Where car user ratios are much higher, 1:15 or 1:30, then the efficiencies are still possible and valuable at schemes of 16 cars.

6.4.14 Many urban schemes have many more than 16 cars in their parc. However the challenge is to get the members to use a number of car stations and in that way increase the action radius by familiarity with vehicle locations and individual vehicles. Another way to increase the action radius is to have all vehicles the same. This has been tried by the company Greenwheels in the Netherlands. With all vehicles the same there is a greater consciousness of a single vehicle pool. When there are many different vehicle types, each specific type may mean that it is in effect operating at a system size of one vehicle. However in a practical sense members want a variety of vehicles. This presents a further challenge to enlarging the action radius to provide such vehicles without the financial penalty of working at a small scale for specialist vehicles.

6.4.15 The value of targetting a failure rate has been seen to create major fixed cost savings in the vehicle parc. These vehicles could be relocated and perhaps even counter intuitively placed at single car stations and so double their size. This would raise the perceived level of service at each station. It might infer that the minimum station size should be 2 cars even in new situations if these locations are planned to grow. Outposts where growth is not sought or targetted may not wish to take this route.

6.4.16 The model is a useful device to explore the mechanisms by which car sharing works. It gives a benchmark of 100% efficiency and shows how this can be reached in different scheme architectures and different scales.

7. OVERLAP BETWEEN CAR SHARING AND OTHER POLICY AREAS

7.1 Employment and retraining.

7.1.1 Car sharing companies can become highly technically innovative and people orientated businesses for the next millennium. It is an important new service industry, which is good for the environment. There are good opportunities for back to work and retraining in an industry that will grow and where the skills learnt are transferable to other industries and in particular to other parts of the transport industry.

7.2 Parking policy and urban regeneration.

7.2.1 Air quality, freedom of movement in urban areas by car, quality of life in urban areas leading to high quality employment and income growth are all affected by the car sharing concept. The concept appeals to those of high educational achievement and their participation in the city will increase its economic base.

7.2.2 However, in the urban areas which are seen as the leading edge of where car sharing is implemented, care must be taken to check for **compensation behaviour**. This is simply that if, under conditions of parking problems, some people give up their car (and its parking space) and enter a car sharing scheme in which, say, 10 cars are replaced by 2, then it is important that 8 other people who were **suppressed** from owning a car by the lack of parking space, do not buy cars. If the number of parked cars is not **reduced** by car sharing then there has been zero gain through the policy since, although those formerly dependent on their cars are now using more public transport, the new car owners were formerly using public transport and are now using conventionally owned cars. A policy of removing parking space is therefore important and needs to be examined carefully.

7.2.3 The Dublin Transportation Office, which is responsible for the implementation of a comprehensive strategy for the Greater Dublin area and which provided financial support for the pilot carsharing scheme in Dublin, considers that in the long term carsharing may contribute to a number of the key aspects of the strategy. These are traffic calming, the development of environment cells in certain sensitive areas, reduction in car use, transfer of trips to public transport. The DTO would also consider carsharing to be a form of public transport in its modal model, which forms the basis for the monitoring and evaluation of the success of the strategy's implementation.

APPENDIX A:

Reports of pilot projects

A1. Ireland

1 Introduction to the Dublin Co-op Car Club

The Co-op Car Club is the Irish pilot carsharing scheme and it commenced operations in May 1997. The initial fleet consists of three leased cars, all brand new Fords, Ka, Fiesta and Escort Estate. There was initially one 'car station' in operation, at the Sandymount DART train station, which is about 2.5 kms south east of the city centre. A second 'car station' has been established at the Clontarf Road DART train station about 2.5 kms to the north east of the city centre. The DART is a key component of the local train network in the Greater Dublin area. Dublin Corporation has agreed to allow the location of a third 'car station' in South Frederick Street in the city centre, but this has not yet been provided.

A co-ordinator was employed part time on a self-employed basis from August 1996 to undertake a number of specific duties concerning the setting up of the scheme, promotional activities, liaison with members and potential members, processing membership applications, liaison with public agencies, supervision of the cars and the car stations, preparation of progress reports. A small office was opened in Dublin in December 1996 and was equipped with a computer, printer and telephone.

The location for the initial car station and the recruitment of members was chosen following an analysis of the demographic data, its good public transport links, the availability of free parking for the cars, its proximity to the City Centre and the location of people who had indicated an interest in joining the scheme. The correctness of the choice was reinforced by the fact that the constituency returned a Green Party TD (member of parliament) in the national election of June 1997.

2 How the Co-op Car Club Operates

Members of the public may join the club for £50 if they hold a full driving license and are over 25 years of age. A returnable security deposit of £250 is also required and may be reduced to £100 provided members pay their bills by Direct Debit. Members may then avail of any of the Co-op cars as often as they like by phoning a LoCall (1890) number to reserve it; the actual booking centre is located in Co.Clare. When using a car, members fill a small logbook located in the cars according to duration of use and mileage. All members receive a members' handbook and a key to a wall safe which is located beside the cars and which contains the car keys. Charges cover all motoring costs, including insurance, tax and fuel (which is obtained by using a special payment card in each car). Members are billed £10 monthly plus a car usage fee calculated from mileage and duration of use. Household and Corporate rates are also available.

FEES

	<u>Individuals</u>	<u>Households</u>
Returnable deposit	£250	£250 per key
Joining fee	£50	£50
Monthly fee	£10	£15
Companies:	Returnable deposit	£250 per key
	Joining fee	£50 up to 5 named drivers £100 up to 20 named drivers
	Monthly fee	£20 up to 5 named drivers £50 up to 20 named drivers

RATES	Ka, Fiesta	Escort Estate
per mile	15 pence	20 pence
per hour	£1.75	£2.00
per day	£17.50	£20
3 days	£45	£50
per week	£105	£120

FINES

Loss of safe key	£50
Loss of membership card	£5
Late return of the car	£20
Failure to clean the car	£10

CREDITS

Washing car	£2
Vacuuming car	£2
Delay caused by late return	£10

3 *Publicity Undertaken*

All standard avenues have been followed up in order to publicise the existence of the Co-op Car Club, including:

- ✓ *Posters*
- ✓ A4 Colour Posters have been printed, and placed in a wide variety of locations including local stores, supermarkets, community noticeboards, the DART train stations.
- ✓ *Leafleting*
- ✓ Triple-folded A4 colour leaflets have been printed and distributed to businesses and residences in the areas of the car stations. A 1,000 leaflet drop was commissioned around the Sandymount train station area. Leaflets were also mailed to potentially

interested parties, eg. Environmental groups, the Green Party and in response to incoming enquiries for information.

- ✓ *Press Releases*
- ✓ Over 40 Press releases were sent to local and national media bodies, including radio and television stations, a wide variety of publications and magazines, motor industry, community and environmental groups.

- ✓ *Public Transport Bodies*
- ✓ Dublin Bus has been informed of the scheme and is supportive, realising the complementary nature of such a scheme with their service. Regular travel pass holders are being targeted as potential members.

- ✓ *Environmentally Aware Bodies*
- ✓ Information has been sent directly to several groups which may be supportive of the scheme due to its positive environmental structure. This includes the Green Party and local members of Greenpeace (2,000 in the Dublin area were contacted during the preparation phase).

- ✓ *Small Business Umbrella Organisations*
- ✓ In addition to the leafleting campaign, the SFA-Small Firms Association and ISME-Irish Small & Medium Size Enterprises have been sent information about the scheme.

- ✓ *Information Evenings*
- ✓ Two public information evenings were held to provide information for interested parties and a forum for joining the scheme. It is intended that such evenings will become a regular event (possibly fortnightly) as the scheme gathers momentum.

- ✓ *Questionnaires*
- ✓ Questionnaires have been designed and sent to over 40 people, who have to date expressed an interest, in an attempt to further tailor the service to the needs of members.

- ✓ *Direct Targeting of Business*
- ✓ Both large and small businesses in the areas of the car stations have been directly targeted with mail shots. Personal visits are also being made to chief executives and owners in an attempt to gain corporate memberships.

A major promotional effort was also co-ordinated during Energy Awareness Week in September 1997, incorporating most of the above methods as well as a public meeting in central Dublin. The outcome of this was three interviews on local radio, one interview on national radio and one on national TV. In excess of three hundred enquiries were dealt with and about the same number of information packs were sent out.

4 Public Response

Public response to the scheme has been supportive. Virtually without exception the concept is received as being 'a great idea'. However, the difficulty appears to lie in encouraging people to take the next step and actually join the Co-op Car Club. This experience is borne out by other similar schemes with which we have been in regular

contact via the European Car Sharing organisation (ECS), namely that the start up period takes time to gather momentum and gain members.

5 Plan of Action

The Co-op Car Club is constantly searching for new ways to promote the idea. Current plans being investigated include:

- large displays for use at conventions and public stalls
- targeting of 24-hour garages as potential ‘car stations’
- continued leafleting and poster distribution and canvassing of the media
- presentations to existing public transport structures
- identification of further ‘car stations’ in more central locations

6 Operational Statistics May-October 1997

	Ka	Fiesta	Escort Estate	Totals
Total mileage used	5610	3756	6513	15879
Total time used	67 days	69 days	60.5 days	196.5 days
% of time used	36.4	37.5	32.9	35.6
No. of bookings	8	6	27	41
Income generated	£1124.09	£2226.86	£2336.40	£5687.35

Number of members at 31.10.97:

- 6 Individual members
- 2 Household members (5 people)
- 2 Company members

7 Questionnaire surveys

Two questionnaire surveys were conducted during the pilot scheme; one was a survey of people who had contacted the co-ordinator for information on the scheme and who had not joined the Co-op Car Club (including the original group of about 25 individuals who had been involved during the planning phase from September 1996); the second was a survey of current members.

7.1 Results of survey of people who did not join.

If you are not already a member of the Co-op Car Club, what stopped you joining?

- Cost in comparison to alternatives
- Need for instant car availability
- Already car owners and couldn't see the benefit in pooling
- Able to satisfy mobility needs with own car & bike & ways of getting around
- Arrangements too complicated in terms of planning, organising

What do you see as being the main advantages of using the Co-op Car Club?

- Suitable for person who only needs a car for specific occasions
- Short term alternative to car rental
- Reduces car use to more necessary journeys
- Reduces pollution/congestion
- High cost prevents large scale use of scheme
- Access to better cars
- Less wasteful than owning own car
- More environmentally friendly than individual car ownership

What do you see as the main disadvantages of using the Co-op Car Club?

- Not much cheaper than car rental especially £250 deposit and membership fee
- Availability of car not guaranteed in case of emergency/spontaneous use
- Having to use other transport modes to/from the car station
- Having to book and plan car usage

What would you consider to be the optimum target group for potential members, and what would be the most effective way of contacting them?

- Age groups 25-35 and 60-75
- Persons who only need a car now and again
- Individuals and organisations in need of occasional use of a car
- People considering buying a new car
- Environmentally aware people
- People with above average incomes
- Residents of areas with a good community spirit and sharing approach
- Advertisements in pubs, colleges, community clubs, mass media.

What do/would you mainly use the Co-op cars for?

- Business
- Sunday outings
- Occasions when public transport was not suitable
- Shopping
- Weekend trips
- Holidays
- Access to countryside outside Dublin

Which methods of transport do you use?

- Walk
- Bus
- DART
- Taxis
- Own car
- Friends' cars
- Bicycle
- Lifts

Have you any other comments or suggestions, which you think would make the Co-op Car Club more attractive to potential members?

Aim at particular communities, eg. villages on the outskirts of Dublin, where public transport access is poor.

Reduce price

Apply for Government grants

Find another system of system of security (the £250 deposit is a serious barrier)

Try to get on popular national radio shows

More active PR of benefits

Publicise experiences in other countries

Promotional campaigns

Stimulate car-sharing between friends and neighbours

The bigger the scheme becomes the more accessible and attractive it will become because then there will be lots of cars available probably in every area in the city, thus reducing the need to book and plan ahead so much

Tying the Co-op Car Club in with the Green Party's free bike scheme

7.2 Results of survey of members.

Do you own a motor vehicle at present? If you do, please state type and cc.

All respondents do not own a car.

Did you previously own a motor vehicle? If you did, please state type and cc.

Only one previous car owner. Small old car sold prior to joining the Club.

Did you sell and not replace a motor vehicle since you joined the Club?

None.

Did joining the Club mean that you did not acquire a motor vehicle?

All members responded positively.

What do you see as being the main advantages of using the Coop Car Club?

Not having to maintain a car; no maintenance worries

Use of new car

One bill for everything

Access to range of cars of different sizes

Use of car only when you need it

No need for own car parking space

Self-discipline in car use; only when strictly necessary

Environmental benefits

What do you see as the main disadvantages of using the Coop Car Club?

High price

Lack of certainty regarding availability

Bureaucracy involved

Distance to car stations

Need for advance bookings

For which purpose do you use the Club's cars?

Leisure
Weekend outings
Work

Which methods of transport do you use?

Bus
Train
Walking
Bicycle

Have you any other comments or suggestions which you think would make the Co-op Car Club more attractive to members and potential members?

More flexible membership fee; no charge in month when cars are not used
Increase range of cars available to suit different occasions
Internet site for making bookings and viewing availability
Lower mileage rates
Lock up facilities for bicycles at car stations
Ability to contact office outside booking hours
Develop links with other organisations involved in environmental issues
Special deals with public transport operators
Clearer comparison with car rental costs
Promoting Car Club membership as an alternative to car rental

A2. The UK

Overview

Funding for the PAYDC project has come from the Bedfordshire County Council (36%) and Edinburgh City Council (24%) and EC (40%). The project was designed with Bedfordshire as the main customer for the pilot project and the location of the pilot PAYDC scheme. Bedfordshire CC wanted to use car sharing to improve transport facilities in a village on the outskirts of the town of Bedford. Edinburgh City Council sought a variety of benefits from joining the scheme including benefits of the review of car sharing in other countries, findings from the operation of car sharing in the UK in practice and lastly the identification of target groups in Edinburgh in conjunction with LEEP, an environmental agency.

After survey of the target pilot site at Renhold in Bedfordshire discussions were held with our project partners at ECS Bremen. These pointed to the difficulties of developing car sharing in semi-rural or rural areas. A different site was therefore selected for the pilot study. This was at Cranfield University itself. This site met the interests of the Bedfordshire Council because it is still a rural or semi-rural site but because universities are normally an urban function the findings of the pilot could be transferred to an urban situation. Cranfield worked with LEEP to establish the background for an independent PAYDC trial in Edinburgh. As a result of dissemination activity an urban group was formed in Leeds and a business plan was constructed for Coventry. Thus the UK pilot is in the following form

- Survey of residents in Renhold
- Development of Car Sharing at Cranfield
- Estimates of air quality and energy saving via car sharing in Bedford
- Assistance to Edinburgh scheme preparation
- Dissemination activity to aid Leeds and Coventry scheme preparation

Finally one of the consequences of the UK pilot has been the setting up of a UK organisation to act as a forum for the development and exchange of experience. Edinburgh, Leeds, Coventry and Cranfield are founder members of this and 20 local government, company and transport interest groups have put themselves on its list.

The Renhold Survey

The interests of Bedfordshire CC were focused on increasing the availability of transport in rural areas and more broadly they had an interest in the journey to school and therefore car sharing among parent groups as a potential mechanism to reduced congestion caused by chauffeuring children to school.

Car sharing works most easily where the marginal car in the household 'fleet' is replaced by a car sharing car. This marginal car may be a second car in a family with school aged children, or may be elderly people who make very little use of their household car. As people move through their life stages, from teenagers who become eligible to drive, to forming households and having children, and on through household contraction and old

age, the number of cars required in a motorised society changes. This rise and fall in the demand for cars through life is visible in a village as much as in a city.

What we learnt from the Renhold survey (reported in full in the Interim Report of the PAYDC project) was that we found a core of people who were willing to start car sharing in the village. One family would put their second car into the scheme and two women who were learning to drive would be the first additional users. The net result of this particular start would be that two cars would not be bought (by the new drivers) and the supplying household would go from a 2 car household to a 1 car household. Ironically with only 300 households in Renhold the ratio of 1 car to 300 households is much better than city schemes where levels of 1 PAYDC car to 5000 households is more typical.

Findings

The first finding was that it was possible to have a car sharing scheme in a small village in which there was already a very high level of car ownership and a low level of local services in terms of shops and a modest level of public transport.

What we learnt from the Renhold scheme was that when starting a car sharing scheme it cannot be targeted at specific problems, such as reduction of school based congestion or help for the elderly. This may be possible when schemes are large and stable, and then they may be expanded with a view to particular policy objectives. However, during a start-up the focus has to be only on the needs of the car share scheme and making it work.

The second finding is to agree with the ECS view that car sharing in small settlements, which ECS define as being below 30,000 inhabitants, should be on a self-organising basis. It is not the basis for a commercially operated scheme. In Switzerland village car sharing is a success because they are part of one centrally organised scheme.

Cranfield University Scheme - CampusCars

Universities are normally found in cities. Cities themselves are rapidly losing or have already lost their manufacturing employment which has become re-located in out of town locations or areas on the urban fringe. Cities are becoming more important as cultural centres, administration, centres for the knowledge industries including universities and as centres of tourism. In Manchester the university is the second largest employer while the City Council is the largest.

Within this broader context a scheme based at a university can be seen as being of interest to the development of PAYDC in urban areas. A university is both a residential area for staff and students and an employment location for the staff. Other campus style equivalents include large urban hospitals with residential nurses and major employment. Large employers may also have a campus style employment site but lack the onsite accommodation.

The Cranfield CampusCars scheme can therefore be seen both as a residential scheme and as an employment based scheme. Both aspects may be applicable elsewhere.

Planning

Significant amounts of negotiation were conducted with the University authorities to identify the relationship of the scheme to the University. Permission to proceed with the scheme was granted by the Director of Facilities after negotiation with the President of the Student Union and the Amenities and Welfare Board. The latter is particularly concerned with supporting the families resident on campus. It was felt that the University needed new transport initiatives. The public transport available was not sufficient and good students who might be attracted to the campus were sometimes deterred by poor transport. If the students showed that they wanted this service then the University would support the idea and assist it. No direct subsidy of the vehicles would be given however.

A meeting was advertised and some 10 students attended and discussed the prices and proposed method of operation of the scheme. A low cost option was requested and older vehicles were seen as fully acceptable to this group.

Pricing

The basic problem was to generate capital to purchase cars as the scheme expanded, to retain a suitable deposit to guard against insurance liability excess and non payment of bills.

The other problem was that drivers do not normally perceive the cost of their travel by car, so that even though the cost per mile in real marginal costs of mileage related depreciation, wear and tear to tyres, engine and vehicle generally, plus oil and petrol, may come to levels that discourage the client group from entering the scheme. Thus there is a benefit from splitting the cost of use into time and mile charges, where the time charge has the additional benefit of encouraging the car to be returned to base as soon as possible.

Finally there is a monthly fee which reminds the member that they are in the scheme and spreads payment for fixed costs over the year. This should not be set too high as it can encourage members to leave if they are not making sufficient use of the scheme. It is reported by ECS that members in PAYDC schemes reduce their car use progressively with time to the extent that the monthly fee becomes significant in the decision to remain in a scheme.

We also wanted to encourage day time use by family members while the students were at work. This was perceived as a problem of not enough day time use compared with evening and weekends.

Our pricing structure in pounds sterling was as follows

Annual fee	95
Monthly fee	15
Hourly charge	0.5
Mile charge (incl. fuel)	0.11
Deposit	100
Deposit on safe key	2

This works out at £275 per year or £5.50 per week plus charges for actual use.

Family membership as above but annual fee of £185 and only one monthly fee per family.

Billing

A standing order for the monthly fee ensures that this aspect is paid promptly. Direct debit of the bills for the travel was not possible. Banks do not allow small operators to have direct access to customers accounts in this way. Only major companies with a significant track record are able to do this.

Billing needs to be frequent (maximum period of one month) in order for the users to budget for their car based expenditure.

Vehicles

Vehicles were supplied by a local taxi company who also undertook the booking and billing arrangements and organised the insurance.

It was proposed to start with three vehicles, two Citroen BX and a Peugeot 405 estate. These were all diesel vehicles and were to be made available to meet demand. The company also agreed to purchase additional vehicles to meet demand on a 1:5 car per member basis.

PAYDC hardware

The University contributed a site near the main entrance where a designated parking area was indicated by road markings and street furniture in the form of a substantial sign labelled 'CampusCars Station'.

Near this location a Key Safe was securely bolted to a wall where it was also in clear view of the security office of the University gatehouse.

The Key Safe was specifically tailored for the project on advice from the safe supplier through the choice of available options. The safe had a retained key lock which meant that the member could not remove the key when the door was open and had to close the safe to get their key back. The lock was of a mortise type and not a 'slam shut' lock which was viewed as problematic in the long term. Each key was sequentially numbered by stamping into the metal so as to identify specific keys with specific people having them.

Bookings

Initially these were made via the taxi company using their system. However on occasions this was to a mobile phone in a taxi while on the road. This did not allow effective cross checking of vehicle availability and also incurred additional costs. The solution adopted was to use the Key Safe as the booking centre initially. This worked well but did require visiting the safe which for some was not totally convenient.

Because all users of the vehicle have access to the Campus intranet computer network a closed user group was formed and a simple booking system adopted on the intranet. This is effectively a text file where members can leave messages in a calendar structure. Family members can book via their student member at work. It is hoped that in the long run an open system will be adopted such that non-members can view the operation of the scheme and be encouraged to join. They will be invited to see if a car is available when they want to travel since this is a major deterrent in the minds of potential members. However, in this proposed development only members can make bookings.

Software

We did not want to re-invent the wheel as regards software. However there was none available in English and we instead approached a supplier of Car Hire software and encouraged them to modify it. The modification required was to split the day into half hour slots. Previously the day had been split into three sections only since there is considerable resistance in the car hire business to part day hires.

The modified software was suitable for use for UK car sharing and had been well tested as a car hire package in over 180 sites in UK, USA and Europe. The price of this package at around £2000 was considerably cheaper than existing car sharing packages. However, the complexity of the software, or indeed of any other car sharing software we have seen, is such that unless you are using it everyday, the functionality is lost within a perpetual learning curve. We concluded therefore that while schemes are small, a simple spreadsheet or manual system is best.

A longer term possibility is to attach the Intranet booking system, above, to the billing spread sheet to create a simple but effective solution for small or medium scale schemes.

Insurance

This remains the biggest difficulty with car sharing in the UK. There are two levels of this problem. In small schemes which are specifically non-profit arrangements it is possible to insure the vehicles under an any driver clause of conventional car insurance. However, in each specific case the insurer must be informed and agreement obtained. There are specific conditions for 'car sharing' on most UK insurance policies but these refer to the giving of lifts or similar purposes. It is a condition of this insurance that no profit is sought from the sharing of the car and that arrangements different to the normal are put to the company for their approval.

At a second level where car sharing is a business this is in principle no different to car rental and can be covered by car rental insurance packages. These are expensive and will also vary with the claims experience of each scheme. If there are significant claims then

the insurance can go so high as to prevent the continuation of the scheme. Major car hire companies guard against this by taking out third party insurance only and self insuring for the damage to their own vehicles.

As experience with car sharing grows it is expected that specific insurance packages will be created. Similarly insurance companies with such experience from Germany or Switzerland may take on this business in the UK. This is a priority activity for the UK car sharing association to resolve.

Scheme Promotion

This is one of the most important aspects of the scheme. At the University we promoted the scheme with posters, meetings, leaflets, regular articles in the student magazine, articles in the national press, and two internet pages including a dialogue box for expressing interest. E-Mail and a regular contact point for face to face discussions were also used.

The scheme was launched mid way through the academic year. This had some advantages as it enabled the operational systems to be sorted out without the pressure of large demands for car use. On the other hand students had already reached a solution to their transport needs either by buying a car or by moving off campus or by learning to do without. The key opportunity for growth comes at the beginning of term with new students arriving on campus.

At the start of the academic year promotion centred on getting entries into the student handbook, getting recommendations from the different schools at the University, being very visible during the student registration days and use of posters and leaflets.

Scheme activity

The initial launch of the scheme was on 16 December 1996. The uptake initially was very slow indeed. The first member came in month 3 growing to four members in month 6. It was expected that significant increase in membership would come in month 8 when the new term started. However this did not happen and losses due to students leaving balanced recruitment and so the year ends with 4 members active.

The usage survey made in October for the car share conference showed that the one car was being used at a rate of 17,000 miles per annum and would generate £4000 of which £1380 are fuel costs.

	Months	Miles	cost/mile	cost/year
Jill	3	870	20.3	£ 799
Mick	4	2014	28.9	£ 1840
Tim	2	988	17.6	£ 1139

John	3	424	24.6	£407
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The car usage rate was 30% over this period which is good using Dortmund as a benchmark.

Car miles per head of 4,296 is below half the annual mileage per car in the UK.

Potential for expansion

A survey of the new students joining the University was conducted to find out how many would buy a car when they get to Cranfield. It was also relevant to know the age of cars the students owned.

93% of UK and overseas students had a driving license.
between 41% (UK) and 46% of overseas students were thinking of buying a car if they did not already have one at Cranfield.

Accommodation on campus is preferentially sought by overseas students. These have half the level of car ownership (36%) compared to UK students. In both cases the average age of car driven by students is between 8 and 9 years.

There are some 550 students living on campus, which, with other family members of driving age, gives some 700 people of which 400 fall into the category of license holding non-car owners when they arrive at Cranfield. This is our target group, which it might be possible to reach 60 to 100 users and supply their needs with 10 to 15 cars parked at 4 car stations on the campus.

Findings

Developing car sharing is not easy. It takes a considerable time for the idea to disseminate to the user group. It has been the support of those responsible for student recruitment that has gradually increased the visibility of the scheme within the University. Building these relationships takes time.

There is a basic demand for the service that car sharing supplies. The scheme will grow if it is perceived as being a viable service. The threshold for this could be two stations with two cars at each plus visibility for how the scheme is working. The latter would be the open access to viewing the internet booking page.

At heart there needs to be an entrepreneur or "green" businessperson or similar person developing the scheme. However, the economics of running 10 cars in a business of this type is such that it could not support a person in employment. The only major opportunity for financial growth would be for the cars to be used in the course of University business. The University makes major use of car hire for its staff to travel off campus. However, to meet this demand the vehicles would have to be of a very different type and much more expensive. This in turn would make CampusCars expensive for student use.

The conclusion is that some other organisation than the taxi company needs to develop the scheme. A local garage and major hire company have been approached. They would be eligible for bidding for part of the University's car hire business which has its peak demand during the day, and the cars would be available in the evenings and weekends for staff and student use in the scheme. Additional lower cost (older) vehicles might continue to be used. It is proposed that this mix of employer's use and staff use in non-work hours is a generic solution to a car sharing scheme located on an employer's site.

The scheme has shown that a good usage level has been achieved but more stations need to be opened and more, newer cars stationed there. The car use per head is below half the UK annual car mileage and confirms the benefit of the car share scheme as an energy saving technology. Mileages will be high at rural Cranfield and further improvements can be expected in true urban areas.

Energy and Air Quality Estimates in Bedford

The conclusions to the modelling work are given in the main report. The key finding is that energy savings in the city itself are equal to the level of penetration of car sharing itself, i.e. if 1% of cars are shared there is a 1% saving in Bedford and up to a 2.5% improvement in air quality. These are tentative conclusions and exclude the energy savings made on trips made outside the town of Bedford.

Preparation of the Edinburgh scheme

One of the most important contributions that we have made to the Edinburgh scheme is to persuade the City Council to develop car sharing in its own right as distinct from an integral part of a car free housing project.

The basis of this is that although car free housing needs car sharing, the converse is not the case, and

- car sharing can contribute to traffic reduction in other locations
- car sharing at car-free housing sites will need a car sharing organisation which will have to have a much larger user base in order to provide the service

Thus the purpose of Edinburgh City Council joining the project was to identify which other areas of the city and which specific user groups would form the basis of a city wide car sharing scheme. To undertake this work the Council nominated a local environmental agency, which specialised in developing employment, LEEP. Cranfield worked with them in three ways; briefing them on the operation of car sharing in the UK and in Europe; design of the market research to locate potential adopters of car sharing and in particular setting up a focus group activity to illicit the views on price and level of service offered by car sharing; finally some models of car sharing development were proposed in consultation with LEEP.

As a result of the joint activity with LEEP some 500 expressions of interest in the car sharing activity were received. Through the focus groups samples of these people were able to express their interest more directly. This was done by discussion around 3 concrete examples of car sharing in which the age and the cost of using the cars were

varied. Although the participants wanted reliable and professionally organised schemes they were less keen on the higher price options. What is clear from the research is that there is a market for the higher price, higher level of service option, but this would not be to the exclusion of other solutions to reach those for whom it was too expensive. In time a variety of solutions may be appropriate to car sharing in Edinburgh. Similarly the option adopted may require its spread beyond Edinburgh to other Scottish and English cities in order to gain a sufficient number of cars in use to cover the cost of the overheads.

What has been proposed in Edinburgh is the most advanced car sharing system in Europe using in-car telematics and global positioning satellite technology for authorisation of hires, collection of hire data and vehicle security. Encrypted infrared key fob transmitters allow access to the vehicles if correctly booked. This high tech scheme meets all foreseen problems of security and ease of use for the individual. A fleet of approximately 200 vehicles is needed to meet its costs.

Dissemination to Leeds and Coventry

Dr Cousins was requested to make a presentation on car sharing at the Leeds Green Transport Week conference in June 1996. As a result of that a group of residents in Leeds decided they would set up a car sharing scheme. Planning for this has gone on over the period to date. A business plan is being prepared and public meetings have been held to generate interest in the scheme. Dr Cousins made a further presentation at one of these meetings, and among other things recommended that those who are interested in car sharing should share their own cars under an agreement with others. This has the benefit of showing that car sharing does work in that locality and prevents enthusiastic members becoming dispirited while the necessary planning work goes on over a 1 to 2 year period.

The Coventry scheme has been taken to an advanced stage of business planning by Brendan Noonan, who was attached to the Cranfield CampusCars project and undertook work on the Renhold survey as part of his MSc in Environmental Studies from Coventry University. Support has been obtained from business formation agencies but matching funding is needed to start the project and this is being sought actively.

A3. The Netherlands

1. INTRODUCTION

1.1 Background

On the basis of a study tour to Germany and an exploration of the Dutch initiatives for carsharing the decision was made, together with the partners in the PAYDC project, to concentrate the research in the Netherlands especially on private carsharing. The reason for this decision is that similar initiatives were the basic assumption of both car sharing projects visited in Germany and because in the Netherlands there is little knowledge of the extent and the working of these initiatives. In order to collect more information a postal survey was undertaken amongst private car sharers in the Netherlands.

The examination into initiatives for private carsharing has shown a picture of the history, the organisation and the needs of improvement of the existing initiatives for carsharing. On the basis of this information the pilot on the one hand has to meet these needs and on the other hand will function as a start for new carsharing initiatives.

1.2 Methodology

Within the frame of reference for the SAVE programme, the pilot project can be broadly divided into the following steps:

1. Research the problems and requirements between private carsharing partners;
2. Analyse and implement measure(s) to improve private carsharing or to meet certain requirements of the members;
3. Setting up a carsharing scheme
4. Evaluate this scheme.

The aim of the pilot is to strengthen the design of private carsharing initiatives. On the one hand, this means increasing the longevity of the partnership and on the other, lowering the threshold for potential members for these initiatives.

Research

The survey indicates how the existing private carsharing partners are characterised and distinguishable from other carshare initiatives in the Netherlands. The survey has the following structure:

A) inventory of partnership form for private carsharing

It is necessary to have a clear idea of the development of partnerships in the Netherlands. This gives an insight into the geographical distribution of partnerships and their extent.

B) questionnaire for members of partnerships and other private initiatives:

A selection of partnerships will be made for further research. This will take place using a questionnaire and might be extended with interviews (for larger partnerships). Both the questionnaire and the interviews will cover the following topics:

- general characteristics of respondent (age, gender, education, income);
- general registration history (motivation, first contact);
- partner sustainability;
- nature of contact with each other (friends, colleagues, etc.);
- residential/style of living (parking opportunities, size of household);
- use of share-cars by the partners (level, frequency, purpose);
- (value) classification of share-car ;
- car ownership/use during partnership (before, during);
- work situation (commuting distance, part time/full time, income);
- learning process (more selective car use; delay or cancel purchase of own car);
- costs pertaining to partnership;
- methods of administration/payment;
- strong and weak points of the partnership (satisfaction, improvements).

C. Analysing problems and/or opportunities of the partnership

Next to the general impression of partnership formation, an analysis of the problems and opportunities facing them will be carried out, along with a prioritization of measures to implement solutions.

Measures for handling organisational problems.

From the list of problems which the survey has identified, it is the intention to formulate one (or more) appropriate solution(s) and to implement this with a selection of the members. Taking into account the pilot nature of the study it is important to allow for financial and technical feasibility in any solution mechanism and particularly the time restraints imposed in the planning scheme of the pilot.

Some potential measures are:

bringing existing partnerships and other private initiatives in contact with each other;
offering a handy and simple administrative package (in/outside the car);
economies of scale (regional/national).

The measure being considered has to be appropriate to the aims of sustainability of the partnership and lowering the threshold to potential members.

Setting up a carsharing scheme

The sharing of private cars is essential for setting up the pilot. This is a new element in comparison with most carsharing projects. The actual initiatives (like Call-a-Car, cars available on demand, Greenwheels etc.) are often based on the sharing of rented cars and

have a commercial character. The city of Delft was chosen as the location for the pilot project.

“Carsharing Delft” aims at obtaining insight into the feasibility of private carsharing systems and into the possibilities to start comparable initiatives which are directed at the sharing of private cars in other regions.

The task of the pilot is:

“The activities within the pilot are directed at increasing and stimulating private initiatives. This means on the one hand the improvement of the durability of the initiatives and on the other hand the lowering of the barrier for potential private carsharing initiatives.”

The formulation of the problem resulting from this is;

“Which problems can be solved for the promotion of the durability and development of existing private carsharing initiatives and which factors of success of existing initiatives can be used for the development of new initiatives and the increase of existing initiatives?”

Evaluating the scheme

After a period of about six months, an evaluation was carried out concerning the effect of the scheme. This evaluation is directed at the energy savings and effectiveness of the scheme. Simple questionnaires and interviews were sufficient to assess the positive and negative aspects and reactions of the measure. The principal aims of sustainability of the partnership and lowering the threshold to potential members are considered in the light of the effectiveness of the scheme.

2. EXISTING FEATURES OF PRIVATE CARSHARING

2.1 Introduction

In preparation of the implementation of a private carsharing project, research was done into existing private carsharing initiatives. In co-operation with the Carshare Bank (an organisation based in Culemborg) and the Foundation for Shared Car Use 130 people who had earlier asked the Foundation for information on small-scale private carsharing projects, were asked to participate in a survey. More than 60% of this group responded. It was found that 49 of these respondents were actually sharing a car with others.

The most important and most interesting results of this investigation are reflected concisely in this section. These results mainly refer to the characteristics of the private carsharer and to the factors determining success while starting a private carsharing initiative, matters that are of importance for the implementation of a successful project.

2.2 Profile of carsharers

The average age of carsharers was 44. Seventy percent of the respondents were between 30 and 50 years of age. Approximately 40% of respondents were members of a household

consisting of one or more persons while 22% were members of a household consisting of 5 or more persons.

Forty-six percent of those surveyed have a degree in higher vocational education (HBO). University and HBO together formed 70% of carsharers. The net annual income of nearly half of the respondents was higher than hfl.52,000 (25,000 ECU).

2.3 History of the carsharing initiative

Most carsharing initiatives are developed out of solidarity among friends, family and neighbours. Only 8% of carsharers did not know each other before starting the carsharing initiative. Nearly 80% of the respondents gave the high costs of a private car as a reason for sharing a car while 65% indicated that they were participating for environmental reasons.

2.4 Ownership and use of a car (before and after)

Sixty-six percent of the respondents owned a private car before starting the carsharing initiative. Seventy-four percent of these car owners drove between 10,000 and 20,000 km. per year. More than 50% used their car in the carsharing project while nearly 45% sold their private car. Only a very small number of car owners continued to use their own car next to the shared car.

About half of the carsharers used the shared car for 0-10,000 km. per year and the other half used it for 10,000-20,000km per year. The shared car was mostly used 2 or 3 times a week. Recreational trips and social visits seem to have been the main motives for using the shared car.

2.5 The living situation of carsharers

Shops selling daily necessities were on average situated 1 kilometre away from the house address. Dividing this in categories gives the following picture.

Distance to shops selling daily necessities	Amount	%
< 500 metres	18	36%
500 - 1000 metres	12	24%
1000 - 2000 metres	11	22%
> 2000 metres	9	18%
Total	50	100%

Parking situation in the home place

Parking possibilities in the home place have been rated moderate to very good by more than 73% (parking in their own street or on private property). None of the respondents rated the parking possibilities as bad or very bad.

Public transport in the home place

Ninety-six percent had public transport at their disposal in the near vicinity. The average distance between the house address and the nearest bus or tram stop measured about 420 metres. Sixty-two percent of the respondents lived within a radius of 400 metres from a bus or tram stop. No less than 42% stated that the bus or tram stopped more than twice an hour near their house.

More than 50% of the respondents rated public transport in his/her home place as adequate to very good. Eight percent reported that public transport in their environment was bad or even very bad.

Geographical distance between carsharers

Thirty percent of members lived within a radius of 100 m. of each other, 50% lived within a radius of 500 m. and 60% within a radius of 100 m. The greater part of the carsharers (almost 70%) reached the shared car by foot. Twenty-four percent used a bicycle to get to the shared car.

2.6 Employment situation of carsharers

Seventy percent of the carsharers were in paid employment and 54% worked more than 25 hours a week. The average distance between house and work place was 12 kilometres. More than 50% lived within a radius of 10 kilometres from their work. The fact that the category "bicycle/foot" as a means to get from home to work is highly represented is probably due to this short distance. The shared car was used by 15% to commute between work and home.

2.7 Improvements and success factors

More than 85% of the carsharers had little need to modify the amount of members or cars within the carsharing project. Ten percent would have liked to have more members joining the project while the amount of cars remained the same. More than 60% foresaw that membership would remain in a private circle.

Respondents indicated that improvements could be made concerning insurance and maintenance and cleaning schedules.

In general carsharers found that being able to come to certain agreements was one of the most important conditions necessary for the success of a carsharing initiative. Other conditions were mentioned as necessary for success in private carsharing were:

- members have to live near each other
- the costs have to be kept low

- agreements have to be put in writing
- the number of members has to stay restricted
- the system cannot be anonymous

The respondents suggested the following improvements concerning the carsharing project, the most important of which were:

- help at finding participants
- help at coming to agreements
- insurance

3. PILOT PROJECT DELFT

3.1 Introduction

The investigation into private carsharing initiatives provided a picture of the history, organisation and need for improvements of the existing carsharing initiatives. On the basis of these data, an attempt was made within the project to on the one hand give an answer to these needs and on the other hand get new carsharing initiatives off the ground. The sharing of private cars was of utmost importance in the design of the project.

The existing initiatives (Call a Car, Car available on demand, etc.) were based on use of rental cars, while the new project stressed the use of private vehicles. Compared to these commercial rental carsharing initiatives, the private carsharing initiative has a number of advantages:

- the car remains available in the home place
- costs, moreover, can be even lower as the initiative is not commercial
- a company with parking space to park the rented cars is not needed
- one does not need other means of transport to get to the car
- the barrier for former carowners to share a car is estimated lower since the car remains "private property" but is used much more efficiently and is therefore less costly.

In addition to this, the private carsharing initiative has a number of disadvantages compared to the rental initiative:

- less attractive for people who like to drive new cars
- the responsibility for repairs and maintenance remains, although to a lesser degree
- insurance has to be taken care of
- administration must be done personally

In view of the advantages and the non-commercial character of private carsharing it is advisable to bring this form of carsharing to the attention of private individuals and especially to the attention of local authorities.

The city of Delft has been chosen as location for the pilot project. There are different reasons for this decision. Delft is a medium-sized city with a good public transport and bicycle system. Just like in other cities there are not enough parking facilities in the town centre to meet the demand. This demand can possibly be reduced by carsharing. With carsharing a more conscious choice of way of transport is also stimulated. The town

council is a supporter of this project in its city. In addition, the Dutch partner Diepens en Okkema is based in Delft. The office already has many connections with interested organisations in the area.

3.2 Preparations

Carsharing (private and commercial) in Delft has hardly get off the ground yet. Therefore the effects of "Carsharing Delft" can well be examined. However, it also means that the concept carsharing is rather unknown in Delft. A good communication around this project is very important.

The setup of the pilot is based on three stages:

- technical
- promotion
- review and evaluation

3.2.1 Technical stage

The first step in the development of "Carsharing Delft" was an examination of how the system should be designed. Matters which could be a possible barrier for potential carsharers are emphasised. In order to let people share cars these barriers must be removed as much as possible and advantages of carsharing must be indicated. On the basis of conversations with relevant organisations, a national survey amongst carsharers and a small literary study it can be seen that the following aspects are important:

1. to commit agreements to a contract
2. expenses
3. insurance
4. administration
5. the matching of participants

Many carsharers have a need to commit agreements with regard to use, expenses, way of payment, settlement of claims etc. to a contract. For this purpose the "Stichting Gedeeld Autogebruik" has developed a pair of contract models which can meet these needs. Besides a couple of contracts have been obtained by way of the "Deelautobank" in Culemborg. This organisation has supported some carsharing initiatives in its town. The parts of the contract serve as a "steppingstone" for the choices which the carsharers have to make.

In carsharing there are expenses involved. Fixed and variable costs can be paid by kilometre and/or by shift/hour. Besides it is possible to estimate the cost in advance and settle this afterwards with the actual cost. All these things strongly depend on the wishes of the users and to what extent the "shared car" is used. On the basis of a cost accounting from the "ANWB" and a car cost software package an arithmetic model has been drawn up with which a reasonably reliable estimate of the cost of the "shared car" can be made. It is also possible to estimate the saving with regard to the actual situation.

Delft Council was asked to exempt carsharers from parking licences in the town centre. This could yield a saving of Hfl. 180.- per year; however the Council did not want to make an exception with regard to the parking regulations.

An important barrier with regard to carsharing is car insurance. Within the actual insurances carsharing is possible. However in case of damage caused by one of the participants, the person who took out the insurance with the insurance company is liable. Therefore the "Deelautobank" in Culemborg has concluded an insurance on the basis of car use instead of car possession. Drivers are liable for the damage caused by them and this leads to a reduction in the number of years driven without an accident. The contributions per year are fixed and there is no increase or decrease with regard to the no claim bonus. Every driver builds up the number of years driven without an accident. Contacts with the "Delfts Assurantie Kantoor (DAK)" made clear that such insurance for this project is only possible when there is a large number of carsharers. The contributions are much higher than for actual insurance. Hence the reason to commit agreements with regard to insurance and claim settlement (including no claim reduction) to the carsharing contracts in order to prevent problems. However, when there is a need amongst carsharers for a special carshare insurance the DAK and insurers will be contacted again. Anyway the DAK is willing to select the most inexpensive car insurance for the carsharers.

For the administration of carsharing a form has been drawn up on which carsharers can enter kilometres and expenses. Depending on the wishes of the carsharers our office can help with the administration. The information can also easily be used for the evaluation of the figures of carsharing. Initially the financial administration is the responsibility of the carsharer.

To share a car a person who has a car must be matched with someone who does not have a car. Both parties have their own needs with regard to the use of the shared car and the expenses for this. These needs should be matched to one another as much as possible. The previous points show that carsharing is custom-made. For this a "custom-made form" has been drawn up to which potential carsharers can input their needs and information. On the basis of this form groups of carsharers can be formed and participants can be encouraged to become involved in carsharing.

3.2.2 Promotion stage

To start the carsharing project in Delft advantages of the "shared car" had to be promoted. In addition it is important to explain the role as mediator of Diepens en Okkema in this project. At the start and during the first period of the implementation of the pilot, support for the process by way of the right promotion at the right time is very valuable.

Promotion took place through:

- Article and adverts in "Stadskrant Delft"
- Information evening and letter to Papaver members
- Letter via "Stichting Gedeeld Autogebruik"
- Information on the WWW site of "Stichting Gedeeld Autogebruik"

In the free local paper "Stadskrant Delft" (circulation 47,500 copies) an article was placed in consultation with the Council in February 1997. In this article the project "Carsharing

Delft” was described. Advantages of carsharing and the role of Diepens en Okkema were indicated. In January 1997 an information evening with regard to shared car use was given to Papaver (environmental organisation) members. As a result of this evening it had been decided to send the approximately 200 members of this organisation a letter containing information with regard to the project “Carsharing Delft”. The members can be considered as potential carsharers. 50 people in Delft who had contacted the “Stichting Gedeeld Autogebruik” were sent letters with regard to the pilot project. In addition, the article from the city newspaper and a contact notice were placed on the web site of the Foundation. People who are interested can contact Diepens en Okkema (via e-mail, fax, telephone or per post) as a result of the information on the web site.

The promotional activities caused people who are interested as a result of the article, the letter via “Papaver” and “Stichting Gedeeld Autogebruik” getting in touch with Diepens en Okkema. Potential members filled in their requirements on the “custom-made form”.

3.2.3 Review and evaluation stage

This stage consisted of a number of activities:

- interviews and inquiries
- analysis of administration information
- evaluation of the promotional activities
- evaluation of the organisation of the project

On the basis of the above mentioned activities it must become clear what the chance of success is to start and further develop carsharing initiatives in other Dutch communities. It also evaluated whether the chosen approach of the project “Carsharing Delft” is the correct one or whether it should be adjusted. In this stage the effects of carsharing with regard to mobility and environment were also examined. It is important for the examination that the users register the number of kilometres driven per drive with the “shared car”. On the “custom-made form” the participants indicate their mobility before and after participation in the carsharing project. Besides this registration it is possible to show the situation before and the situation after the project at the beginning of carsharing and at the end of the examination (October 1996) by way of inquiries/interviews.

People who volunteered for the project “Carsharing Delft” make up the research population. A difference can be made between the people who actually participated in carsharing and the people who did not really participate (unable to match, choose Call-a-car Delft etc). For this last group it is important to find out why they did not want to participate in carsharing. For the first group personal experiences with carsharing are important. It must become clear to what extent the chosen approach has encouraged participants in carsharing and what the problem solving power of the project organisation is. This information was used for the evaluation report.

3.3 Two systems in Delft

3.3.1 Bottom-up approach

Diepens en Okkema chose an approach based on the bottom-up concept for the inhabitants of Delft. This meant that instead of introducing a product on the market and thereby creating a demand, they chose to let the demand determine the supply. Practically, this meant that the inhabitants of Delft were informed through a local newspaper of the various possibilities of carsharing for both car owners and people not owning a car.

It became clear from the wishes of car owners that they did want to share a car, provided this car was to be shared with only one other person/household. This meant that, apart from geographical barriers, a group of people who did not own a car (mainly living in the city centre) could not be paired with a car owner. A suitable alternative was sought for this group of non-car owners. The possibilities offered to those interested were split into two carsharing schemes:

Private Carsharing and Centre-Car (a neighbourhood car)

3.3.2 Private Carsharing

Private carsharing involves one or more persons who together share a car, which is either owned by one of the participants or by all the participants collectively. This form of carsharing often originates from agreements between friends, family or acquaintances. It was attempted to stimulate private carsharing in Delft by bringing together and advising car owners and non-car owners. First of all, personal information of those interested was collected. This included important data such as house address, ownership of a car, brand and type of car and estimates of the desired use of the car.

Interested people were then, under the supervision of Diepens en Okkema, paired and advised while coming to agreements concerning:

- settling the costs
- administration
- insurance
- conditions of use
- maintenance
- ownership of the car

3.3.3 Description of the Centre-Car system

General Description

From 1 September 1997 a car was made available for four households situated near the city centre by a local car rental company/ car dealer. A small safe had been placed at a central point in the vicinity of the car. It contained a logbook with reservations, the car keys and a simplified map on which one could indicate where the car had been left after use. The usage of the car was paid for on the basis of a time rate and a kilometre rate. The car rental company checked the data from the logbook and the car on a monthly basis.

Logbook reservations

The booking or reservation of the car was noted down in a logbook. This book was placed in a small safe, which was situated at a central point in the city centre near the car and the home addresses of the households. The participants could indicate in the logbook between which times (and dates) they wanted to use the car. A maximum period of usage of three days applied for the Centre-Car (a “day” ran from 6.00am to 6.00am).

Parking space

The car was provided with a parking permit for the city centre. The car was to be parked as near to the safe as possible. After use, the participants had to indicate on the map provided where the car was parked.

Refuelling the car

Participants in Delft could refuel the car on an expense account of the car rental company at any SHELL station. If it was impossible to pay for the fuel with the card provided one could refuel at one’s own expense. Fuel receipts needed to be saved and handed in to the car-rental company. These costs were later deducted from the monthly invoice.

Alternatives for when the Centre-Car was booked

If the car was already booked carsharers could contact each other directly for possible alterations of reservations.

The car rental company offered the possibility of a replacement car at all times. This implied, however, that the car needed to be collected at the establishment of the car rental company. The tariffs for the alternative car were similar to the tariffs for the original Centre-Car provided that the cars were similar in size, type and design. If the car could not be picked up it could be delivered by the car rental company for a fee of fl.12.50 (6 ecu) per occasion.

A maximum period of usage of three days applied for the Centre-Car. If a longer period of usage was desired, a car could be rented from the car rental company. In the latter case, a “carsharing discount” of 30% applied to the existing rental tariffs.

Damage to the car

The car was insured by the car rental company. In the case of damage caused by a member a maximum fine of fl.300 (150 ecu) applied. If damage was caused by a third party when the car was not in use the costs were divided amongst the participating households and paid to the car rental company.

Periods of use and tariffs

As a basis for the period of usage and tariffs time spans of three hours applied. The costs were based on time used and kilometres driven. Per time span a time tariff of fl.12.50 applied with a maximum of fl.39.00 per day (6.00am-6.00am). Furthermore, a kilometre tariff of fl.0.27 (including fuel) applied.

4. PILOT EVALUATION

4.1 Introduction

In this chapter certain aspects of the Delft project will be evaluated. On the one hand, this entails a process evaluation and on the other hand it entails an evaluation of two carsharing systems. The users, Diepens en Okkema and the car rental company were used for this evaluation.

4.2 Reactions

4.2.1 Effects of the promotional activities

The target group was approached and informed about carsharing in various ways:

- Articles and adverts in local newspaper February & August 1997
- Direct mailing February 1997
- WWW site March 1997
- Information meeting July 1997
- Radio interviews May & August 1997

In the end, 71 inhabitants of Delft responded. A detailed form was sent to all respondents on which one could indicate wishes and characteristics regarding carsharing. Forty-four households applied for carsharing in Delft via this form. This group consisted of 12 car owners (27%) and 32 households who did not own a car (73%).

It proved to be difficult to pair people who were unknown to each other since they were hesitant to share their car with others. A lot of time and energy was spent to come to a successful match, with few results. A vital link was the information meeting. The involvement of potential carsharers proved to increase after they were introduced to each other during this meeting. An important part of the carsharing initiative shifted to the potential carsharers themselves. Because of this Diepens en Okkema were better able to fulfil its role as a “broker” more efficiently. The ideas for the two systems in Delft came into existence during this fruitful meeting.

4.2.2 Profile and wishes of those interested

A quarter of those interested were members of a household consisting of two persons and no children. It was found that one third were a member of a single household.

Most of those interested indicated that they would not be able to set fixed dates and times on which they wanted to use the shared car. The desired use of the shared car varied between 500 and 20,000 km per year while most potential carsharers indicated a usage between 5,000 and 10,000 km per year. Only 5 % were also willing to share the ownership of the car.

More than half of those interested did not indicate a preference for the number of households to share the car with. Thirty-two percent wished to find a carsharing partner living in the same district.

4.3 Private carsharing

4.3.1 Matching

Of all interested 7 households started sharing a car using the private system.

1. 2 households were already sharing a car. They applied for a meeting at Diepens en Okkema in order to set down their oral agreements in writing.
2. 2 further households had been sharing a car since 1 July 1997. Both households filled in the detailed form on the basis of which Diepens en Okkema estimated the kilometre price to be fl.0.35. Their former car insurance (WA+) was turned into an All-risk insurance. One household was to pay the other household the additional costs of this insurance (a fixed amount of fl.65 a month). Their agreements were set down in a contract.
3. 3 other households had been sharing a car since July 1997. The kilometre price was set at fl. 0.30 by mutual agreement.

4.3.2 Usage

Data based on usage of the car by the several carsharing combinations described in 4.3.1 above were from the very start. The periods in which data were recorded were not the same for every group. All groups drove more than 1,200 kilometres during the first month while during the following months usage decreased. The smallest group consisting of two households, had a relatively high usage.

While drawing a distinction in the usage of the shared car between the car owner and the other participants a number of conclusions could be drawn. When looking at the two groups it can be seen the car owner used the car more often (more trips) but that the average distance per trip smaller than that of the non-car owners. A possible reason for this can be found in the fact that the non-car owners used the car more selectively and were more willing to combine trips.

4.4 Centre-car

4.4.1 Profile of the users

The Centre-Car system started off with 4 households. All households contained two working members (6 part time/1 full time) and in 3 households these couples had one

child. The couple in the fourth household did not have children. The age of the participants varied between 31 and 39. All participants were highly educated (HBO/University). The household income of all participants was between fl.65,000 and fl.104,000 per year. Almost all participants went to work by bicycle or foot. For most, the distance between their house address and work was between 5 and 10 kilometres.

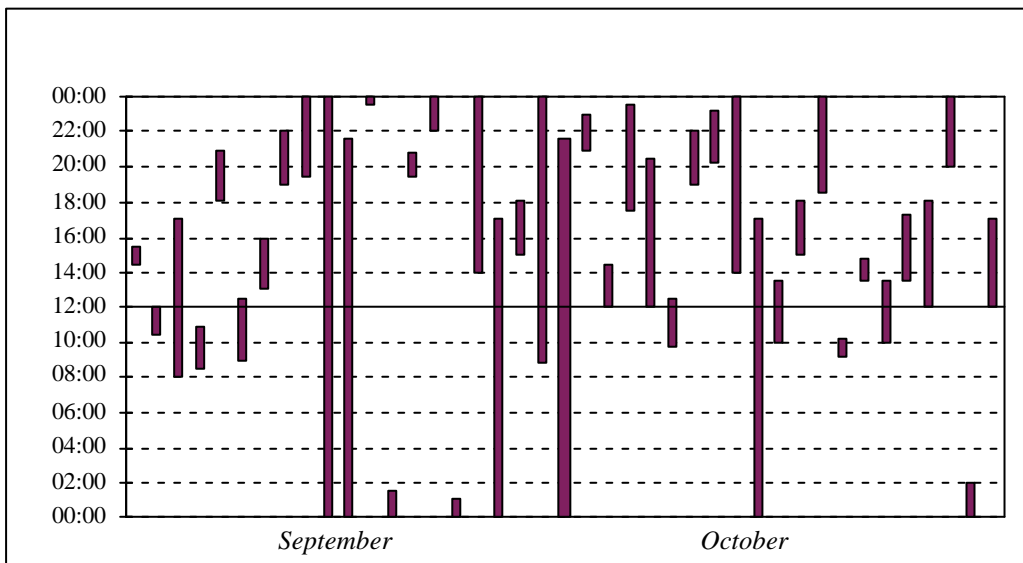
4.4.2 Usage of the shared car

As far as possible the usage of the car over two months (September/October) was analysed. The time and kilometre data are presented below:

Month	kilometres	time-blocks (3hrs.)	Income Car-rental Company
September 1997	961	24	225 ecu
October 1997	2086	39	500 ecu

September was not a successful month for the car rental company since the income generated was too low. October, however, compensated for this.

The car occupancy (number of hours used/24 hours a day) was still very low: 10% in September and 16% in October. From the trip data the days and times of car use were deduced. These findings are reflected in the figure below.



The Centre-Car was mainly used in (late) afternoons and was particularly used during weekends. The participants' motives for using the Centre-Car were especially related to social visits, recreation and sport.

4.4.3 Experiences with and future of the Centre-Car

The experiences with the systems were evaluated after two months with both the participants and the car rental company. The following issues were raised:

- Participants considered the Centre-Car to be “their own car”.
- A bicycle was often used to reach the car and this did not cause any problems.
- A fixed parking place for the car appeared to be very important. Participants had already found a fixed parking place themselves.
- In many instances the car had been used spontaneously when participants found that it was not yet booked. This use of the car is a big advantage over existing rental systems because it is much more flexible.
- Making appointments and agreements with each other was experienced as a very positive process. This made it easy to modify reservations. This way, the system was not anonymous and a lot of goodwill was generated as a result.
- Participants were conscientious about the use of the car, as reflected in the length of use and the willingness to combine trips.
- The system was based on trust between participants and the car rental company since registration was not done by a computer and reservations were noted down in a logbook.
- Both the car rental company and the participants wanted the system to remain in use. The group of users could still be extended but had to stay small and personal.
- The car rental company preferred to protect the small-scale aspect of the system. Potential expansion would therefore initially take place outside the existing system (other car, other participants). The optimal combination could, depending on the usage pattern of the participants per group, be put together.

4.5 Conclusions

Although concrete initiatives in Delft did not abound, a positive image of the possibilities of carsharing in Delft had arisen. The experiences are summarised below:

- Due to the mediation by the organisers of the project it appeared to be possible to have strangers (not family, neighbours or friends) share a car.
- ‘If one sheep leaps over the ditch the rest will follow’. Expectations were that promotion and attention directed towards concrete examples of existing carsharing initiatives would lead to an increase in the number of people interested in carsharing (and actual carsharers).
- Some of those interested were at first reluctant to start sharing a car but, due to the positive experiences of others, joined the project.
- From the data it was clear that especially highly educated people in their forties, young families and people who were expecting an addition to the family, applied for the carsharing project. More people applied who did not own a car than those who did. Many households seemed to postpone the purchase of a new (first or second) car because of the possibilities of carsharing.
- In order to improve the concept of carsharing, an organisation is needed that provides information and matches the various households with the various carsharing organisations. This organiser has to find a way to bring the various parties together and this is a very labour intensive process.
- At first, a commercial carsharing organisation will not be feasible/profitable. The product is still fairly unknown and it takes a lot of time to convince people to actually start sharing a car.