Car sharing means more travel with less pollution

Eco-efficient services: Stop selling cars; sell kilometres instead

by JOOST VAN KASTEREN

The product, or hardware if you will, still lies at the heart of the production and consumption chain, resulting in a significant environmental impact. Basing design on applied value instead of the product itself can offer substantial ecological advantages. Ir. Rens Meijkamp tested the eco-efficient service theory by examining car sharing schemes, commercial ventures which make rental cars available to their customers on a twenty-four hour seven days a week basis, thus providing an alternative to privately owned motor vehicles. The results? The potential environmental benefits of car sharing (which should not be confused with car pooling) are enormous: the environmental impact of car sharers is 40 percent less than that of the average Dutch household, at least insofar as mobility is concerned. If car sharing were to continue to develop at the current rate, the total environmental impact resulting from mobility could be reduced by 30 percent in the year 2010. Even so, it remains to be seen whether that will be enough to create a sustainable society.

Car sharing has been around for quite some time, as Rens Meijkamp, who graduated as an industrial designer, observes in his thesis. As far back as the nineteen-thirties, garage owners would keep cars at the

Information and communication technology plays a major role in the car sharing system. All organization members have a chip card for identification purposes. The cars are fitted with communication equipment using GSM technology.
disposal of people who wished to use a car, but did not have the means to purchase one. The customer paid for the distance travelled and for the fuel consumed. Over the years the hired car, as one form of car sharing, has gained a permanent place within the mobility spectrum. Car sharing has also been practised on an informal basis for many years. Within the same family, for example, a car may be used by any member in the possession of a driving license. In the nineteen-seventies, we see the phenomenon of several families buying a single car together to minimize the cost. Car sharing in the form researched by Rens Meijkamp for his doctoral thesis started in the early nineteen-nineties, in particular in Switzerland and Germany.

In the Netherlands, «Huur-op-Maat» (Rent-to-Size) was the first organization to offer car sharing, in 1995. The concept differs from informal car sharing in that it has a commercial basis. It is also different from «normal» car rental schemes in that the shared car must be able to offer an alternative to a privately owned vehicle. This it can do. Thanks to information and communication technology (ict), the shared car can be more flexible and cheaper to use than a «normal» rented car. The use of chip cards combined with automatic billing on a distance travelled basis can dramatically reduce transaction costs. In addition, a shared car need not be parked in a special garage, but can be collected from, and returned to, a parking space nearby.

Nowadays many organizations offer car sharing schemes. Well-known names include Greenwheels, AutodelenAmsterdam, Call-a-car, Auto-op-Afroep (car-on-demand) and AutoAbonnee. The web site of the «Stichting Gedeeld Autogebruik» (Car Sharing Foundation), www.autodate.nl, shows the number and location of active car sharing organizations for various towns. The number of trading points has grown to over 500. In 1999 the number of participants was in the region of 25,000. The government also promotes the concept of car sharing. It does so directly by supporting initiatives through an advertising campaign, and by making parking spaces available for shared cars. Car sharing is stimulated indirectly by reducing the number of parking spaces in town centres and increasing parking fees. At a recent conference, the Dutch minister of transport announced a target of 200,000 car sharers for the year 2010.

Washing machines
‘Car sharing has always been referred to as an example of an eco- efficient service,’ Meijkamp says, ‘an innovation strategy that was developed during the early nineteen-nineties in order to reduce the environmental impact of consumerism. The core of an eco-efficient service is that instead of selling the product, i.e. the hardware, you offer the applied value of the product for sale. In other words, you don’t sell cars, you sell kilometres. And instead of selling washing machines, you sell clean clothes. The underlying concept is that the value to the consumer lies not so much in the ownership of the product as its use. The product itself is no more than an instrument.’ [See the box on eco-

Behind the windscreen of the shared car, a wireless chip card reader is fitted which communicates with the central administration computer by means of GSM communication equipment. Once someone has requested the car (by telephone) and a reservation has been issued, the car can be opened only if that person’s chip card is held near the reader.

Shared cars are parked not only along the streets, but also in special parking locations in car parks, as in the theatre car park under the Doelenplein in Rotterdam.
According to proponents of the eco-efficient service strategy, shifting the focus from the product itself to the applied value will automatically yield a reduced environmental impact. On the one hand this is because it is in the interests of the provider of the services to keep the cost of a commercial unit, e.g. a car kilometre, as low as possible. In other words, within a certain class of car, he will opt for the vehicle that offers the lowest running costs. Since fuel is a major factor in this equation, the provider will tend to opt for a fuel-efficient car. He may even install an economizer to stimulate his customers to save fuel. On the other hand the environmental impact per service unit may be reduced by the fact that consumers change their behaviour, in this case their use of mobility.

Meijkamp: ‘In a car sharing scheme, all the parts that make up the running costs of a car (including initial investment, insurance, and maintenance) have been made variable and included in the cost per kilometre. This offers a much better basis for comparison with other types of transport, such as trains or buses, than is currently the case. People tend to look only at the fuel cost, since they will have spent the money to cover the other costs anyway, and so a train ticket will practically always appear more expensive. If you include all the other costs in the comparison however, travel by rail or bus is likely to turn out cheaper.’

**Trade-ins**

So far for the theory. The question Meijkamp asked himself was whether eco-efficient services will actually result in a substantial reduction in environmental pollution. As far as the service providers themselves go, the results are less than spectacular. Compared with a kilometre in a «normal» car, the environmental impact of one kilometre is reduced by 14 percent. The gain is mostly the result of the fact that the provider tends to opt for lighter, more fuel-efficient cars. According to Meijkamp, the environmental benefits could be greatly enhanced if service providers were to focus even more on efficiency. For example, the current practice is to trade in cars after two years, just like normal rental cars. Meijkamp theorizes that in the long term, special cars could be built for car sharing. These cars would be designed to minimize the direct costs of fuel and maintenance.

**Survey**

The best way to reduce environmental impact is by influencing car sharers’ use. A survey has shown that on average, the number of kilometres travelled by car drops by one third after people start car sharing. Most of the difference is contributed by people who previously ran their own car. These users see their car mileage drop by no less than two thirds, from an average of 13,380 kilometres to 4,730 kilometres per year. This is not to say that these people became less mobile. On the contrary, the total number of trips even increased by 13%, but the group now uses other forms of transport to get around, including bicycles (+ 9%), trains (+ 25%).
and buses (+ 25%). Overall, the reduction in environmental impact is approximately 40 percent compared with the average Dutch household. Compared with the previous use of private transport by the car sharing group the environmental benefits are slightly less pronounced (centre bar). This is because the motorists in question were already accustomed to weighing the pros and cons of travelling by car, according to Meijkamp. In addition to reducing the emission of substances that contribute to global warming and acidification, car sharing also results in extra space, since the need for parking spaces is reduced. In the Netherlands, there are 887 cars per 1000 households, each of which takes up 12.5 square metres of space, making a grand total of over 11,000 square metres, or more than two soccer pitches. Car sharing reduces the number of cars to just over 200 per 1000 households, which results in additional useful space of 8500 square metres per 1000 households.

Eighteen months ago, Meijkamp, together with fellow industrial designer Ir. Jelle Zijlstra, won the Autodate Concept Competition with a plan to increase space by introducing car sharing in residential areas. They distinguished between three different scale levels for car sharing: «small», the compact, fuel-efficient car for short distances, to be available around the corner; «large», car facilities at public transport intersections where car sharers can hire a car to bridge the distance between intersection and destination; and «medium», a neighbourhood facility where you can hire a car for special purposes such as holidays and the transport of goods. For the Leidsche Rijn residential area near Utrecht the concept would result in over 90,000 square metres of extra space, which, according to the designers, could be used as a green lung, an ecological zone, or for recreational facilities.

**Snags**

All in all, the environmental benefits of car sharing can be substantial. Meijkamp has prepared a scenario based on the assumption that the number of car sharing participants will increase from the current number of 25,000 to 400,000 in 2010. If the service providers also lend a hand and manage to increase the environmental gain per car kilometre from 14 to 35 percent, the emission of co2 for instance will be reduced substantially. In his thesis Meijkamp mentions a reduction of 0.34 megatons of co2 per year, which is over 12 percent of the Dutch traffic emission reduction target for co2.

These figures appear to confirm the assumption that eco-efficient services will contribute to reducing environmental pollution. Even so, Meijkamp can spot a few snags. To begin with, car sharing practice has shown that service providers do not automatically go for maximum environmental efficiency. For instance, in the Netherlands, shared cars are still being traded in after two years because this proves more economical as a result of reduced maintenance costs.

In the second place, eco-efficient services are based on a highly functional product concept; you don’t own a car,
you use car kilometres. In real life however, it cannot be
denied that products, and cars in particular, represent a
certain emotional value which cannot be compensated
by money alone. This is why, according to Meijkamp,
other advantages should be emphasized, such as ease of
use (no parking problems), and added comfort (a larger
car to go on holiday with). Even so, many people will
refuse to abandon their own car.
A third and major snag is that eco-efficient services do
not impose a limit on the number of services used.
Although car sharing schemes will manage to reduce the
number of car kilometres, mobility in general will
remain the same, or will even increase. For this reason,
the contribution of eco-efficient services towards a
sustainable society will probably remain modest,
according to Meijkamp. A fourfold improvement in
efficiency is improbable, let alone ten or twenty times
the current efficiency, as has been suggested. Even so,
considering the environmental benefits to be reaped
from car sharing, the contribution, however low, is not
to be scoffed at.

Acceptance
Dr. Ir. R. Meijkamp looked at the acceptance of car
sharing. To what extent will car owners be prepared to
exchange their beloved jalopy for a more or less
anonymous shared vehicle? Meijkamp distinguishes two
aspects. In the first place, the factors that play a role in
the decision to adopt the car sharing concept, and in the
second place, the prerequisites for the service if car
sharing is to remain a long-term option. To find an
answer to these questions, Meijkamp devised a
questionnaire which was presented to 3300 households
in Amsterdam, Rotterdam, and Haarlem.
The households were not picked at random. The
subjects had shown their interest in car sharing by
requesting information from one of four car sharing
companies (two in Amsterdam, one in Rotterdam, and
one in Haarlem).
Some of the households had decided to use a car
sharing service (the adopters), some had not (the non-
adopters). Of the adopters, some had (previously)
owned a car, whereas others had never owned a car of
their own.

Motive
The main motive for participating in car sharing, at
least among former car owners, is cost reduction. The
main Dutch consumer organization has calculated that
an average family, driving 9,000 kilometres a year in a
small saloon, can save over US $ 150 a month by
switching to car sharing. Other considerations, such as
environmental pollution and parking problems, also
play a role, but the main argument that wins people
over is the money they can save.
‘Of course, for this to work, people need to be able to
see how much it costs to run their own car’, Meijkamp
says. This isn’t a question of knowledge alone. Many
people find it difficult to balance the pros and cons of
owning a car in a rational way. Many people believe
that the monthly running costs data published by

The use of very fuel-efficient cars greatly affects the
environmental balance of car sharing. The petrol version
of the Volkswagen Lupo offers a fuel consumption of 5.8 l/100
km, and even less in the diesel variant, only 3 l/100 km.
During a number of tests, a petrol-driven prototype of the
SMILE, a concept car developed by Greenpeace, needed
only 3.3 l/100 km, considerably less than the Peugeot 106,
which at 6.2 l/100 km uses slightly more than the Lupo.
consumer organizations and automobile associations do not apply in their particular case.

In addition to cost, the availability and service level of car sharing are factors that play a major role in the decision whether or not to switch. The cars should be available at a short distance from your house, and you should be able to take a car whenever you need it. Most people don’t object to the need to make a reservation, as long as it doesn’t have to be done days in advance.

Meijkamp: 'In fact, car sharing will have to be very much like owning a car if people are to make the switch.'

His research also shows that most of the users are satisfied with the quality of the service. Ninety percent of the respondents say the service is “good” to “very good”. Their main point of interest is the service experience. People don’t really mind what type of car they get. Meijkamp has found, as long as it is clean and reliable. The same goes for the location where the car is to be collected. Not only should it be nearby, it should also be clean. As far as the service offered by the company staff goes, the customer needs to feel that he is being taken seriously. And, not only should the car be reliable, the organization itself should be so, too. In other words, the car hire conditions must be unambiguous, and there should be no need for discussion about the bill.

Eco-efficient services

The following formula was defined in the nineteen-seventies by Ehrlich and Holdren to determine the environmental impact of production and consumption:

$$EI = P \times US \times EM$$

In this equation, EI stands for Environmental Impact; P for Population; US for Units of Service; and EM for Environmental Metabolism, i.e. the environmental effects per unit of service. The formula shows that two components in particular determine the quantity of the environmental impact, i.e. the behaviour of consumers, which is expressed in the number of services used, and the (environmental) quality of the technical system providing the services. In order to reduce the environmental impact, one option would be to reduce the P factor, i.e. reduce the population. Ehrlich himself, together with his wife Anne, was an ardent proponent of this approach, but active population control policies tend to meet with social opposition. A second option is to reduce the number of units of service by changing consumers’ behaviour, either by means of legislation, or through information. Former minister Pieter Winsemius used to refer to the carrot (subsidization), the sermon (information), and the whip (legislation). In some cases, established behaviour can be successfully changed (as with the separate collection of waste), but in other cases, including motorized mobility, attempts to do so have had little or no effect.

The third factor involves the environmental effects per unit of service, i.e. the technical system, with a marked emphasis on a reduction of the environmental impact of both process and product.

Eco-efficient services go one step further, in that instead
of trying to optimise the product itself through technological innovation, you try to improve the environmental efficiency of the product’s function. In the case of motorized transport the emphasis is not on the development of a clean engine, but on the reduction of the environmental impact per car kilometre. Eco-efficient services provide a major impulse for innovation. And although technical innovations form a natural part of the equation, the emphasis is on innovating the way in which a function is provided.

Meijkamp: ‘A major difference between a product and a service is that you can produce a product in a central location and distribute it from there, whereas a service cannot be produced in advance, but has to be supplied at the moment the customer wants it. This is why eco-efficient service development is concerned mainly with the design of service organizations.’

Car sharing schemes have been available in the Netherlands since 1995. A number of providers are developing their services into a common national network. The picture shows a Greenwheels parking location in The Hague. The Greenwheels organization runs 160 cars (Peugeot 106). Car sharing parking locations are located both at public transport intersections and in residential areas.

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