# From routine choice to rational decision making between mobility alternatives

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# Abstract

The own car being used both frequently and satisfyingly, people soon develop car-use routines: Activating a certain travel goal leads to the automatic generation of the car as a behavioral response. Other mobility alternatives principally being at a person's disposal are not taken into consideration for use anymore. On the one hand, such routines are helpful since they avoid cognitive overload. On the other hand, they have fatal effects on the perception and adoption of ecologically promising mobility alternatives: Such options are largely ignored, and if they are nevertheless perceived, no evaluation with respect to own needs and desires takes place. The political aim of inducing behavior change by promoting the use of ecological innovations is thus undermined.

A retrospective qualitative study (interviews and group discussions using the grounded theory approach) with 39 participants of two Swiss car-sharing organizations shows that car owners indeed first had to undergo a break-through of their car-use routines before they became aware of the car-sharing offer and took it into consideration as an own behavioral alternative. Triggering events for such a break-through were changes in a person's life situation or her outer mobility conditions which led to a change in her mobility requirements, opportunities or abilities. I.e., the own car either *could* not be used anymore or its use was less and less *wanted* so that the need for new mobility options increased. After this change from a routine to a conscious, rational decision-making state, the adoption of car sharing depended on actual mobility needs as well as personal attitudes and values. Those factors, however, had been insignificant under strong car-use routines.

After an empirically-based theoretical modeling of this process, a quantitative questionnaire was distributed to 655 Swiss mobility participants who had either joined a car sharing-organization just a few weeks before the investigation, only recently had asked for information on car sharing, or who generally would have had access to car sharing, but didn't show interest in joining it jet (i.e., a random sample out of the urban, German-speaking Swiss population). The results underline the importance of significant and/or cumulative-gradual changes in the mobility-relevant decision-making context for weakening car-use routines and opening the way for conscious, rational decision-making. At the same time, by comparing the new car sharing users to the other population samples, a detailed mobility and attitudinal profile of today's car-sharing adopters could be drawn.

Besides theoretical implications, changes in the mobility-relevant decision-making context and their subsequent break-through of car-use routines are practically relevant. Persons responsible in marketing and policy making should intervene in moments consumers are most open to rational arguments and a variety of behavioral alternatives. Concomitantly, technology development should more strongly take routine behavior into account and look for new, ecologically sound behavioral options that can be used in a routine manner but nevertheless set incentives for behavioral change.

## Keywords

Routine choice – rational decision making – car sharing – 3rd Swiss Transport Research Conference – STRC 2003 – Monte Verità

# 1. Introduction

In western societies, daily travel behaviour predominated by the use of privately owned cars causes significant environmental problems (e.g. Greenpeace, 1991; Vester, 1995; BUWAL 1995, 2001). Behaviour changes are urgently needed (e.g. Harborth, 1993; Midden & Bartels, 1994; Michaelis, 1998). Most measures to stop the increase in car ownership and use, however, were nothing but a drop in the ocean. On a global level, the car is gaining more and more ground (e.g. Haaf, 1991; Hauchler et al., 1997; ARE & BfS, 2001). Besides classical political push measures to restrict car use (e.g. tax increases, closing off inner cities for car traffic; cf. e.g. Vlek et al., 1997; Kaufmann-Hayoz et al., 2001) and marketing-oriented measures to "pull" consumers from their own car to public transport or non-motorized forms of mobility, innovative technologies emerged on the market that have been designed to facilitate the transition from car-dominated to ecologically more sound mobility patterns (e.g. Vester, 1995; OECD, 1997; Petersen & Diaz-Bone, 2001). Such innovations can be classified as either technical innovations (like e.g. light weight electric vehicles, electric scooters), service innovations (like e.g. combined car-/public transport-offers or car sharing) or combinations of both (Truffer et al., 2000; Harms, 2003).

Despite of their promising ecological balance sheets (taking into consideration not only technical information over the whole product life cycle but also the use patterns of pioneers and early adopters; e.g. FGM, 1996; Muheim, 1998; Meijkamp, 2000), innovation adoption rates largely lag behind their calculated market potential. In the case of car sharing – the technology under consideration in this article – current membership rates in the different car-sharing organizations are of a factor 12-30 lower than what has been forecasted about a decade ago (Harms, 2003). Apart from financial or lifestyle reasons, or from mobility needs that cannot be fulfilled by the new technologies, one important reason for low diffusion rates are car-use routines (Meijkamp & Aarts, 1997; Franke, 2001; Harms & Truffer, forthcoming). The own car being used both frequently and satisfyingly, other mobility alternatives are not taken into consideration for use anymore. I.e., ecologically sustainable mobility innovations are much less perceived and much less consciously evaluated than they could would all consumers act rationally and reflect all mobility-relevant information principally at their disposal at any time (see below).

## 2. Theoretical background

Routine behaviour can be described as an *„(...) automated strategy for dealing with the environment to affect a desired goal*" (Bargh & Barndollar, 1996, p. 461). I.e., a behaviour that once was reflected with much cognitive effort in order to achieve a specific goal (e.g. the use of a car to do the weekly big shopping) slowly loses its conscious decision-making character and becomes habitual, automated. The term "strategy", however, indicates that this behaviour is nevertheless intentional and principally controllable, and that it can be made conscious again at any time – a characteristic that distinguishes it from simple behavioural reflexes (Bargh, 1994; Aarts, 1996; Ouelette & Wood, 1998).

Necessary preconditions for behavioural automation are a stable decision-making context and the frequent and satisfying performance of the respective behaviour within this context (e.g. road and weather conditions, parking situation at the shopping centre and shopping needs staying unchanged during the time a person uses the private car for this trip; Triandis, 1977; Ronis et al., 1989; Bamberg, 1996). Some authors, however, empirically prove that routines can also originate from one single, intensive problem-solving process after which the favourite solution is automatically retrieved from memory, i.e., with no or only little cognitive effort (Betsch et al., 1998).

In decision-making terms, routine behaviour can be treated as equivalent to a simple decision-making heuristic: "Behave the way you always did, normally it was the best choice.". In situations like travel mode choice where the average adult in western societies makes more than 1000 trips per year (e.g. ARE & BfS, 2001, for Switzerland), the use of such heuristics indeed seems plausible and rational since considering all the pros and cons of each mobility alternative each time before making a trip would result in permanent cognitive overload and the fact that a person would rarely find time to leave her house at all (Kahneman et al., 1982; Aarts, 1996).

However, behaviour guided by such simple decision-making heuristics runs the danger of becoming "frozen" (Lewin, 1958; after Dahlstrand & Biel, 1997) and maladaptive (Ronis et al., 1989): The stronger it is automated, the less effort is spent in controlling if the context conditions indeed stayed unchanged over time. I.e., what once proved to be the best choice under the given conditions might now only be second or third best because new behavioural alternatives emerged on the market that might better fit to the own needs and desires. Those alternatives, however, are often not perceived or at least not consciously evaluated: Under strong behavioural routines, people tend to become blind for new options. This does not only hold for innovative offers, but also to alternatives existing since long but not having been used by the

respective consumers up to date (see Aarts et al., 1997; Verplanken et al., 1997 for empirical results in the travel mode choice domain).

Reasons for this are

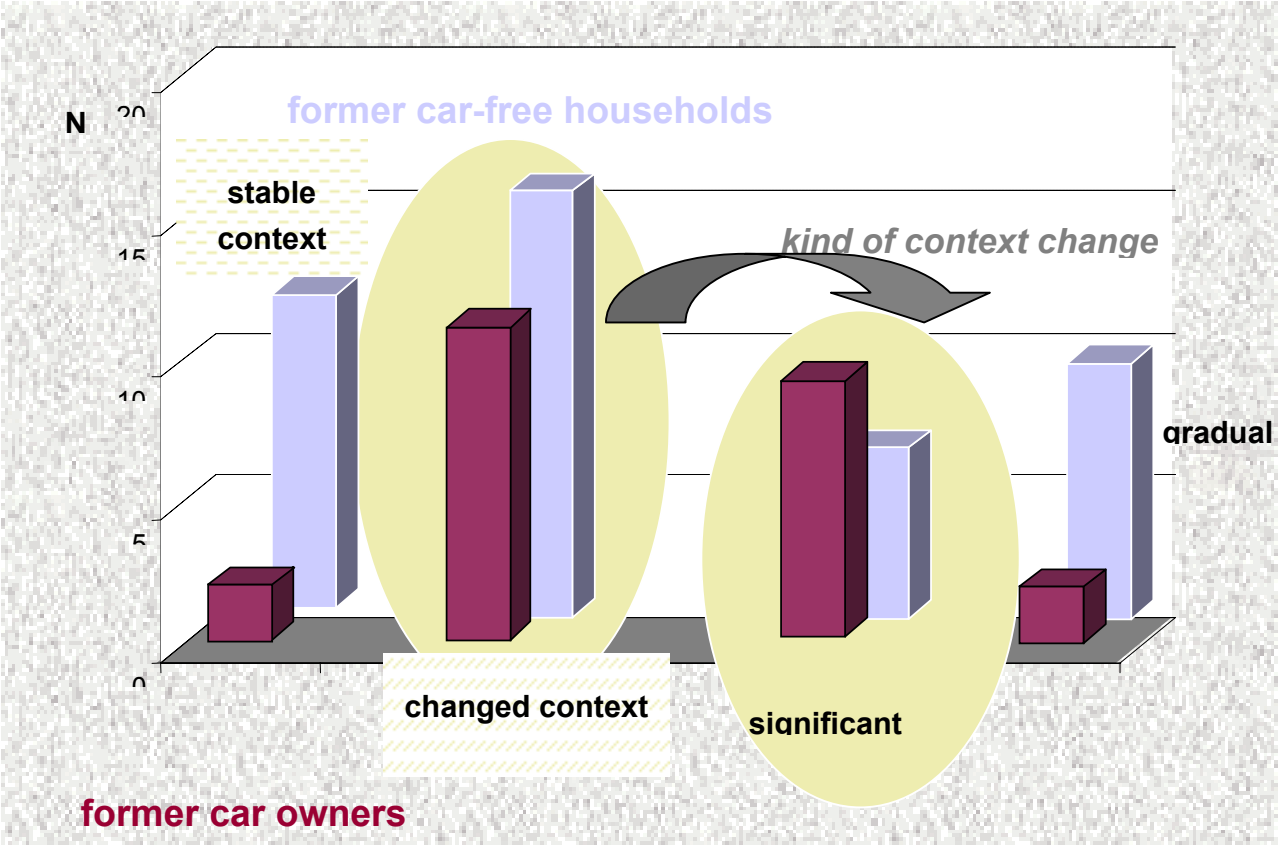
1. *cognitive blindness:* People disposing of strong behavioural habits tend to focus their information seeking activities – even in new situations – on the habitually chosen alternative (Verplanken et al., 1997, 1998). Acting differently doesn't simply "come to one's mind". I.e., other behavioural options are neglected or only superficially screened.
2. *motivational blindness*: People tend to avoid the performance of behaviours that might be contrary to their own convictions or behaviours in other domains (Festinger, 1957; Eagly & Chaiken, 1993). Information on new behavioural alternatives is more likely to be processed if people already possess some information on and experience with it, perceive a fit of the new information with already existent attitudes and behaviours and get information on the innovation from different, personally important spokespersons (Tesser & Shaffer, 1990).
3. *uncertainty:* New behavioural options are often perceived as bound to a number of uncertainties (Rogers, 1995). This is not only due to a lacking experience and the concomitant tendencies to avoid losses and to stick to the sure, known status quo (e.g. Kahneman & Tversky, 1979; Ritov & Baron, 1992), but also because seldom other, personally relevant people can act as informants. Consumers put much weight on interpersonal communication for their decision making – an information channel often lacking for innovations, because people like to expose themselves to socially homogeneous environments (Kroeber-Riel & Weinberg, 1996).

For an innovation like car sharing, we can thus state that there are significant cognitive and motivational barriers for car owners to process objectively available information on it and to pass the step from passive "software information" uptake (information on how the innovation works; Rogers, 1995) to active attitude formation (uptake of "innovation-evaluation information"). If nevertheless an attitude is formed, it will be less certain and most often also less positive than the attitude towards car ownership (for the same reason of lacking experience: The more often a certain product is perceived and/or used, the more positively it is evaluated, and the more spontaneously can attitudes be retrieved from memory; Zajonc, 1968; Cacioppo & Petty, 1989; Fazio, 1989). Transport innovations that radically deviate from traditional car ownership do thus need a high amount of extra promotional effort to overcome those perceptive and motivational barriers on the side of the (car-owning) consumers.

Qualitative research studies, however, showed that there are moments in which consumers are startled out of their blindness and begin to consciously reflect on their own behaviour (Harms & Truffer, 2000; Franke, 2001; Harms, 2003). This could explain why, after all, one fourth to one third of all car-sharing clients owned a car before joining an organisation and gave it up with or short time before the adoption. Such moments can be described as situations in which the mobility-relevant decision-making context of individuals changes significantly so that the old mobility alternative (the car) either *cannot* be used anymore, or decision making criteria are newly weighted so that its use isn't *wanted* anymore (Harms, 2003).

In a qualitative pre-study among 39 members of two Swiss car-sharing organisations (qualitative interviews and group discussions following the grounded theory approach (Glaser & Strauss, 1967); Harms & Truffer, 2000, forthcoming; Harms, 2003 in detail), about 85% of those people who owned a private car before becoming a car-sharing member reported on significant changes in their personal life situation when being asked about their motivation to join a car-sharing organisation. Only in the second place, the attractiveness of certain product attributes like environmental friendliness or low car-use costs were mentioned. The reported changes referred to a new working place, moving the own house, the breakdown of the own car or other things that significantly influenced the private mobility context and the availability and/or usefulness of an own car. People from car-free households less often reported on such changes (55%). If they did so, they focused on continuous gradual changes that at a certain moment in time reached an acceptance threshold and asked for a change (e.g. an increasing difficulty of borrowing a car from neighbours or slowly changing trip demands that made life without a car more and more difficult; see fig. 1).

**Figure 1:** Comparison of former car owners and car-free households with respect to context changes having taken place before car-sharing adoption

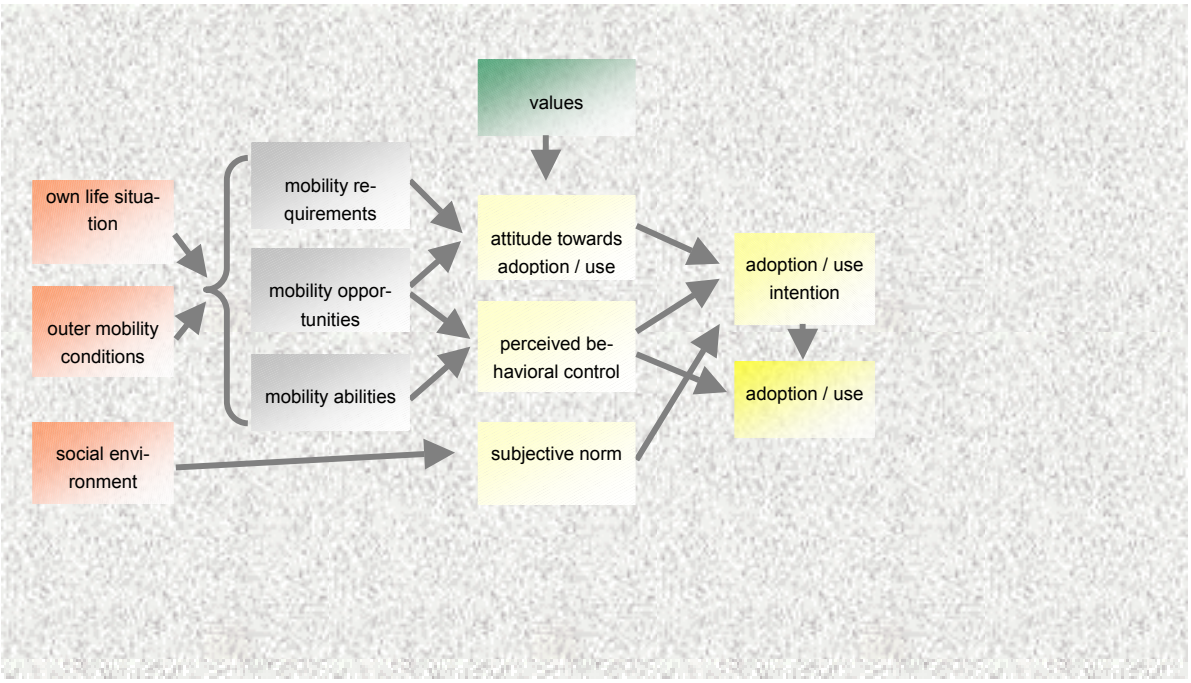



Translating the reported context changes into their subjective mobility-relevant effects, a classification can be made into changes in mobility requirements (changes in subjective needs and requirements being requested from an outer environment), mobility opportunities (objectively present mobility alternatives) and mobility abilities (personal capabilities to use the different alternatives; after a general behavioural model of Vlek et al., 1997). Such changes can be significant or gradual in character. Interpreting them as times of routine-weakening or routine-break-through is justified – on the one hand by the order of mentioning them in comparison to product attributes (i.e. did the consumers focus on product attributes in the first place which shows that it was the product that attracted their attention and influenced their willingness for a behavioural change, or did they focus on context changes which indicates that they had to be "woken up" by an external event before taking product attributes into consideration), and on the other hand by additional verbal material. For the time span before the mobility context changed, former car owners often report on routine car use ("The car stood in front of the door, and I stepped in without thinking about it." "I could have used the bus, but it simply didn't come to my mind."). They sometimes were already aware of the existence of a car-sharing offer but did not consider it as a personally relevant alternative and did not ask for

more information in order to form an attitude on it. After the context change occurred, people describe information seeking processes on new behavioural options and underline them with sentences like: "… and then we noticed that there is this car-sharing offer, and we saw the telephone number, and we rang them up and wanted to know more." The decision in favour of the new alternative was then taken by rational arguments like financial reasons ("we couldn't afford a new car, and this seemed to be a good, inexpensive solution"), little effort ("you don't have to care for reparations or parking places") or environmental convictions ("for a long time already, we considered owning a car as very harmful to the environment, but we waited until its breakdown to say: now is the moment to give it up. Car sharing seemed to be a good alternative – you can still use a car from time to time, but you share it with others."; Harms, 2003).

The behavioural model resulting from the theoretical considerations and the described qualitative study is shown in figure 2. Mobility requirements, opportunities and abilities influence the attitude towards a certain behaviour (what one *wants* to do) as well as the perceived control on performing the behaviour in question (what one *can* do; Vlek et al., 1997). Together with evaluated information from a social environment, a person decides on the adoption or rejection of a new behavioural alternative and engages in this new behaviour if there are no objective obstacles preventing its performance (following the theory of planned behaviour by Ajzen & Madden, 1986; Ajzen, 1991). Routine weakening or breaking are, however, difficult to sketch in such a figure. The frequent and satisfying use of one behavioural alternative leading to a permanent repetition of the same behaviour, context conditions as well as attitudes and subjectively perceived control are slowly faded out in decision-making, and a shortcut from one use of the behavioural alternative to the next is generated (Fazio, 1989). Only under changed context conditions this shortcut doesn't work anymore and the earlier cognitive elements are consciously activated again and adapted to the new situation. It is thus a model that on the one hand holds for consciously reflected, rational decision making in new situations (making new / different trips or generally reflecting on the purchase / adoption of a new behavioural alternative), on the other hand it can also account for heuristic, short-cut routine behaviour, at least if one considers routines as mentally principally accessible behavioural strategies to reach a specific goal (see above). Even rational decision-making approaches like the theory of planned behaviour allow attitudes and control beliefs to be retrieved from memory, without being consciously constructed again each time a similar decision is made.

**Figure 2:** Behavioural model resulting from qualitative pre-study




In the following, we are going to quantitatively test a number of model elements, thereby focusing on the routine shortcut (frequent and satisfying past behaviour leads to a spontaneous repetition of the same behaviour in the future) and the role of context changes for routine weakening. Taking car sharing as an empirical example, we can formulate the following research hypotheses:

1. *cognitive blindness:* People disposing of strong mobility routines a) less often perceive information on car sharing; b) less often seek information on car sharing; c) less often form an attitude on car sharing and d) less often become a member in a car-sharing organisation than people disposing of only weak mobility routines.
2. *motivational blindness:* Car owners a) less often perceive information on car sharing; b) less often seek information on car sharing; c) less often form an attitude on car sharing and d) less often become a member in a car-sharing organisation than people out of car-free households.

   Effects of cognitive and motivational blindness should be additive.

3. *uncertainty:* Car sharing is considered as a more uncertain mobility option than the classical alternatives "own car" and "public transport" both by car owners and people out of car-free households. However, car owners consider car sharing even more uncertain than car-free households.

4. *importance of context changes:* Changing decision making contexts a) lower behavioural routine strength; b) lead to an active search on new mobility alternatives, and c) lead to a new evaluation of existing and new mobility alternatives. Since the difference between the current behaviour and the behaviour required when adopting car sharing is much bigger for car owners than for car-free households, we also state that car owners in the immediate time span preceding the car-sharing adoption a) undergo context changes more frequently than car-free households, and b) more often report on significant context changes.

## 3. Empirical study

We distributed a quantitative questionnaire to four groups with different relationships to car sharing. A fifth group emerged spontaneously and was taken into consideration for some calculations as well. Focusing on context changes as triggers for breaking routines and opening the way for behaviour change, the central group under investigation (group 1) were clients who joined a car-sharing organisation only short time before filling out the questionnaire (2 to 8 weeks before). They were (as all the other groups as well) asked in a backward-oriented research design to report on their travel behaviour, personal life context and objective mobility conditions during the last half year before responding to our questions. Most measures were taken twice – once referring to the current status (e.g. how often are cars currently used) and once asking for stability or change within the last six months. Besides, the questionnaire included attitudinal, value-oriented and socio-demographic data (see table 1). We compared group 1 to people who asked for information about car sharing 1-4 weeks before filling out the questionnaire, but did not join an organisation yet (group 2), and a representative random population sample who generally would have access to car sharing (the sample was matched to the new clients regarding living place), but who neither asked for information about it yet nor joined a car-sharing organisation. We split the random sample into people who would generally be interested in car sharing (group 3) and people who don't show any interest (group 4). By chance, we got a number of responses from people who already were member in a car-sharing organisation for a longer time (longer than the one defined for the new clients), and so we decided to take them into consideration for comparison as well (group 5). By this, the five groups can be rank-ordered along a car-sharing involvement-gradient (see table 2). The research was done in the German-speaking cantons of Switzerland in spring 2000, and only private car-sharing clients (no firms) were integrated into the study.

**Table 1:** research variables and measures

| variable | measure | status | change |
|---|---|---|---|
| **routine strength** | - frequency response measure (Aarts, 1996) | x | |
| **information perception and search** | - 2 direct questions | x | |
| **mobility behaviour** | - activity-centered use of different transportation means | x | x |
| | (analogous to frequency response measure items) | | |
| | - frequency of car-/public transport-use (days per month) | x | x |
| | - intention to change behaviour | x | |
| | *4 open questions on reasons for behaviour change* | | |
| **product evaluation** | *(evaluation of car, public transport and car sharing on frequent and infrequent trips as well as overall evaluation:)* | | |
| | - attitudes (evaluation on 6 product attributes for each kind of trip and means of transportation + 1 attitude change question) | x | x |
| | - subjectively perceived control (1 item per trip and means of transportation + 1 control change question) | x | x |
| | - subjective norms (1 item per trip and means of transportation as well as willingness to comply with social environment) | x | |
| **values** | - 18 value questions, bundled by a factorial analysis | x | |
| | (different item sources) | | |

| | | | |
|---|---|---|---|
| **mobility- relevant decision-making context**<br><br>*(closed questions)* | - personal life situation | x | x |
| | (10 questions; on the basis of qualitative pre-study) | | |
| | - outer mobility conditions | x | x |
| | (5 questions, on the basis of qualitative pre-study) | | |
| | changes in: | | |
| | - mobility requirements | | x |
| | - mobility opportunities | | x |
| | - mobility abilities | | x |

It is clear that distributing a one-shot quantitative questionnaire referring to a time span that is already some weeks ago is methodically not the best choice. Answers might be biased due to different cognitive and motivational biases (e.g. Bortz & Döring, 1995). Additionally, measuring independent and dependent variables at the same time does not allow for proving causal relationships directly. However, a forward-oriented design is difficult to realise for this topic: Ideally, a random sample out of the population should be drawn and observed over a longer time span. It should then be noticed which people (with which context conditions, behavioural and attitudinal profile) undergo context changes and how those changes influence (routine) behaviour. Since the distribution of context changes within the population is not clear, and the number of people who afterwards indeed join a car-sharing organisation will be low (due to the technology's limited market penetration up to date), and additionally, multiple investigations are not very well accepted (especially not by people whose personal life conditions changed), we renounced on such a design. Instead we assume that if cognitive and motivational biases appear, they will be evenly distributed among the five research samples, so that inter-group comparisons are nevertheless valid. Causal relationships can later on still be tested by means of theoretically based methods like structural equation modelling.

**Table 2:** Research design

| | new clients (group 1) | sought for information (group 2) | random sample: interested in car sharing (group 3) | random sample: not interested in car sharing (group 4) | long-term clients (group 5) |
|---|---|---|---|---|---|
| expected number of respondents | 100 | 100 | 100 | 100 | - |
| distributed questionnaires | 520 | 517 | 1429 | | - |
| filled out completely | **257** | **119** | **122** | **128** | **29** |
| feedback rate | 50% | 23% | 18% | | - |

## 4. Results

*1. cognitive blindness:* By way of median split we divided our research sample into strong-routine and weak-routine participants (strong routines: N=329; weak routines: N=322). Car-use routines and public-transport use routines were taken together, i.e. routine strength is a measure independent of the *kind* of routine people show. The median-split value for routine strength is only slightly above the mean routine strength value (.56 on an interval scale ranging from 0 = no routine to 1 = very strong routines)[1]. Regarding attitudinal uncertainties, we

[1] Routine strength was measured by the frequency-response measure proposed by Aarts (1996). Respondents are confronted with 10 trip destinations for which they have to indicate as quickly as possible which mobility alternative comes to their mind for making this trip. It is suggested that by imposing time pressure, information is spontaneously retrieved from memory (as an element of a cognitive schema having the trip destination as its topic and the respective means of transportation as one of the slots that are filled out by time and experience). Normally this measure should be used in face-to-face interviews since experimenters cannot control for intensive, conscious decision making in a written questionnaire. For the sake of practicability, we nevertheless decided to use this measure in the questionnaire and gave explicit information on how to answer the ten items. Correlations of routine strength and actual behaviour were high (Harms, 2003).

only took the response category "don't know" into consideration and ignored missing values, because the latter may also be based on reasons other than uncertainty. If we had combined the two, uncertainty percentages would have approximately doubled. In reality, however, uncertainty rates may even be higher than this doubled value: Since no reaction times to the respective questions can be measured in a written questionnaire, it is possible that respondents spontaneously form an attitude on car sharing which is solely based on the information given in the beginning of the questionnaire which they quickly forget again afterwards.

Most of the hypotheses concerning cognitive blindness can not or only marginally be confirmed. People disposing of weak mobility routines slightly perceive more information on car sharing than people showing strong routines. This difference, however, is only due to the response category "partly" referring to the question: "Did you know car sharing before?". Information seeking as well as the decision to join a car-sharing organisation are completely independent of routine strength. However, there is an interesting tendency to evaluate the different product attributes with more certainty if mobility routines are weak than if they are strong (see table 3).

**Table 3:** Results on cognitive blindness (routine strength)

| **Item** | **response category** | **Routine strength** | | $\chi^2$ | **df** | **p** | **considered groups** |
|---|---|---|---|---|---|---|---|
| | | **strong** | **weak** | | | | |
| *information perception:* | | | | | | | |
| know car sharing | yes | 67%[1] | 67% | | | | |
| | partly | 20% | 28% | 5,538 | 2 | .063 | 3, 4 |
| *information seeking*: | | | | | | | |
| asked for information | yes | 34% | 32% | 0,134 | 1 | .714 | 2, 3, 4 |
| *attitude formation:* | *mean* | *21%* | *12%* | *marginally significant* | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| can't evaluate car sharing<br><br>(% "don't know")[2] | convenient | 17% | 9% | 2,709 | 1 | .100 | |
| | well adapted | 17% | 10% | 2,831 | 1 | .092 | |
| | fast | 17% | 9% | 4,079 | 1 | .043 | |
| | no stress | 23% | 14% | 2,981 | 1 | .084 | |
| | cheap | 28% | 19% | 2,693 | 1 | .101 | |
| | env. friendly | 23% | 12% | 5,135 | 1 | .023 | |
| | easy (control) | 20% | 9% | 5,111 | 1 | .024 | 3, 4 |
| *adoption:*<br><br>became member | yes | 43% | 40% | 0,734 | 1 | ..392 | 1, 2, 3, 4 |

[1] percentage within each routine-strength group

[2] We are referring to the evaluation of car sharing on irregular trips here since this is the most frequent way of using the technology. Uncertainties for regular trips as well as for evaluating car sharing as a whole are, however, similar.

*2. motivational blindness:* Car owners indeed perceive car sharing less often than people out of car-free households. They less frequently ask for information on it and significantly less often become a member in a car-sharing organization. However, they do not significantly less often form an attitude on car sharing than car-free people (see table 4).

**Table 4:** Results on motivational blindness (car ownership)

| **Item** | **response category** | **car ownership** | | $\chi^2$ | **df** | **p** | **considered groups** |
|---|---|---|---|---|---|---|---|
| | | **car** | **no car** | | | | |
| *information perception:* | | | | | | | |
| know car sharing | yes | 68% | 82% | | | | |
| | partly | 24% | 16% | 9,169 | 2 | .010 | 3, 4 |
| *information seeking*: | | | | | | | |
| asked for information | yes | 21% | 56% | 43,807 | 1 | .000 | 2, 3, 4 |
| *attitude formation:* | *mean* | *17%* | *12%* | *not significant* | | | |
| can't evaluate car sharing (% "don't know") | convenient | 14% | 8% | 1,006 | 1 | .316 | |
| | well adapted | 14% | 10% | 0,418 | 1 | .518 | |
| | fast | 14% | 11% | 0,277 | 1 | .599 | |
| | no stress | 21% | 14% | 1,238 | 1 | .266 | |
| | cheap | 26% | 14% | 3,228 | 1 | .072 | |
| | env. friendly | 18% | 10% | 2,461 | 1 | .117 | |
| | easy (control) | 14% | 15% | 0,006 | 1 | .936 | 3, 4 |
| *adoption:* | | | | | | | |
| became member | yes | 16% | 65% | 153,43 | 1 | .000 | 1, 2, 3, 4 |

The additive character of routine-based (cognitive) and car-based (motivational) blindness gets most visible in people's decision to join a car-sharing organisation: While only 11% of the car owners with strong car-use routines decided to join a car-sharing organisation, 69% of the car-free households with weak public-transport use routines did so. The influence of the motivational variable is thereby much higher than its cognitive counterpart. Information perception and seeking are, however, dominated by people out of car-free households disposing of *strong* public-transport use routines. Uncertainties in attitude formation show the expected tendencies. They are, however, not statistically significant (see table 5).

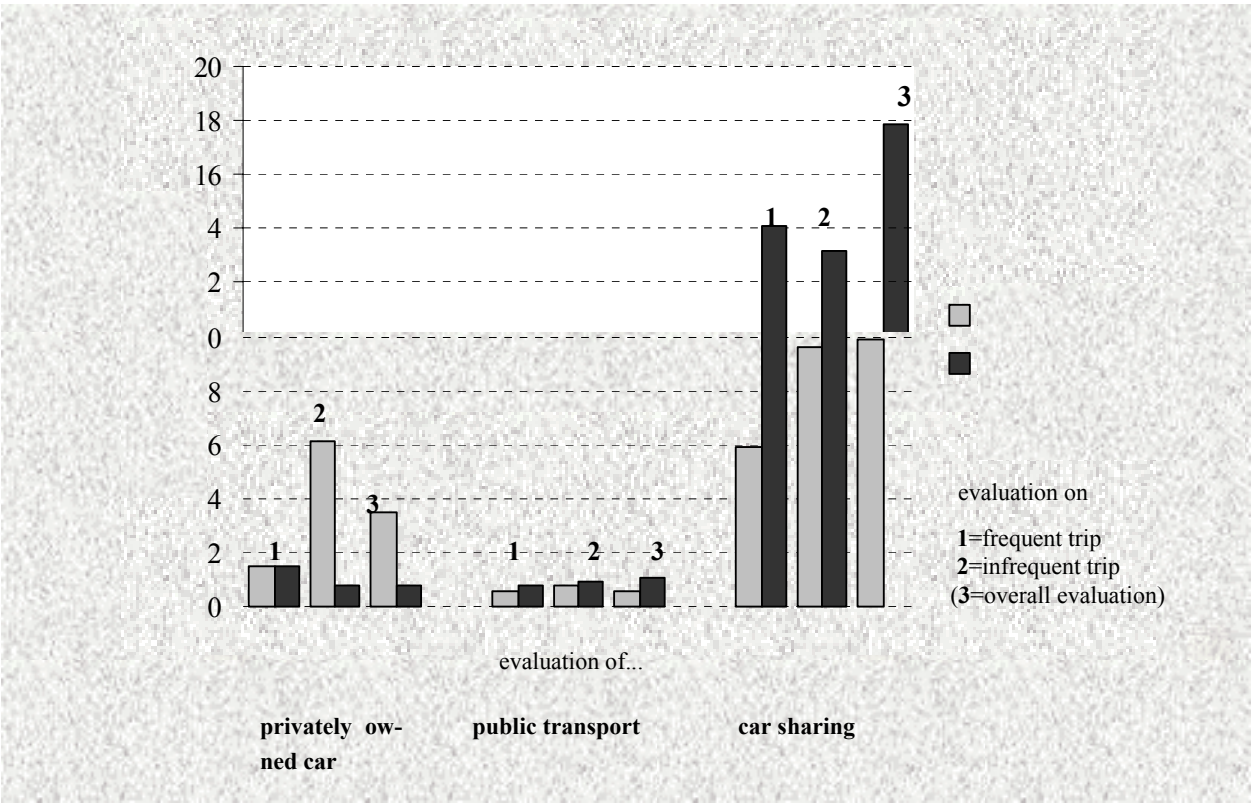
**Table 5:** Results on additive character of cognitive and motivational blindness

| **Item** | **response category** | **car** | | **no car** | | | | | **considered groups** |
|---|---|---|---|---|---|---|---|---|---|
| | | **rout +** | **rout -** | **rout +** | **rout -** | **$\chi^2$** | **df** | **p** | |
| *information perception:* | | | | | | | | | |
| know car sharing | yes | **60%** | 67% | **84%** | 68% | | | | |
| | partly | 24% | 28% | 9% | 26% | 12,235 | 6 | .057 | 3, 4 |
| *information seeking*: | | | | | | | | | |
| asked for information | yes | **15%** | 27% | **58%** | 51% | 46,924 | 3 | .000 | 2, 3, 4 |
| *attitude formation:* | *mean* | ***23%*** | *12%* | *15%* | ***6%*** | *not significant* | | | |
| can't evaluate car sharing (% "don't know") | convenient | 19% | 10% | 11% | 5% | 4,386 | 3 | .223 | |
| | well adapted | 19% | 11% | 13% | 5% | 3,727 | 3 | .293 | |
| | fast | 19% | 9% | 14% | 5% | 4,758 | 3 | .190 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | no stress | 24% | 15% | 19% | 5% | 4,622 | 3 | .202 | |
| | cheap | 31% | 19% | 21% | 5% | 7,009 | 3 | .072 | |
| | env. friendly | 26% | 13% | 13% | 5% | 9,021 | 3 | .029 | |
| | easy (control) | 21% | 9% | 17% | 11% | 5,349 | 3 | .148 | 3, 4 |
| *adoption:* | | | | | | | | | |
| became member | yes | **11%** | 19% | 62% | **69%** | 154,75 | 3 | .000 | 1, 2, 3, 4 |

*3. uncertainty:* Car sharing is indeed considered as a more uncertain mobility option than the classical alternatives "own car" and "public transport" both by car owners and people out of car-free households. Additionally, car owners consider car sharing more uncertain than car-free households (see figure 3).

**Figure 3:** Uncertainty in evaluating privately owned cars, public transport and car sharing (random sample; groups 3 and 4)



*4. importance of context changes:* Context changes happen frequently and in very different personal domains and outer mobility conditions in all research groups. However, from group 1 (new clients) to group 4 (random sample not interested in car sharing) we see a decreasing tendency for changes on *all* of the context items that were given in a closed form. Moreover, group 5 (the long-term clients) show a change rate that is as low as the one of research group 4. I.e., apparently people who only recently became member in a car-sharing organisation and people who recently asked for information on it are often in a phase of contextual instability exerting an influence on their mobility behaviour. Answers to the closed questions on context changes can, however, not be causally related to behaviour changes, since they only asked if such context changes had taken place within the last six months. A number of changes might have happened without exerting any influence on mobility behaviour (like we see for research groups 3 and 4 where behaviour most often stayed unchanged, but nevertheless context changes took place). Therefore, we coded the answers to the open questions asking for reasons for behaviour change and took those answers as the decisive independent variables. We can classify the given answers into four main categories: No changes, preference changes, context changes and changes in means of transportation at a household's disposal (see table 6). While preference changes were only rarely mentioned, context changes as well as changes in means of transportation proved to be important triggers for behaviour change. Context changes subsume significant and gradual changes in the personal life situation as well as outer mobility conditions (see above). Changes in means of transportation in the household refer to events like recently having sold the own car or recently having bought a bike or a long-term ticket for public transport. There is a high probability that such changes have also been preceded by context changes, but this cannot be proven by the empirical material.

Routine strength is indeed the weakest when people's behavioural context has recently changed. Has the context stayed stable, routine strength is significantly higher. Additionally, people who underwent context changes asked for information on car sharing more frequently than people within a stable behavioural context. They significantly show more interest in it and more often joined a car-sharing organisation within the last two months before filling out the questionnaire. Concomitantly, attitude and perceived behavioural control towards car use changed significantly stronger (see table 6). The most important changes can, however, be observed if people have undergone a change in means of transportation in their household. This is not astonishing, since a significant change in people's opportunity to use those means has taken place, whereas context changes may either have been significant or gradual. Additionally, one might suppose that before actively or passively undergoing a change in means of transportation, context changes might have taken place. A change in means of transportation would then be a reaction to those context changes.

**Table 6:** Results for context changes

| Item | reason for changed behaviour | | | | statistical significance | considered groups |
|---|---|---|---|---|---|---|
| | **no change** | **preference change** | **context change** | **change in means of tp** | | |
| routine strength (0=weak, 1=strong) | .58 | .53 | .47 | .49 | F = 5,772<br>df = 3, 647<br>p= .001 | 1-5 |
| recently asked for information (within last 2 months) | 30% | 43% | 44% | 48% | $\chi^2$= 15,349<br>df= 3<br>p= .002 | 1-5 |
| generally interested in car sharing | 52% | 64% | 71% | 89% | $\chi^2$= 50,584<br>df= 6<br>p= .000 | 1-5 |
| new member (within last 2 months) | 33% | 43% | 42% | 78% | $\chi^2$= 47,405<br>df= 3<br>p= .000 | 1-5 |
| change in attitude towards own car[1] | -.06 | -.29 | -.12 | -.44 | F = 5,108<br>df = 3, 570<br>p= .002 | 1-5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| change in perceived control towards own car[1] | -.11 | -.21 | -.20 | -.58 | F = 6,108<br>df = 3, 578<br>p= .000 | 1-5 |
| change in attitude towards public transport[1] | .05 | .07 | .09 | .16 | F = 0,945<br>df = 3,626<br>p= .418 | 1-5 |
| change in perceived control towards public transport[1] | .04 | .00 | .18 | .28 | F = 4,283<br>df = 3,623<br>p= .005 | 1-5 |

[1] scales running from -2 (much more negative / difficult) to +2 (much more positive / easier)

Finally, if we take a closer look on the new car-sharing clients, we see that people who owned a car until short time before becoming a member in a car-sharing organisation most frequently report on significant changes in their own life situation. People who had been car-free for a longer time as well as people who kept their own car and considered car sharing as a second-car alternative most often do not report on context changes at all, and if they do so, they more frequently refer to gradual changes than the first group (see figure 4 and table 7). In total, significant context changes overweigh gradual changes in all research groups, which is contrary to the results of the qualitative pre-study (see above). We hold empirical methods responsible for this result: While people in a qualitative study have time to report on states that gradually changed over a longer time span, the slots for verbal reports are much smaller in a quantitative questionnaire. Additionally, all open questions in the questionnaire explicitly asked for changes that happened during the last six months – a period that might have been too short to take gradual context changes into consideration.

**Figure 4**: Reasons for changed car-use behaviour among new clients

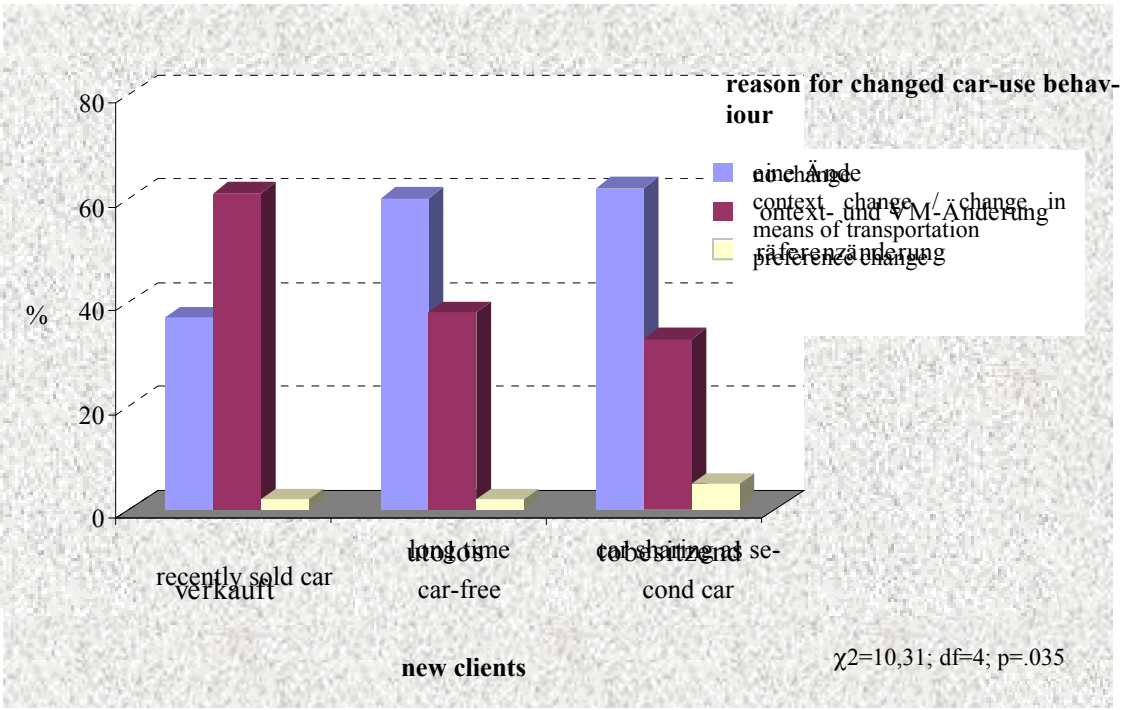



**Table 7**: Importance of significant and gradual context changes
(new clients; percentage per mobility group)

| reason for changed behaviour | new clients | | |
|---|---|---|---|
| | **recently sold car** | **long time car-free** | **car sharing as second car** |
| **own life situation** | | | |
| significant | 100% | 57% | 50% |
| gradual | - | 29% | 38% |
| **outer mobility conditions** | | | |
| significant | - | 12% | - |
| gradual | - | 2% | 13% |

## 5. Discussion

Behavioural routines seem to play an important role in *information perception and evaluation* on innovative mobility technologies, but the results of the quantitative study are less significant than those of the qualitative one. There might be several reasons for this: First, car sharing already exists for 16 years in Switzerland now, and information diffusion throughout the population may already be much higher than for many other innovations. The qualitative study was run three years before the quantitative study, and in the meantime, organisations grew, and promotion was significantly increased. Second, the use of different empirical methods may be hold responsible for the results: While a qualitative study leaves enough room for reports on routines and their behavioural effects, the use of a method of spontaneous retrieval from memory (the frequency-response measure, see above) within a written questionnaire may be questionable since the researchers cannot control for conscious and in-depth reflection. The quantitative results should thus be qualified by other methods (e.g. experimental settings; measuring of reaction times).

Since routine strength did not hinder the seeking of information on innovative mobility technologies, *information seeking* seems to be an important pre-step within a conscious decision-making process. Only if people have perceived the car-sharing offer and were able to form a vague attitude on it, they are (depending on the favourability of their attitude) willing to seek for more information, strengthen their attitude and decide on the adoption / rejection of the new technology.

*Adoption / rejection decisions* are then made consciously, rationally and depend on the "behavioural distance" of the decision-makers towards the new technology: Car-free households already use public transport or the bike for frequent trips (a necessary precondition for using the car-sharing cars without owning a private car besides), and car sharing broadens their mobility opportunities (having a car at one's disposal for infrequent trips). Car-owning households, however (especially those with strong car-use routines), have to completely change their behaviour, renounce on the car for frequent trips and change to public transport if they become member in a car-sharing organisation. The car is not standing in front of the own house anymore, and due to reservation obligations car use has to be precisely planned. Only in situations where personal life situations change in such a way that the decision-making framework is completely reversed (an own car is not needed/wanted anymore, or it simply cannot be used anymore, and the alternative would be a car-free state without the possibility to use cars at all) car owners are ready to give up their old behaviour. Out of car-free households, however, people with *strong* public-transport use routines are the ones who are (con-

trary to our hypothesis) most interested in car sharing. Nevertheless, they are not the ones who finally adopt the most frequently. Here, a mixture of behavioural and financial arguments might come into play: Merely using public transport or the bike (and using them frequently and satisfyingly), car sharing could be a nice, but not really necessary additional behavioural alternative, which in this case might seem too expensive (if the cars are used very rarely, annual membership rates might be an adoption barrier). People with *weak* public-transport use routines are used to take public transport on most of their trips, but additionally they need to use cars from time to time. Car sharing for them might be a good alternative for privately borrowed or rented cars.

Despite of the long existence of car-sharing organisations in Switzerland and their continuous expansion within this period, consumers still consider car sharing as an innovation bound to a number of *uncertainties*. Both, car owners and people from car-free households are more uncertain in forming an attitude on it than on private car ownership and public transport. Car-sharing organisations should react to this fact by enabling more free test memberships and still more co-operations with known and trustworthy partners.

Other *practical implications* out of our research are: a) If routines indeed impose cognitive barriers to information perception and attitude formation (see the discussion above), marketing efforts for innovative mobility concepts should be adjusted to this phenomenon: They should be bundled in moments where routines are the weakest and people are most open to conscious, rational decision-making, i.e., in moments of important context changes (e.g. moving, changing the job). Policy making could explicitly help here and set incentives for behaviour change by evoking outer mobility context changes (e.g. closing off inner cities for cars). b) Seen the motivational barriers to give up the old behaviour and to adopt a technology that can only be used with significant behavioural adaptations, technology development should be better adjusted to the needs of car owners, i.e., to allow for more flexible car use without the need of owning a car. Ideally, at the same time (e.g. financial) incentives could be set to induce behaviour changes.

In this paper we focused on the relationship between routine strength and rational decision making. The *decision-making process per se*, like sketched in the behavioural model, was not discussed. Reasons that make people adopt car sharing, i.e., the attractiveness of product attributes as well as the importance of internal value systems, are, however, clearly emerging out of both empirical studies. They will be analysed in detail elsewhere (Harms, 2003).

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