



## **Introduction: Habitual travel choice**

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**Abstract.** In this introduction to the special issue on habitual travel choice, we provide a brief account of the role of habit in travel behaviour, discuss more generally what habitual choice is, and briefly review the issues addressed in the solicited papers. These issues include how habitual travel behaviour should be measured, how to model the learning process that makes travel choice habitual, and how to break and replace car-use habits.

### **1. Introduction**

It has frequently been noted that daily travel patterns tend to repeat themselves from day to day, from week to week, and perhaps from year to year (Pendyala et al. 2000). Does this mean that individual travel is habitual? And in what sense is it habitual? Since habitual travel behaviour implies that the same choices are made over and over again, is it plausible to assume that such choices are the outcome of deliberation? If not, how should travel choice models assuming that choices reflect deliberate utility maximisation (McFadden 2002) be modified to take this into account? How should the process of forming habitual travel choice be conceptualised and modelled?

In this special issue on habitual travel choice we have solicited papers that address several of the pertinent issues related to the important tasks of measuring, conceptualising, and modelling habitual travel choice. Although not really a new topic (cf. the concept of inertia in travel choice modelling), it is nevertheless a current interest revitalised by behavioural scientists (Verplanken et al. 1994; Verplanken et al. 1997; Aarts & Dijksterhuis 2000) drawing on recent basic research in the *automaticity of behaviour* (Bargh 1997; Oelette & Wood 1998). An important reason for this interest in habitual travel choice is its bearing on travel demand management strategies. A choice that is non-deliberate may in fact be difficult to influence with rational arguments (e.g., increased costs), since the person making the choice tends to discount relevant information. Thus, it must also be asked how habits are broken, that is, how choices become deliberate and rational again. In the next section we

provide a brief account of the role of habit in travel behaviour. The following section discusses more generally what habitual choice is. Finally, the issues addressed in the solicited papers are described.

## **2. The role of habit in travel behaviour**

Most research on travel behaviour is cross-sectional aiming at the development of models that can be used in transport planning to forecast how travellers choose between available alternatives (destination, mode, departure time, etc.) under given circumstances (Ortuzar & Willumsen 1995). In this research the description of travellers is generally limited to sociodemographic variables such as age, sex, education, and income. Possibly important is that people's history is ignored since it consists of previous learning experiences that are likely to affect subsequent choice.

If habit is defined as the repeated performance of behaviour sequences, it must be asked how a person arrives at those sequences, that is, combinations of purpose and mode, destination and day of the week, departure time and route, and other more complex combinations of the activity attributes and associated travel. It may be assumed that the cost of searching for and constructing new alternatives is generally too high and the expected gains associated with new alternatives too uncertain. In this situation travellers reuse past solutions to make their behaviour easier and less risky. This may in particular be true if they are constrained by time, budget, or social commitments.

Habits understood in this way are an obvious challenge to transport modelling and planning. In transport modelling the challenge is how to incorporate habitual choice as well as how people acquire and use knowledge of their environments and of the transportation system. In transport planning it is essential to analyse how habits and acquired environmental knowledge influence the implementation of policies.

In the modelling of revealed preference data, direct indicators of habit are normally avoided. Examples of potential such indicators to include in mode choice models would be annual vehicle miles, public transport trips during the last two weeks; in destination choice models one may use the size of the activity space of a person, perhaps measured as the distance to the furthest regularly chosen location; in departure time choice models an obvious indicator to include would be the most frequently occurring departure time. In passing it is interesting to note that vehicle ownership, the prerequisite to use, is generally included in mode choice models – but not past use, nor generally the opposing prerequisite: ownership of season tickets for public transport.

Models derived from stated response surveys more often include indicators describing the current revealed behaviour. An example would be the mode chosen for an observed trip that is used to construct choice alternatives. The surveys frequently also include questions about car ownership/availability and annual vehicle miles as well as the number of public transport trips per week and ownership of season tickets for public transport.

When models that include indicators of habit are used in forecasting, they require simulations at the disaggregate level. While this poses no problems for short-term forecasts, it does for longer-term forecasts as these would need to trace travellers' performance over time to calculate the values of the habit indicators. This task has yet to be undertaken over any serious length of simulated time. The ad-hoc solution proposed is a discounting of the associated parameters in line with the forecast horizon.

Transport policy has tried over the last decade to complement (massive) infrastructural investment and transport service expansion with various less spectacular forms of travel demand management measures such as, for instance, individualised marketing of public transport, travel blending, information services, variable message signs, low key increases in out-of-pockets for parking, and management of parking spaces. The success of such measures depends on the ability of travellers to recognise, to respond to, and to integrate these new signals into their activity/travel habits. What does it take to make them do this? A better understanding of habitual choice appears essential to answer this question.

### 3. What is habitual travel choice?

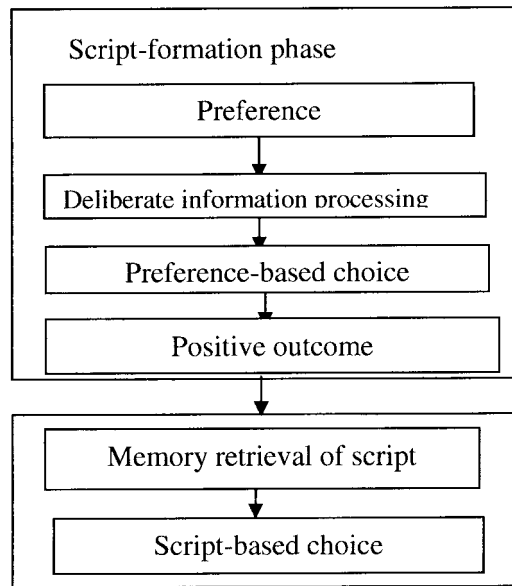
Attitude research in social psychology (Eagly & Chaiken 1993; Gärling et al. 1998) identifies *past behaviour*, *intention*, and the *situation* (opportunities and/or constraints) as potential determinants of behaviour. In the theories of reasoned action (Ajzen & Fishbein 1980; Fishbein & Ajzen 1975) and planned behaviour (Ajzen 1991), intention is defined as the probability the actor consciously assigns to engagement in a particular behaviour. In the theory of planned behaviour, a positive attitude towards the behaviour, positive attitudes held by important others (e.g., authorities), and *perceived situational control* are all determinants of intention strength. If several intentions compete, a choice is made on the basis of their strength. The relationship between how strongly past behaviour or *habit* and intention determine a behaviour is assumed to be reciprocal (Triandis 1977): the stronger determinant habit is, the weaker determinant intention is, and vice versa.

Another definition of intention is implied by a theory proposed more recently by Gollwitzer (1993). In this theory intention is the will to imple-

ment a goal to which commitment has been made. Recent research has shown that a chosen goal is frequently not implemented until an intention (or plan) has been formed (for reviews, see Gärling & Rise 2002). An exception is when the behaviour is repeated over and over again. Then the situation will trigger the behaviour, either directly (“mindlessly”) or by activating the goal and/or the intention.

It is thus generally assumed that the formation of an intention is preceded by deliberate information processing which may include choosing decision strategy, searching for information, selecting or constructing alternatives, and evaluating alternatives. Conversely, if habit is the strongest determinant of a behaviour, the behaviour is preceded by less or no deliberate information processing. Habit or habitual choice has been defined as choosing to perform a behaviour without deliberation (Ronis et al. 1989; Gärling & Garvill 1993). Empirical evidence for this claim was obtained by Gärling et al. (2001) and Verplanken et al. (1997). Gärling et al. used both correlational and experimental methods to test the process model illustrated in Figure 1. In an experiment non-drivers were lured to over and over again make the same (fictitious) choice of driving to a distant destination where a good could be purchased at an attractive price. Since the outcome of the choice was positive, participants were assumed to develop a positive attitude towards choosing to drive and therefore continue to make this choice. After some time the choice became *script-based* as witnessed by the fact that less information was searched and processed. Thus, information stored in memory in the form of a script (Schenk & Abelson 1977) was retrieved (Gärling 2001), alleviating the participants from deliberate information processing when making the choice. If a choice is once made after deliberation, it may still be rational (goal-directed) when it become habitual unless the situation changes in a way that is not detected. The latter in fact occurred in the experiment by Gärling et al. (2001). At a later stage the attractive destinations appeared at a shorter distance. Since participants failed to note this, they continued to choose to drive. In contrast, participants in a control group chose to walk to the destinations at the shorter distance.

A caveat in much descriptive research on travel habits (e.g., Hanson & Huff 1988) is that repeated choices of a behaviour does not necessarily imply that the behaviour is habitual. The reason for repeating a behaviour may simply be that the intention (e.g., to drive to work) is formed repeatedly. Thus, other methods must be developed to classify the behaviour. A key to this is that different amounts or depth of information processing is instigated. Instead of habitual choice or behaviour, the notion of *deliberate vs. script-based choice* may be proposed. Another distinction between planned and impulsive behaviour can also be made based on the degree of deliberation (see Table 1) (Gärling et al. 1998). Sometimes an intention is formed late without



Source: Gärling et al. (2001).

Figure 1. The transition of deliberate preference-based to script-based choice.

Table 1. A proposed classification of planned, impulsive, and habitual behaviour.

	No or little deliberation	Much deliberation
No intention formed	<i>Habitual behaviour</i>	NA
Intention formed	<i>Impulsive behaviour</i>	<i>Planned behaviour</i>

time for much deliberation. In fact, impulsive travel choices do not seem to be infrequent (Gärling et al. 1998; Doherty & Miller 2000).

Any attempt at influencing travel choices (e.g., to make them more rational) may fail if the choices are non-deliberate (habitual). At least it takes additional measures to make the choices deliberate (Dahlstrand & Biel 1997) before they can be changed. In the study by Gärling et al. (2001), changes of the situation (the attractive destination at walking distance) was eventually detected, after which walking instead of driving was chosen. Fujii et al. (2001) found that a forced change of a routine choice (driving to work) made people aware of the attractiveness of other alternatives (public transport).

Based on the idea that habitual choices are script-based, Verplanken et al. (1994, 1997) developed the *response-frequency measure of habit*. A set of pre-selected, naturally occurring situations or scripts (see Fujii & Kitamura 2002) are presented to participants who are asked to quickly make a mode

choice. The more frequently a certain mode is chosen, the more habitual or script-based the choice is assumed to be. The idea is that a developed habit or script (e.g., of choosing to drive) has generalised to many situations so that it is triggered by the goal of travel from one place to another. In several studies (e.g., Aarts & Dijksterhuis 2000) the measure has been validated. It may in fact be a better measure than asking participants to recall past choice frequencies (Gärling et al. 2000). This is understandable because if choices are not deliberate, it will also be difficult to remember having made them.

#### **4. Which are the current research questions?**

In this section we briefly review the papers solicited for the special issue. We do this by highlighting the research questions they address. These include the challenge of developing methods for identifying habits from activity/travel travel diaries, how to model that choice become habitual, and finding methods to break and replace habitual travel choices.

##### *4.1. Measuring habitual travel behaviour*

As Robert Schlich and Kay Axhausen (2003) rightly point out, in travel diaries intraperson variability has been focused on less than interperson variability. Investigating the former requires observations of travel over longer time periods than the normal single day. This is because long-term rhythms or repeating patterns (Pas 1988) will otherwise be missed. It is also necessary to develop adequate methods for indexing similarity or variability of (complex) activity/travel patterns. Given an available data set consisting of 6-week travel diaries, Schlich and Axhausen are able to compare different such methods.

One rationale is to infer that travel habits exist if only a limited number of all possibilities is chosen over time. This is also shown empirically to be the case by applying one of the methods that are compared. This method was developed by Hanson and her colleagues (Hanson & Burnett 1981; Hanson & Huff 1982, 1986). A problem is that some choices are not possible because of constraints, thus perhaps reflecting these constraints rather than travel habits.

An improvement within the activity-based approach would be to compare days instead of trips. Both Huff and Hanson (1986) and Pas (1983) have developed methods for indexing pairwise similarity between days. Pas takes the method a step further in basing the similarity on several attributes categorised as primary and secondary.

Even more closely related to activity analysis is the method proposed by Jones and Clarke (1988) which calculates similarity based on activities performed in each time interval during a day. Since activity data are not always

available in travel diaries, they must be inferred from trip purposes with the drawback that in-home activities are neglected. Furthermore, travel attributes should not be omitted since they are important for transport planning.

The empirical comparisons reveal expected differences between the methods. Specifically, it is shown that the trip-based methods indicate that the activity/travel patterns are more variable over time than the time-budget-based methods. Indeed, less similarity is observed when the method captures more of the complexity of the activity/travel patterns. Despite method differences in level of similarity, the methods tend to assess individuals similarly. Furthermore, that activity/travel is less variable on work days is revealed by all methods. An important conclusion is also that the observation period should not be less than two weeks if one aims at measuring variability.

#### 4.2. *How does travel choice become habitual?*

It seems obvious that learning plays an important role in the formation of habitual travel choice, although the details of this learning process are still not well understood. A first step is to build a dynamic model of complex activity/travel choice. Such a model is reported by Theo Arentze and Harry Timmermans (2003). They do not draw on a traditional utility-maximizing theoretical framework which makes too demanding assumptions concerning what people are capable of doing. Yet, the assumption is made that learning is adaptive. People are assumed to learn from feedback about the consequences of their choices so that their future decisions improve. Specifically, on the basis of how they evaluate the outcome of prior choices, they either learn new condition-action rules, new conditions under which to apply old ones, or when to explore new alternatives.

No empirical data are presented. However, a series of numerical experiments or simulations show that the model has the desired properties. Nevertheless, alternative specifications are possible and should be compared in future research. Such future research may, as discussed by Arentze and Timmermans, use methods that entail interactions with computers. Even virtual reality techniques may be brought in to make the experiments as realistic as possible.

#### 4.3. *Finding ways of breaking bad travel habits*

Why cannot private car use be easily suppressed? In addition to that, the car is an attractive alternative to many, there are obstacles that prevent switching to other modes. Thus, drivers may be unable to switch even though they are motivated to do it. Unavailability of alternatives is of course a main obstacle in many cases. Yet, inertia or habit may also play an important role. It increases

the transaction costs since switching to another mode makes it necessary to learn new routines. Furthermore, searching and processing information about alternatives are reduced. Thus, important changes may go unnoticed, for instance, that attractive alternatives become available.

Both Jörgen Garvill, Agneta Marell and Annika Nordlund (2003) and Satoshi Fujii and Ryuichi Kitamura (2003) address the question of how a car-use habit can be broken and changed into a habit of using public transport. They approach the issue at different levels. Garvill et al. start with the assumption that choices to use the car are not contemplated and may therefore not be rational. If drivers can be forced to deliberate, they may sometimes realise that choosing another mode would be better. By asking subjects in a field experiment to answer questions concerning their choice before they start home-based trip chains, the intention was to force subjects to deliberate. For subjects with a strong car-use habit it appeared as if this worked: A temporally extended decrease of car use was observed for subjects in the experimental group with a strong car-use habit.

The study reported by Fujii and Kitamura (2003) complements the field experiment by Garvill et al. (2003). A free bus ticket was offered for one month to an experimental group of drivers. The idea was that the drivers would be motivated to start to use the bus so that the car-use habit would be broken and replaced by a bus-use habit. The results showed that attitudes towards bus use became more positive and the frequency of use increased even one month after the period when the free bus ticket was valid. At the same time it was observed that choices of car became less habitual or script-based.

The results of these two studies are encouraging. However, further studies are needed along the same lines. Whereas in the Garvill et al. (2003) study no incentives were offered, only incentives were in fact provided in Fujii and Kitamura (2003). Future research needs to investigate the effects of combining incentives with providing knowledge.

However, the study by Sebastian Bamberg, Daniel Rölle, and Christopher Weber (2003) questions the role of habit (see also Bamberg et al. 2002). In fact, changes in residence and offering a free public transport ticket were shown to increase car users' choice of public transport to the same degree irrespective of their past frequency of car use. The hypothesis that automatic behavior is resistant to change may not be at issue. Rather, the results highlight the importance of analyzing such complex behaviors as travel in more detail. It does not seem plausible that awareness should play no role for such behaviors. In contrast to many everyday acts (dressing, locking the door, etc.) whose performance go unnoticed, people are likely to be aware of travel such as for instance commuting to work. Does this mean that choices are deliberated? Probably not. But there is perhaps awareness of the implementation and evaluation of the choices, thus bad outcomes are perhaps detected.



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