



## Stated adaptation surveys and choice process: Some methodological issues

Bruno Faivre d'Arcier, Odile Andan, Charles Raux

### ► To cite this version:

Bruno Faivre d'Arcier, Odile Andan, Charles Raux. Stated adaptation surveys and choice process: Some methodological issues. *Transportation*, 1998, 25 (2), pp. 169-185. 10.1023/A:1005042505063 . halshs-00139993

**HAL Id: halshs-00139993**

**<https://shs.hal.science/halshs-00139993>**

Submitted on 24 Sep 2008

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Stated Adaptation Surveys and Choice Process: Some Methodological Issues

Bruno FAIVRE D'ARCIER,<sup>1</sup> Odile ANDAN<sup>2</sup> & Charles RAUX<sup>2</sup>

<sup>1</sup> *Institut National de Recherche sur les Transports et leur Sécurité, INRETS,*

<sup>2</sup> *Laboratoire d'Economie des Transports, CNRS - Université Lumière Lyon 2 - ENTPE,  
address : LET-MRASH, 14 Avenue Berthelot, 69363 Lyon Cedex 07, France  
e-mail : bruno.faivre-darcier@let.mrash.fr, odile.andan@let.mrash.fr,  
charles.raux@let.mrash.fr*

**Key words:** survey method, stated response, choice process, travel behaviour

**Abstract:** The 'Stated Adaptation' survey is an interactive technique which allows us to obtain a clearer picture of the attitudes and behaviours of individuals when confronted with hypothetical situations, in particular inexperienced travel conditions. This method makes use of a simulation game whose purpose is to explore on small samples individuals' choice processes when selecting between the different transport alternatives which are available to them. This paper describes how gaming-simulation is designed, with reference to the issues tackled by two surveys which have recently been carried out in France (reactions to urban road pricing and perception of electric vehicles). It describes the benefits of this experimental approach which allows stated behaviours to be checked to a considerable degree. The limits and potential developments of this survey technique are also discussed.

### Abbreviations:

BRCS :	Behavioural Response Choice Process
EV :	Electric Vehicle
SA :	Stated Adaptation

## Introduction

The growing scarcity of public resources and the increasing environmental concerns in recent years have led to a change of emphasis from infrastructure investment to infrastructure management. The focus is now less on creating new infrastructure than on optimising that which already exists. This transport system management task is complex because it involves the use of innovations such as urban tolling, motor vehicle access restrictions, temporal and spatial modulation of motorway tolls or the introduction of new technologies such as zero-emission vehicles.

Traditional demand forecasting techniques, based on revealed choice, seem ill-equipped to cope with these innovative measures. For example, the introduction of urban tolls will probably lead to real upheavals in the travel practices of motorists: it is therefore necessary to consider, not merely the impacts of price and duration on their travel behaviour, but also the capacity of motorists to modify their daily or weekly activity pattern in response to the times when tolls are in operation.

This evolution of transport policies leads to new data needs, and consequently to new types of surveys (Stopher, 1997). Combining revealed-choice data and stated-choice data is more and more needed in order to attempt to assess which behavioural responses individuals can adopt when they are faced with a new policy or a technological innovation. Besides the use of micro computers to simulate more complex hypothetical situations, in relation with the present stakes of transport demand management (Polak & Jones, 1997), another orientation has been studied since some years. Jones (1979) was the first to explore the possibilities of gaming-simulation with HATS, and gave rise to the development of several types of surveys regarding inexperienced conditions of transport (Lee-Gosselin, 1990 ; Turrentine et al., 1992, Kurani et al., 1994). These types of surveys focus the observation not only on the stated choices of the respondents, but also on their choice process. Such an orientation leads to a more qualitative approach, the goal of which is to attempt to understand not only the reasons of individuals' behaviour but also the conditions which can favour the success of new transport policies.

Referring to the taxonomy of Stated Responses Surveys proposed by Lee-Gosselin (1996), we will discuss some methodological issues of one such choice process oriented interactive technique, named the 'Stated Adaptation' survey. Such a type of survey differs from conventional Stated Preference exercises in that the respondent is fully free to state which behavioural response he or she can imagine when faced with several hypothetical situations, described by transport system attributes.

The main purpose of such surveys is to explore the range of potential adaptation processes that people undertake when they face travel conditions to which they are unfamiliar. Hypothetical situations are here used as a pretext to incite respondents to express their attitudes and let them imagine and assess the potential behavioural responses they could adopt. By the way, SA techniques can be an exploratory means to be used prior to Stated Preferences surveys, when the influence of transport attributes and their levels is not well known. However this is not the only contribution of such a method : SA surveys can also help to yield or test new behavioural hypotheses - as in experimental economics -, or to give detailed insights into behaviour in order to refine theory.

The discussion refers to two recent French surveys, one dealing with reactions to urban road pricing (Raux et al., 1994, 1995) and the other dealing with perception of electric vehicles (Faivre D'Arcier et al., 1996).

Section 1 reviews the main concepts which provide the basis for the exploration of choice processes. Section 2 describes the main features of the interactive Stated Adaptation technique, the design of the simulation game and the data which has to be collected. Section 3 discusses the benefits of the technique and the methodological problems which need further work.

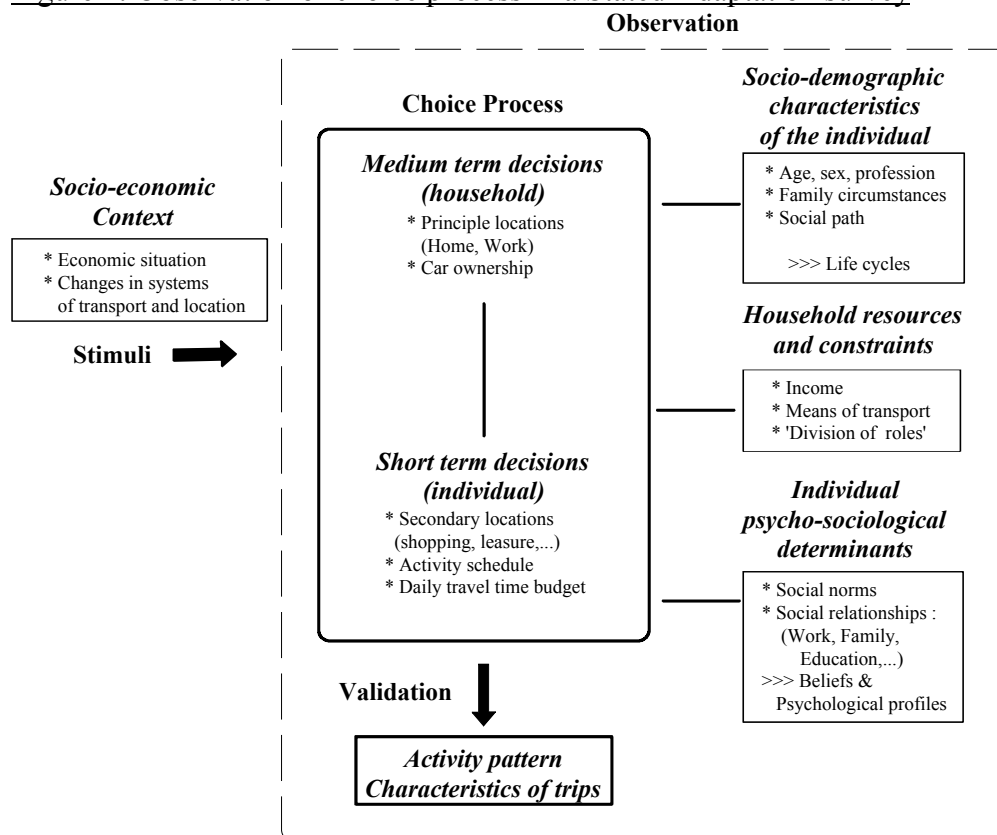
## **1. A complex and changing choice process**

Analysis of travel behaviour shows that a large number of factors determine the travel choices which individuals make. The concept of 'choice set' expresses the idea that in order to perform an activity pattern, individuals carry out a process of selection from among the transport modes which they perceive to be available on the basis of

their personal characteristics, available resources and experience of the transport system.

Because of the complexity of the real choice process, we will use another concept, named as 'Behavioural Response Choice Set' (BRCS), which can be defined as *all the behavioural responses the individual can imagine in order to cope with any change in his or her environment*. This definition covers a broader range of alternatives than that of the conventional choice set as defined by transport planners and model developers. Following this definition, the individual can mobilise different types of resources, such as time, money, means of transport and / or activity rescheduling (Figure 1). Although BRCS is difficult to measure it can be explored indirectly, for example by examining the whole range of alternatives which an individual considers to be feasible for a specific activity and trip.

**Figure 1: Observation of choice process in a Stated Adaptation survey**



BRCS depends on two sets of factors. The first are specific to a particular individual and consist of, on the one hand the individual's socio-demographic characteristics and the resources and constraints of his or her household, and on the other hand a set of psychological determinants and social norms, which define different types of psychological profiles. The second set of factors are exogenous ones: economic situation, activity locations, transportation systems. The large number of factors which influence BRCS explains the variety of individual behavioural responses and the fact that these are subject to change over time.

Thus, the Stated Adaptation (SA) survey which aims to explore the individual choice process is founded on the following mechanism: by confronting individuals with

changes in their environment (for instance stimuli on travel conditions) they can be led to express the various behavioural responses which they envisage. It is thus possible to gain an understanding of the different factors which influence their choices and the resources (time, money, means of transport) which they require.

In such a survey, the objective is not mainly to record the stated adaptations, but to explore and analyse *how* the respondents build and justify their stated behaviour.

## **2. Inciting the respondent to react to a non experienced situation**

The SA survey is a qualitative approach which is realised during an in-depth face-to-face interview. As its main goal is to explore the nature of the individuals' choice process, it can be applied on a small sample, selected to observe the diversity of individuals' situations. In France, we have experienced that beyond 15-20 respondents (individuals or households), we find redundancy in the variety of stated adaptations, which let us think we identified the main components which can influence choice processes. Using gaming-simulation, the surveyor will ask the respondent to state his or her behavioural adaptations when faced with any type of change in the travel conditions. A set of scenarios is designed, each round introducing a modification of one or two attributes related to the travel conditions. These hypothetical situations are applied to the current individual's activities and trips: this is a means to make the individual appreciate the potential consequences of the hypothetical situations on his or her activity pattern and to check the realism and the validity of stated responses.

### **2.1. Conduct of the survey**

The first step of the survey is to collect diary data on current trips and activities in order to constitute the « facts base » for the simulation (see below). These are complemented by a questionnaire about travel habits in general and household characteristics. Considerable effort is devoted to building the facts base into a detailed wall chart or computerised display for use in the interview, providing a picture of travel and activity for the diary period.

The face-to-face interview is conducted a couple of days after completing the facts base. It starts by verifying the contents of the facts base. Firstly, this reminds respondents of the conditions under which they made their trips and secondly it familiarises them with the materials to be used in the game. The two surveys mentioned above focus on a time diagram which portrays the activities and trips which actually took place during the diary period, and which will be used in order to check and validate the stated responses during the simulation.

The simulation game as such can then begin. This involves the presentation of successive scenarios. For each scenario the respondent is expected to state how the changes in travel conditions described in the scenario would have affected his or her recent activity pattern had they occurred during the period covered by the diary.

Lastly, we must not overlook one of the last phases of the interview. This is a debriefing conducted in the presence of the respondents. This takes the form of a free discussion after the game has officially ended. It deals with respondents' opinion of the scenarios and the simulation game. Although it is informal this final phase is important as it sheds light on any self-censorship which the respondents might have performed.

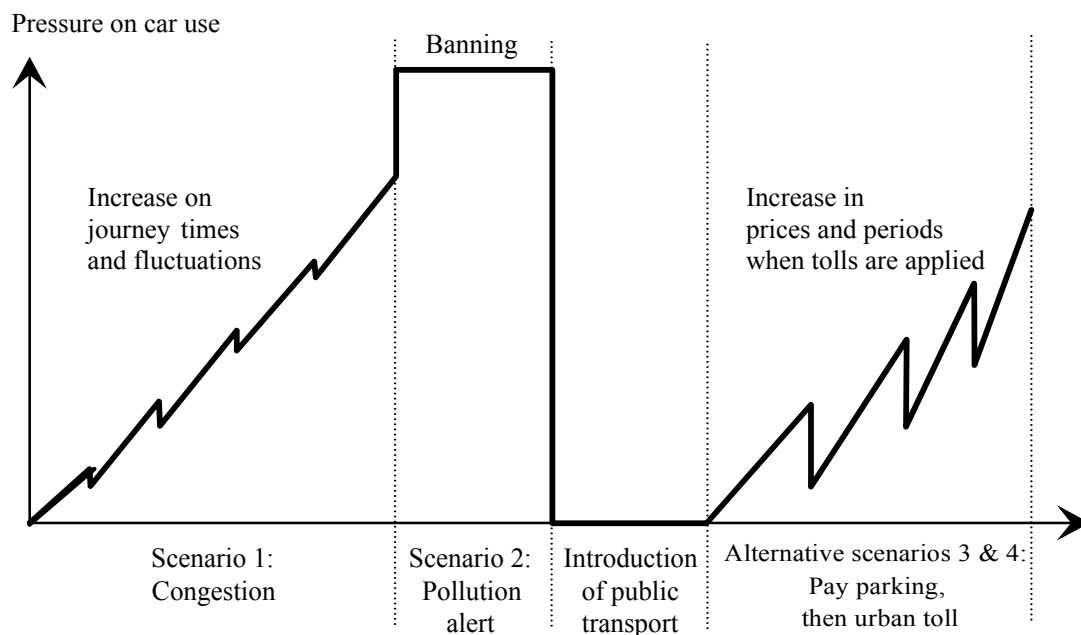
Once the game is over they frequently express their deeper value judgements, or even provide information which confirms or invalidates the preferences which they have stated during the game. It is thus a phase of validation which is not to be neglected and which provides the interviewer with many valuable insights and reduces the risk of strategic bias.

## 2.2. A method which leads individuals to express themselves

### *Designing the scenarios*

The use of a face-to-face interview is a means for a free dialogue with the respondent: he or she can directly explain to the surveyor the perceived consequences of the scenario, the difficulties in coping with the new situation and the reasons for the adopted behavioural response. The surveyor can also strengthen or lighten the pressure in the scenarios in order to observe the critical values of attributes for the respondent. But to be sure of the efficiency of the gaming-simulation, two conditions have to be enforced.

Figure 2: Scene-settings and order of scenarios for the Urban Road Pricing survey

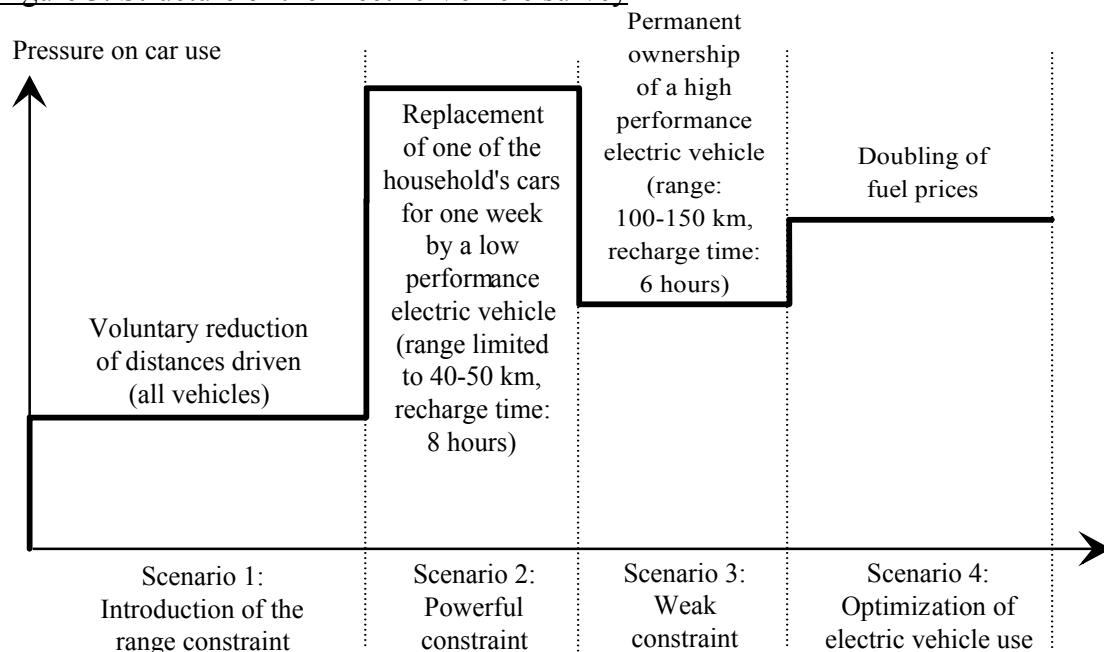


The first condition is to make the respondent enter into the "game" by means of scene-setting. The method has enough flexibility to allow a gradual progression in order for the respondent to willingly express a view about a topic which is as sensitive as urban tolls or limited range vehicles. For instance, in the urban toll gaming-simulation, scenarios were presented in the following order (Figure 2): the first was that of increasing congestion (travel time increase and uncertainty), the second was a temporary banning of car use as a result of a pollution alert. After additional public transport supply was introduced, the last two scenarios involved the pricing of car use - payment for all parking or the introduction of road tolls. The role of the first two

scenarios (increasing congestion and banning of car use) was two-fold: firstly, to present the future in a slightly dramatised form in order to place the respondent in a context which makes the later pricing scenarios seem feasible, and secondly, to justify the introduction of these pricing scenarios on the grounds of the fight against congestion and environmental deterioration. The increase in public transport supply makes the pricing scenarios imaginable. Although the scene-setting of this public transport supply is designed to lower the pressure on car use by replacing the two first scenarios, we must recognise that the perception of the respondents after the congestion and car banning scenarios was somewhat not a complete relief for their car use.

The second condition of efficiency is to introduce pressures on life-styles which elicit reactions from the subject. The choice and order of scenarios is vital in order to lead the respondent to reveal gradually the BRCS components which he or she considers in the context of reorganising his or her travel. The flexibility of the simulation method allowed us to adapt the presentation of scenarios to the situations of individuals in order to elicit a reaction. This is also the question of designing scenarios which produce changes in the respondents' environment which are sufficiently great for them to feel forced to consider making adaptations. We have chosen to alternate phases under which respondents are faced with strong constraints (which oblige them to make choices) and phases when these constraints are relaxed (during which a more comfortable range of behavioural responses are feasible). This process also helps respondents to learn during the gaming procedure and to express the way the rules governing choice change according to the level of constraint.

Figure 3: Structure of the Electric Vehicle survey



For instance, in the electric vehicle survey, the two first scenarios let the respondents perceive the potential consequences of a range limitation on their weekly use of cars (Figure 3) : the first round is to familiarise respondents with the idea of a reduction in their "distance consumption", as the second forces the respondents to cope with a low range electric vehicle (50 km per day). Then the two last scenarios simulate

the ownership of an EV with a better range (100 km per day) : the stable possession of such a vehicle can indeed lead to more fundamental behavioural changes, refers to a long term decision (buying a car) and can induce life-style adaptations. In the fourth scenario, introducing EV use incentives (doubling gasoline prices) is a means to explore to which extent the respondents can optimise the use of their EV.

#### *Which amount of information to provide to the respondent?*

What is the amount of information needed on each of the scenarios, in order to make them clear enough for the respondents ? Do we have to provide a lot of details on each scenario or to limit strictly the information and wait for queries for additional information by the respondents ?

As simulation was based on a sequence of several scenarios, giving a detailed description of all the parameters could lead to the respondent being confused during the gaming exercise (or to interference between scenarios): it is difficult to remember a large amount of information and it also makes it difficult for the person conducting the survey to identify which information has the greatest influence on the choices stated by respondents. On the contrary providing a small initial amount of information encourages respondents themselves to state what information they require. This provides the surveyors with important information about some of the factors which the respondent considers to be important in order to construct his or her behavioural adaptations. However the initial amount of knowledge possessed by the respondent is unknown.

By means of interactivity it is possible to start to explore each scenario by initially supplying only a very limited amount of information about it. This was the case, for example, in the electric vehicle survey, where an over-detailed description of the vehicle itself could have drawn the survey away from the issue of range by focusing the attention of respondents on issues such as the appearance of the electric vehicle. On the other hand, the numerous requests for information (about acceleration, motorway driving, overtaking heavy freight vehicles, turning circle) provided a great deal of information both on the way the new type of vehicle was perceived and on what the household expected from a vehicle. In the case of the urban road pricing survey, a limited initial amount of information was also important to avoid focusing on control measures (motorway-type toll booths or electronic tolling, feasibility of zone-based tolling) and concentrate only on the principle of pricing.

It is clear that giving information on the respondent's request can change their responses. Let us remember that hypothetical situations are here used to encourage the respondents to explore all the behavioural adaptations they can imagine. As the main aim is not to account how many respondents will carry out any particular adaptation, these potential changes are on the contrary an interesting information on the variability of respondents' behaviour and their BRCS boundaries : this is something difficult to appreciate with conventional SP surveys.

### **2.3. Relevance and realism of stated responses in a non experienced situation**

In order to get individuals to respond to untested travel conditions, we have to make them aware of meaningful changes to their own situation. In this kind of survey, the means used to do this is to apply these changes in an activity and travel framework they already know and experienced (the facts base).



For instance, in the case of the urban road pricing survey, this facts base is the activity pattern of a day in the respondent's life: a reaction is thus elicited from the respondent on the basis of trips which he or she has made. In the course of the interview, the interviewer presented the respondent with different constraints which would have the effect of distorting his or her current activity pattern, for each of the scenarios. Only those trips whose origin or destination was in the tolled area and which were made during the toll operation period were included. The effects of congestion were expressed as later and later arrival times for each of these journeys. The effects of toll scenarios were expressed in the form of an amount to be paid for the whole survey day. Thus, for each of the scenarios, the respondent reasons on the basis of impacts on his or her own activity pattern and is able to state plausible adaptations to the various disturbances to his or her travel conditions.

The facts base required differs according the issue being investigated. In the case of the electric vehicle survey the facts base consisted of all trips undertaken using the household's vehicles during one week. The facts base is specified around three criteria :

- who is mainly concerned: the individual or the household ?
- the observation duration: one day or one week or another time period ?
- the most adequate framework to observe changes: activity pattern, trips, car use?

These three criteria have to be combined in order to provide a relevant design of the facts base. This can be explained again with the example of the urban toll survey :

- we selected the individual rather than the household because the former is personally affected by tolling of specific car trips. An individual possesses certain priorities for action which serve as a basis for decisions regarding his or her activity pattern.
- the activity pattern is observed because it is in this framework of his or her personal mobility that the individual will, or will not, modify his or her behaviour.
- one day is selected because it is a sufficiently short period of time in order for the respondent to recall his or her activity pattern easily and report it with maximum accuracy. A day is also a sufficiently long period of time for a behavioural response choice set to be explored. It is quite straightforward to calculate the changes brought about by each of the scenarios in turn and see how they influence the respondent's activity pattern.

But how can we make sure that stated adaptations are realistic ? This problem of realism of stated responses is shared by all the surveys based upon hypothetical situations. In the case of the Stated Adaptations method, the interviewer plays an important role. He or she ascertains that the respondent has correctly understood the scenario and checks the stated adaptations, by relying on the facts base. These stated adaptations must be plausible and compatible with constraints, be they space-time within the activity pattern, interpersonal, or psychological.

As the design of the simulation has shown, a gaming dynamic is essential to understand what motivates the changes made by respondents in their behaviour. The element of play in this technique (which respondents recognise and enjoy) is an important source of stimulation which guarantees their involvement in the survey.

However responses checking is limited by the scope of the facts base. For example, in the urban road pricing survey collecting the individual's entire activity

pattern for one day provided precise knowledge about his or her spatial, temporal and travel organisation, but only limited insight into the interpersonal constraints linking him with the rest of the household. Only information about trips which were made in the company of other persons (who may or may not be members of the same family) allows this issue to be tackled in the interviews, but it was impossible to validate some behavioural changes, for example when it was stated by the husband that his spouse would perform taking children to school or other activities in lieu of him.

Conversely, in the electric vehicle survey, the situation as regards interpersonal constraints was measured well, as simulation was conducted with the presence of the whole family, but a number of trips (walking or public transport trips) were ignored.

### **3. Benefits and limits of Stated Adaptation surveys**

The experience acquired with the two surveys allows us to draw some conclusions of a more general nature regarding the benefits of this simulation technique and some methodological problems which require further study.

#### **3.1. Benefits of this simulation technique**

The existence of interactivity managed by the interviewers during the interview makes this survey technique extremely flexible. Five specific points deserve particular attention:

The first involves the *ability to test complex situations*, which are difficult to deal with in questionnaires. In particular, interactivity provides the means of achieving freer expression which shows more clearly the information which respondents need in order to construct their adaptations.

The second is the method's *ability to explore the choice processes of individuals*, either through the remarks they make about the constraints applied by each scenario, or as a result of observing the way in which they re-organise their activities, or finally as a result of the range of solutions which they consider, whether these are implemented in the course of gaming or not.

The third point relates to the ability to distinguish clearly between *what relates to attitudes* (opinions or judgements of the scenario) *and what relates to behaviour*. It is thus possible to see more clearly how an individual can make a very negative value judgement of a scenario and at the same time adapt to it without too much difficulty. Similarly, the initial stressing of the importance of certain constraints on the activity pattern does not necessarily stand up to the test of events: both in the case of the need for daily range and timetable rigidity we were able to see the extent to which, in the course of giving free expression to their responses, individuals could bring into question factors which had appeared to act as "anchorage points" in structuring their activity patterns.

The fourth point relates to the ability, owing to the presence of interviewers, to *immediately detect non-responses*, refusals or wildly implausible responses, and to cope with them :

- most of non-responses, due to inadequacy of scenarios to affect the individual's facts base, can be avoided by customisation of scenarios ; this customisation does not require a face-to-face interview and can be done in

computerised surveys. However non-responses in the case of non-experienced future situations can also be due to *traumatism*. Traumatism occurs when the respondent feels that the situation is totally incompatible with his or her expectations. An example is a shopkeeper's rejection of the urban toll scenario, or the very fierce reactions of some respondents to the idea of parking charges at their place of work. Similarly, in the case of the electric vehicle, one person reacted very violently to the idea of a considerable reduction in range, considering it to be "a step fifty years backwards". Such attitudes can lead to a powerful bias in gaming and influence the nature of the proposed adaptations. These attitudes would not be detected in mail-back or computerised surveys and it is important to be able to detect them.

- wildly implausible responses occur as a means the respondent uses to escape from their constraints as they become unbearable. This covers systemisation in responses (see below) or responses allowing the respondent to circumvent the effects of the tested scenario on his or her activities : this can be responses like « I will borrow my father's car » in case of household's car unavailability. Whatever the relevance or reliability of this response, the problem is that such stated behaviour cannot produce valuable information on individual adaptation process facing strong constraints. Even if such an attitude has to be recorded as an adaptation that may occur the interviewer as GOD (Lee-Gosselin's proposal for Game Overall Director) can modify the simulation and make the proposed response non valid, in order to explore which alternative behaviour the respondent could adopt if such a solution were not available.

### 3.2. Limits and further work required

As with any survey involving hypothetical situations, biases can be introduced (Soguel, 1994; Pearce & Markandya, 1994). The control of the experimental process, validation using a base of actual facts, customisation and interactivity all reduce the danger of bias. However, there remain several risks of bias : although they are not all specific to Stated Adaptations techniques and can be encountered more generally in stated preference or stated response surveys, they require some precautions during interviewing and further work to be overcome. One of the first concern is to reduce possible interviewer effects as the management of such an interactive survey is complex. This kind of bias can be partly avoided by an appropriate training of the surveyors, and identified and controlled through surveyors debriefing and interview recording.

*Which role do psychological factors play in stated responses ?*

All individuals do not possess the same means for adapting to changes in their travel conditions : these means can be those relating to resources and opportunities available or those relating to psychological factors.

For instance, in the urban toll gaming-simulation, we have detected several different categories of tactics which individuals employ in order to face pressure : these tactics reveal, to varying degrees, the range and extent of the means individuals possess. These tactics were categorised on the basis of the amount of information they provide.

The first two types of tactics reveal that the individual has a good understanding and command of the means at his or her disposal. The "experimental" tactic is for the

individual to make a completely fresh appraisal of the situation every time the context changes. In the "cumulative" tactic the respondent faces the increasing temporal or financial pressures by gradually building on the solutions which are available to him or her, without questioning the adaptations which he or she chose previously.

The two other types of tactics provide little information about choice processes. The "passive" tactic is characterised either by hesitation between two solutions or by a type of passivity which leads the respondent to choose an action almost randomly without any real thought. The "systematic" tactic is to adopt a set of several measures which the person will use invariably whatever the nature of the applied pressure, until a threshold is reached : then the same type of reaction is always triggered.

This is why stated response methods are productive with some individuals, less productive with others. However these response tactics may also be linked to two possible biases in the conduct of the survey :

- the *memory effect* occurs when respondents have a tendency to repeat the actions which they performed in a previous scenario. Put another way, they do not attempt to absorb all the characteristics of a new scenario but merely re-state their earlier choices. This gives rise to remarks such as "remind me of what I did in the last scenario ..." or "in that situation I would behave the same as before...". It is difficult to interpret this phenomenon. It may mean either that the respondent is tired of the game or simply averse to change. It can also, however, be the result of a single strategy of adaptation which reveals that powerful constraints apply to the individual's choice set. The person conducting the survey can minimise this bias by checking that the suggested actions are coherent with the scenario in question and can be validated with reference to the respondent's fact base.
- *Systemisation* occurs when respondents propose only generalised strategies which are able to solve all the problems associated with the constraints in the scenarios. In this case, dialogue with respondents should verify the relevance and realism of the strategy, as this may express an anti-game mentality. The systematic cancellation of certain activities or the permanent transfer of habitual car users to public transport are suspicious. One way of validating the choice is to ask how respondents would adapt if such generalised solutions were not allowed in the game.

So the issue to be solved is the relative influence of individual resources and opportunities, survey biases and psychological factors in the construction of responses.

#### *Learning process and stability of stated behavioural responses over time*

This point relates firstly to the importance of the *learning process*. During the game, the succession of scenarios gradually improves respondents' understanding of the way each scenario affects them in practical terms. They thereby obtain a fuller understanding of the tested environment in relation to their activity patterns. Repeating the exercise of re-organising trips over the analysed period leads respondents to improve the way they control the parameters which condition their choices. The construction of adaptations often undergoes a refinement process: the ability of respondents to remember the actions which they chose in previous scenarios also helps them to identify the main issues more quickly and suggest more realistic actions. They can even take the place of the surveyor and check their actions themselves. However,

this observation highlights one of the central issues of gaming-simulation: although the scenarios are independent they have a cumulative effect on behavioural adaptations which makes a direct comparison with the initial activity pattern difficult.

How is it possible to assess the stability of stated behavioural responses over time? This is a difficult problem, which applies to all stated response techniques and which involves two aspects. The first is that of applying the stated behaviours for one day respondent's trips, and the second is knowing how these behaviours can change over a longer period of time :

- in the first case, if travel practices are known (stated frequencies) it may be possible to distinguish between customary and occasional trips: the first ones generate behaviours which are stable over time, while the second ones seem to be dictated by specific rules of a different nature.
- in the second case, the learning process and experience acquired during simulation give the impression that scenarios which simulate the long term burden of constraints could allow us to estimate the level of accumulated constraint which could ultimately lead to a sudden behavioural change (such as the monthly or annual cost of tolls). In this respect, it should be noted that respondents always refer to their behavioural changes as 'a trial' - behavioural responses are frequently conditional, as if only real-life experience could allow respondents to appraise the accumulated strength of the constraints in each scenario. Respondents find it difficult to imagine possible changes in the structure of their life style.

For this reason, on each occasion, a clear distinction must be made between stated responses which relate to the facts base (i.e. the period under study) and those which concern more general, permanent, behaviour. This check should be carried out during each scenario.

This leads us to underline another methodological challenge, controlling change. During the experimentation, information is made available at a few stages in the interview during which the individual carries out his or her learning processes. This learning is made in an accelerated manner, if we consider that in real life many months or years are needed to attain such a level of learning. This could introduce a bias in what, in reality, would be the resulting behaviour. The importance of the control of information provision and its speed as a factor of behaviour change, underline the need to take up this methodological challenge.

The last point is not the least important. The structure of the game leads to respondents being asked to *reconstruct their day at a later date*. As a result, the respondents possess more information during the game than when they made their trips. Thus, for example, simulated congestion will not have the same results when it is discovered during a trip as when it is known about before setting out. Similarly in the case of the electric vehicle, respondents seemed to have very little knowledge about the lengths of each of the trips they made at the time they made them, whereas they possessed this information during the game. Moreover it is clear that for a number of individuals whether or not to make a trip can be an instantaneous decision taken on the basis of constraints which are felt at the time. Reconstruction on the basis of the time-space diagram can therefore be misleading, far removed from the conditions of real-life decision-making. For this reason, whenever possible, it is necessary to enquire whether each trip is exceptional or frequent, planned or unplanned (see Gärling, 1997). This

provides an understanding of respondents' margins for manoeuvre and avoids erroneous interpretations of some behavioural responses.

However, this reconstruction bias, which applies to every stated response technique using activity patterns, is less of a problem if we focus on the choice *process*, as in this type of Stated Adaptation technique, rather than on stated choices themselves.

## **Conclusion**

Coping with the challenges which emerge from new transport demand management policies implies an evolution in the type of data on travel behaviour. The Stated Adaptation survey focuses on the observation of the behavioural response choice process, as a means to understand how individuals will react to new transport policy. This qualitative approach is not only a preliminary observation of the potential changes in travel behaviour. It can also be considered as a tool to produce new behavioural hypotheses in four types of situations: i) when individuals are going to be confronted by an inexperienced situation; ii) when the models obtained from Stated or Revealed Preference surveys do not provide a statistically satisfactory representation of behaviours; iii) when an attempt is made to understand the mechanisms of behavioural change, for example in order to explore how individual behaviours will change in the longer term; iv) in order to investigate the social acceptability of new policies.

This method is however complex and expensive to use: apart from conducting the interviews themselves, which requires trained staff who are able to direct a game which sometimes lasts two hours, the processing and analysis of data is both time-consuming and difficult. For these reasons customised surveys of this type cannot be considered for large samples : their use can only be exploratory and the validation of the new behavioural hypotheses has to be done with more quantitative methods. However, the quality of the information obtained justifies the effort involved, as it provides an indispensable insight prior to the implementation of more conventional stated preferences methods. In addition to what can be learnt directly from the surveys we have discussed, the potential for this technique in the area of transportation should be emphasised. Further use of SA surveys is planned on topics as varied as the influence of the quality of service provided by public transport on modal choice, making the choice between several competing routes, or measuring the individuals' willingness to adopt a more sustainable mobility

## **Acknowledgements**

The researches upon which this paper is based have been sponsored by the French Ministry of Transport (Research Direction, DRAST, PREDIT, n°92.0013) for the urban road pricing survey, and the French Environment and Energy Saving Agency (ADEME, Transport Dept, n° 2 03 0049) for the electric vehicle survey. The paper benefited of helpful comments by Martin Lee-Gosselin and anonymous reviewers.

## References

- Bonnel P, Chapleau R, Lee-Gosselin M, Raux C (1997) *Les enquêtes de déplacements urbains. Mesurer le présent, simuler le futur*. Editions du Programme Rhône-Alpes Recherches en Sciences Humaines, Centre Jacques Cartier, Lyon, 513p.
- Faivre d'Arcier B, Nicolas JP, Andan O (1996), *Les réactions à la voiture électrique - recherche exploratoire sur les comportements et les attitudes des ménages*, Rapport INRETS n°210 , Arcueil, France
- Gärling T (1997) Reintroducing Attitude Theory in Travel Behaviour Research: the Validity of an Interactive Interview Procedure to Predict Car Use. *Transportation vol. n°*.
- Jones P (1979) HATS: a Technique for Investigating Household Decisions. *Environment and Planning, A* vol. 11
- Kurani K, Turrentine T, Sperling D (1994) Demand for electric vehicles in hybrid households : an exploratory analysis, *Transport Policy* 1 :4, October, pp. 244-256
- Kurani, K.S, T. Turrentine, Sperling D.(1996) "Testing electric vehicle demand in "hybrid households" using a reflexive survey." *Transportation Research D*. v. 1 n. 2. 1996.
- Lee-Gosselin M (1990), The dynamics of car use patterns under different scenarios : a gaming approach, in Jones P (Ed), *Developments in Dynamic and Activity-Based Approaches to Travel Analysis*, Oxford Studies in Transport, Gower Press, Aldershot, UK
- Lee-Gosselin M (1996) The Scope and Potential of Interactive Stated Response Data Collection Methods, in: *Household Travel Surveys Transportation Research Board Proceedings 10, Washington DC*
- Pearce DW, Markandya A (1994), *L'évaluation monétaire des avantages des politiques de l'environnement*, OCDE, Paris, France
- Polak J, Jones P, (1997) Using stated-preference methods to examine travellers preferences and responses, in Stopher & Lee-Gosselin, (1997), (Eds) *Understanding Travel Behaviour in an Era of Change*, Pergamon, pp 177-207.
- Raux C, Andan O, Godinot C (1994), The simulation of behaviour in a non experienced future : the case of urban road-pricing, *Seventh International Conference on Travel Behaviour Proceedings*, 13-14 june
- Raux, C, Andan, O, Faivre d'Arcier, B, Godinot, C (1995) *Les réactions au péage urbain. Enquête exploratoire*. Etudes et Recherches, Laboratoire d'Economie des Transports, Lyon, 163p.
- Soguel N (1994), *Evaluation monétaire des atteintes à l'environnement : une étude hédoniste et contingente sur l'impact des transports*, Imp. L'Evoile SA, Neuchâtel, Switzerland
- Stopher P, (1997) Current transportation planning and modelling data needs in the USA : a review of separate and joint strategies for the use of data on revealed and stated choice, in Bonnel et al. (1997) op.cit.

Stopher P, Lee-Gosselin M (Eds) (1997) *Understanding Travel Behaviour in an Era of Change*, Pergamon, 583p.

Turrentine T, Lee-Gosselin M, Kurani K, Sperling D (1992), A study of adaptative and optimizing behavior for electric vehicles based on interactive simulation games and revealed behavior of electric vehicle owners, paper at the 6th WCTR, Lyon

## **Contributors**

Bruno Faivre d’Arcier is a research director at the French National Research Institute on Transport and its Safety (INRETS), dept. of Economy and Sociology Applied to Transport. His main fields of research are urban transport planning processes, public policies assessment methods and travel behaviour analysis.

Charles Raux is a senior research engineer at CNRS-LET (Laboratoire d’Economie des Transports). His main fields of research are urban transport analysis and modelling, financing and pricing urban transportation.

Odile Andan is a researcher at CNRS-LET (Laboratoire d’Economie des Transports). Her main fields of research are urban transport analysis, traffic congestion sources analysis and transport demand management policies.