Cognitive Laboratory Approach to Instrument Design

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ABSTRACT

In a multi-cultural environment with different legal conditions and population structures it is necessary to develop a method which can deliver reliable and comparable data of a high quality to build up a database of European travel behaviour as an invaluable tool for policy makers. Recognising this necessity, the European Union commissioned the project MEST (Methods for European Surveys of Travel Behaviour). MEST aimed to develop a benchmark survey of long-distance travel behaviour, which can be applied across Europe with questions understood in all member states of the European Union, the prerequisite to the cost-efficient collection of data. A series of three waves of pilot surveys in various countries is the main tool to achieve this aim.

The first wave of pilots included extensive pre-testing of the survey instrument as well as the concepts that lie behind travel diaries in general. For these cognitive laboratory exercises, "think-aloud"-interviews, a method to study cognitive processes in respondents, were used. These type of interviews help detecting weaknesses of design, question wording and order and the respondents' involvement in the survey. The exercises of the first wave took place in the UK and France. Based on the results of the first wave's cognitive laboratories, the questionnaires were improved and tested in the second wave of pilots. Before the third wave of pilots started the improved instrument was again tested in cognitive laboratories. This time only questionnaire pre-tests were undertaken in Portugal and Sweden.

The paper will report the results of the cognitive-laboratory exercises. It will present the improvements of the survey instrument based on the knowledge gained about the respondents' difficulties.

INTRODUCTION

Experienced survey researchers (Richardson, Ampt and Meyburg 1995) have repeatedly stressed the importance of survey pre-tests. They help to develop questionnaires that deliver data of high quality by making sure that the questions and reply-categories provided are easy to understand by the respondents. The questions should be non-threatening and non-intrusive and the wording should be as unambiguous as possible. Also the structure of the questionnaire, the order of the questions and the layout of self-completion surveys should be in line with the respondents' view rather than the researcher's view (see Meyburg 1997)

This paper provides a brief overview of the most common methods for pre-testing survey questionnaires and explains the procedure of cognitive laboratories as a means to study the perception of the survey by the respondents.

As an example for the use of the cognitive laboratory approach the work on the European Union funded project MEST (Methods for European Surveys of Travel Behaviour) is discussed in more detail. The project made extensive use of the cognitive laboratory approach to design a European benchmark survey for measuring long-distance travel behaviour.

PRE-TESTING QUESTIONNAIRES

Methods

There are several methods that can be used to test survey questionnaires, before the actual fieldwork takes place, of which the most common are the following:

- *Experts groups*

  The researcher who carries out the survey assembles other experts in the field of the study

to evaluate the quality of the questionnaire. This method can utilise the different experiences of other researchers. The weakness of this method is the lack of contact with "real" respondents and the danger of repeating undiscovered errors made in previous surveys.

- *Focus groups*

  Groups with 6 – 8 people, ideally members of the survey target group, discuss the strengths and the weaknesses of the questionnaire in detail. This method is a very cost-effective means to gain insight into respondents' perception of the survey. The dynamics in the group can serve to develop suggestions to improve areas that are difficult or unclear to the respondents. The weakness of this method is the loss of detailed information on the individual and the danger of group influence.

- *Cognitive laboratories*

  Respondents of these face-to-face interviews are probed to think aloud while they complete the questionnaires. During the exercise there is ideally as little as possible interviewer interaction. After the test the respondents are asked about their overall perception of the questionnaire and the survey topic and can give more detailed comments on their difficulties with certain areas of the questionnaire. There is also room for suggestions by the respondents to improve the survey.

- *Pilot tests*

  Pilot surveys are strictly speaking not a pre-testing method, but the second step after thorough pre-tests of the questionnaire design, to test all aspects of the survey. However in this step some information about the instrument design can be collected, which may lead to improvements of the questionnaire before the real survey. The survey is carried out with a small part of the original sample. In the case of telephone or face-to-face surveys the reactions of the respondents can be judged and commented on by the interviewers. Also it is possible to add questions about the design of the questionnaire to the interview. In the case of a self-completion mail-back survey the response rate, the rate of item nonresponse

and the quality of the data are the only indicators to help discover weak parts of the questionnaire design.

Common reasons for omitting pre-tests

There are three common reasons why the thorough pre-testing of questionnaires is often omitted in the planning process of surveys:

1. *Time restrictions*

   Intensive pre-testing and the analysis of the results and the possible changes to the questionnaires that have to be considered after the tests are considered to delay the field work.

2. *Budget restrictions*

   Perhaps the most common reason?!.

3. *Routine*

   Questionnaire pre-tests are considered to be unnecessary if the researcher is very experienced in designing surveys or if a very common design is used.

The shortsightedness of these reasons becomes obvious at the latest in the data analysis phase. Time and cost savings in the instrument-testing phase are likely to cost time and money when the collected data is to be analyzed and summarized in a report.

Seymour Sudman and Norman Bradburn, authors of several books on survey design recommend: ”If you don’t have the resources to pilot-test your questionnaire then don’t do the study!” They also stated that “even after years of experience, no expert can write a perfect questionnaire” (Sudman and Bradburn 1983).

COGNITIVE LABORATORIES IN TRAVEL SURVEYS

General State of Practice

The application of cognitive psychology to the examination and assessment of survey measurement error is now well established in many areas of market research and sociological studies (see Sudman, Bradburn and Schwarz, 1996 or Tanur and Fienberg 1992). The widely spread perception that travel surveys give only non-attitudinal and factual information about the respondents' actual movements and some socio-demographics could be the reason for the under-estimation of the importance of good questionnaire design, even for travel diaries. Whereas the necessity to test the question wordings and order in attitudinal questions is widely accepted, the same is not true for surveys which collect only facts about the respondents.

The design of travel diaries is often copied from "good examples"; i.e. the most commonly used ones, assuming that the designers of the original questionnaire undertook thorough pre-tests. But also assuming that the results of the pre-tests would still be valid after several years and for the particular sample of the new survey and that several small changes made by the current researcher have not affected the quality of the questionnaire. There is also a false understanding that the response rate to a survey is the only measure of quality. Therefore designs that have achieved a high response rate in a previous survey are adopted for surveys without investigating the possibly different backgrounds of the sample and the circumstances of the survey. There is a belief that something that has once proved to be good cannot be further improved, which for example leads to the reproduction of the KONTIV travel diary, designed for the German market over 20 years ago, in current travel surveys in different parts of the world.

The studies undertaken in the course of the MEST projects and the results of the pilot surveys carried out in four European countries showed that the assumption of a homogeneous world that has not changed for decades cannot hold.

Methodology

Cognitive laboratory exercises are face-to-face interviews ideally undertaken in the respondents' normal environment: their homes or their workplace. Respondents of this type of interviews are told that the researcher is not only interested in their answers to the questions in the diary or the socio-demographic forms but also in the methods used to arrive at them. The respondents are therefore asked to "think aloud", expressing everything that goes through their minds while retrieving the information from their memory or using the help of other persons, diaries or timetables to complete the forms. The interviews are either audio-or videotaped giving the researcher the opportunity to see which areas of the questionnaire are difficult and which areas are answered with ease. The actual time of information retrieval and possible misunderstandings of concepts can be observed

Although this method gets very close to the real settings in which a questionnaire would be completed, it has certain limitations:

- Dedicated and defined time frame

  In a normal setting respondents might undertake the completion of a survey form over several days, whereas in the case of the cognitive laboratory exercises the respondents are forced to complete the forms in the set timeframe
- Presence of interviewer

  The influence of the interviewer's presence cannot be underestimated. The respondents in an experiment tend to be more thorough in giving detailed and correct information and also the rate of respondents "giving up" before finishing the task will not be comparable to a real situation.

Cognitive laboratory exercises are a qualitative research method and should be treated as such. Any expectations on representation of a population and also any kinds of quantification of the results run the risk of failing. However respondents in cognitive laboratory type exercises provide the researcher with invaluable information about the quality of the design of a survey instrument, which is difficult or impossible to achieve with any other method.

THE MEST PROJECT

The project Methods for European Surveys of Travel Behaviour (MEST) was commissioned by the European Union out of the necessity to develop a methodology to collect consistent and comparable travel data from all member countries of the EU. A review of long-distance travel surveys undertaken in various countries across Europe showed that the methods used for sampling, the survey instruments, protocols and units were different in all countries, so that it is virtually impossible to merge the collected data to a European database (see Youssefzadeh and Axhausen 1996).

Naturally one is tempted to assume that a survey instrument developed and tested in one country only needs to be translated into other European languages and the same instrument can then be used equally across Europe. In fact language differences represent some of the smallest barriers on the way to developing a harmonised survey instrument, which is understandable across Europe and successful in terms of its reliability and its accuracy as well as in capturing the correct data, its validity and its cost-efficiency.

Furthermore cultural differences have to be considered in the survey approach. This affects the design of the survey instrument, i.e. the contents of the questions and their order and the layout in which they are presented. Questions that present no threat or intrusion to one culture might be rejected by another (Sudman and Bradburn 1982). But also the survey protocol and the data collection method might lead to different response behaviour in different European countries.

People in some countries perceive surveys in general and telephone surveys in particular as an intrusion into their private lives, which is partly due to the over-surveyed society well observable in the UK and partly in France. Others are happy to reply to questions as long as they are not approached in person but only on paper, whereas respondents in Southern European countries seem to prefer the personal contact with the interviewer to a selfcompletion mail survey. In terms of sampling, every country has its own regulations and possibilities, which have to be considered. Data protection laws vary in each country and can cause problems for a European Survey, if they are not followed. So

translating survey forms is not a sufficient way to produce a survey, which would be “understandable” and efficient in costs and results across Europe.

To develop and test a suitable survey method, which provides comparable data of a high quality the similarities and differences of respondents’ behaviour in different countries have to be observed, measured and implemented in one instrument. That was the aim of the MEST project, which could have been described as a huge pre-test to the real European long distance survey. At the same time EUROSTAT, the statistical office of the European Union, has been co-ordinating studies to test a common set of definitions for long-distance travel diary surveys (EUROSTAT 1995 and Axhausen 1998).

Within the project three of the above mentioned pre-testing methods were implemented.

- *Discussions with groups of experts*

  The project Consortium consisted of 12 partners from 8 European Countries that contributed to the design of the survey with specific experiences in their respective countries. Also during the 36 months of the project, three workshops were organised in which about 50 participants from different European and Non-European countries discussed the outline and the overall aim of a multi-national long-distance travel survey. Participants were survey researchers from Universities, private consultancy firms or Government authorities.

- *Pilot-tests*

  There were three waves of pilot surveys undertaken with a relatively small sample in four rather diverse member countries of the European Union (France, Sweden, Portugal and the UK). The surveys were carried out by market research firms with specific experience in carrying out travel surveys.

- *Cognitive laboratories*

  Think-aloud exercises were carried out in all four test-countries together with the first and

the second wave of pilot surveys. The outline and the results are described in detail in the next chapter.

MEST PILOT SURVEYS (WAVE 1)

The aim of the initial cognitive laboratory exercises was not only to test the survey instrument, but also the concepts that lie behind travel surveys in general and the requirements of EUROSTAT in particular.

As a starting point for further tests and improvements a travel diary was designed which was partly based on the experiences of the Austrian EUROSTAT pilot surveys (Axhausen, Köll and Bader 1996). So the instrument as well as the protocol had been successfully tested and provided a solid basis for comparison and further improvements.

Design and protocol

The first wave of the development of the benchmark survey included initial person-based pilot surveys in Portugal and Sweden. At the same time cognitive laboratory exercises were carried out in the UK and France.

The instrument consisted of a “small set” and a “large set” which concerned the amount of detail enquired about the household socio-demographics and the travel activities. The remaining possible dimensions, which could be varied and would have an effect on response behaviour and data quality, were fixed as follows:

Survey object:	All stages of journeys, involving at least one destination further than 100 km from the current base (reference location) of the respondent. Tours within the destination area do not need to be reported.
Survey period:	(reporting period): 6 weeks
Overall approach:	Stage-based, i.e. movements with one mode; with some journey level questions, i.e. questions regarding the whole movement from home (reference location) and back
Minimum distance:	100 km from current base (reference location)
Minimum duration:	None
Temporal directions:	Prospective and retrospective
Geographical exclusion:	None
Survey package:	Household questionnaire (including questions concerning the household, its members and the vehicles owned by it) Travel diary
Explanatory material:	Separate explanatory booklet including examples of journeys and brief explanations on the journey form
Data collection method:	Selfcompletion mail-out and telephone
Incentives:	None
Destination area:	Municipality or urban area
Reference location:	Any destination, where the respondent stays for more than one consecutive night.

The household questionnaire was designed in a landscape format (A3 folded to A4) allowing enough space for socio-demographic information about all household members and the characteristics and usage-schemes of vehicles owned by the household.

The stage-based travel diary adapted a column-based design in portrait format, with three columns per A4 page, similar to the KONTIV design (Axhausen 1995). The six available columns were allocated to one column of journey-level questions and five columns for each stage.

Cognitive laboratory exercises

The work in this part of the first wave of pilot surveys carried out in France and the UK consisted of two elements for each respondent:

1. A pre-test of one of the two currently used survey forms involving think-aloud protocols, respondent observation and discussion in a laboratory setting:

    - "large set" (longer version of household and travel questionnaires)
    - "small set" (shorter version of household and travel questionnaires)

2. Three out of five smaller task-oriented surveys highlighting particular and problematic aspects of travel diary surveys; again to be performed in a laboratory setting preferably in the respondents' homes:

    - *Explaining the stage* – respondents had to divide hypothetical journeys, described in little stories or drawn on maps into stages according to the given explanation of the concept of a stage.
    - *Capturing activities* – paraphrased description of activities had to be assigned to the categories in the questionnaire
    - *Car availability* – three types of questions about respondents' car availability were tested: an added page to the person form requiring detailed responses, an added question to the person form and a question about car availability on each stage of the journey added to the travel diary
    - *Capturing the route* – respondents were asked to remember recent car journeys, filling in an alternative travel form asking about "bigger towns passed" or "major

junctions and important roads" or public transport journeys, completing a travel diary with an added question about "main points along the route"

- *Capturing the mode* – descriptions of modes were to be classified against the mode codes provided on the short and the long versions of the travel diary

Exercise results

Questionnaire pre-tests

One of the major complaints of the interviewees was difficulty with the readability due to the relatively small fonts. It has to be pointed out that the target population of the EUROSTAT survey in Austria, of which the questionnaire design was used, had been considerably younger (between 15 and 45) than the sample for the MEST pilots. But the packed design of the stage-based KONTIV design with its three columns per page, one of the most commonly used designs for daily regional travel diaries, did not allow for larger fonts.

The respondents assessed the following tasks as very important:

- consistent layout, making clear whether a number, a written reply or a cross (tick) was required
- clear and easy guidance through the columns of the travel diary
- a category of "not applicable" and the opportunity to give further written descriptions in case of use of the category "other"
- the possibility of multiple response for several questions
- a larger number of categories to choose from (preference for the long version of household and travel questionnaires)

The interviewees tended not to read the explanation booklet in advance, but rather used it as a reference when they had difficulties in understanding a question.

Explaining the stage

Surprisingly the exercise showed that there were no learning effects, i.e. respondents easily completed the forms for the invented journeys, but had difficulties afterwards dividing their own journeys into stages.

Other results were the effect of repetitiveness, which led to a decrease in the level of detail with the number of stages to be described. The think-alouds also proved that respondents considered short stops en route as irrelevant and did not report them. This information about the perception of the importance of information can be very useful in the understanding of reasons for item nonresponse in surveys.

Capturing activities

Most respondents wished to have the possibility of multiple response. The response categories provided were not always considered to be unambiguous and mutually exclusive.

Car availability

Public transport users considered the whole question as irrelevant and tended to skip it. In the UK context it proved to be more efficient to ask a question related to the terms of insurance as every driver's name has to be mentioned in the insurance contract.

Capturing the mode

Again the respondents showed a clear preference for the larger version of the forms allowing for more categories to choose from. It was seen as very important that the categories are mutually exclusive. Also all categories should be clear to everyone, even if the mode described was not used, its presence on a list of categories would cause confusion and frustration to the respondents who did not

fully understand what was meant by it. Terms such as “charter” versus “scheduled” or IC/EC trains (Intercity/Eurocity trains) were not understood by everyone.

Capturing the route

The exercise proved to be especially successful with car drivers who almost without exception had a perfect knowledge of the roads used and who had no difficulties in explaining their routes. Whereas in the case of domestic travel the interviewees remembered the major roads better, in the case of international travel they preferred the question about bigger towns passed .

MEST PILOT SURVEYS (WAVE 2)

The second wave of MEST pilot surveys included no cognitive laboratory exercises. The emphasis at this stage of the project was to take on board the results of the pilot surveys and the cognitive laboratory exercises of the first wave and implement them in a new instrument design. The new design would then be tested in all four pilot countries, France, Sweden, UK and Portugal. The reaction of the respondents to the overall survey design and specific aspects of it was investigated in a follow-up telephone interview.

Following the results of the cognitive laboratories in which the respondents had expressed a preference for larger fonts and a clearer design, a new page-based travel diary was designed, which allowed for enough space for respondents’ comments and a high grade of readability.

Changes made in the second wave

Survey instrument (general)

The design of the stage-based travel questionnaires, which had been tested in the first wave of pilots, was varied in a way to help the respondents read and understand them. Also many changes were made in the content of the questions and the categories offered.

Household Questionnaire

The results of the first wave of pilots and the cognitive laboratories suggested the use of the long set of questions and thus collecting more socio-demographic information about the respondents and members of their households as there was a clear preference for a larger number of categories to choose from. Also once involved in the survey the respondents seem not to mind a larger set of questions.

The long questionnaire was an improved design and some of the questions were re-worded in order to make them less ambiguous and clearer. This was particularly the case for the vehicle form, which in the first wave included questions about the share of usage each household member had for each vehicle and also the share of fixed and variable costs amongst those household members who used the respective vehicles.

Travel Questionnaire

As an alternative to presentation in columns, a page-based design was developed that was supposed to give an easier overview of the questions and answering categories, even for aged respondents. Especially the page-based, but also the column-based questionnaire was improved in terms of readability. Larger fonts and only two columns per page were used, which also helped the guidance through the forms.

The parts concerning journeys and trips/stages were clearly separated so that less confusion might result regarding the different concepts. Also the question order was varied to be more in line with the way the interviewees remember their journeys. To increase the involvement of the respondent in the survey and lower the repetitiveness, the respondents were asked to give each of their journeys a name. This was also done to study how people remembered their journeys and which clues they used to recall information about journeys.

Survey object:	All trips/stages of journeys, involving at least one destination further than 100 km from the current base (reference location) of the respondent.
Survey period:	(reporting period): 4/8 weeks
Overall approach:	Stage-based, i.e. movements with one mode; trip-based, i.e. movements towards the final destinations and back; with some journey level questions, i.e. questions regarding the whole movement from home (reference location) and back
Minimum distance:	100 km from current base (reference location)
Minimum duration:	None
Temporal directions:	Retrospective
Geographical exclusion:	None
Survey package:	Household questionnaire (including questions concerning the household, its members and the vehicles owned by it) Travel diary
Explanatory material:	Separate explanatory booklet (re-designed) including examples of journeys and brief explanations on the journey form
Data collection method:	Selfcompletion mail-out
Incentives:	None

Destination area: Municipality or urban area

Reference location: Any destination, where the respondent stays for more than one consecutive night.

Results of the second wave of pilots

The main issue studied in the second wave of pilots was the quality of the survey instrument. Respondents in general felt more comfortable with the improved design. The explanation booklet was easier to use and the layout of the questionnaires allowed for a very good readability and enough space for written replies.

But despite the improvements, respondents still proved to have difficulties dividing their journeys into trips or stages. The main problem was the omission of return trips/stages to the origin of the journeys, which many respondents either forget or perceive as being irrelevant, although the instructions on the forms repeatedly ask for the inclusion of the returns back home. In these cases and in cases where responses were not clear or wrong or individual questions were not answered, the follow-up interviews proved to be very helpful. Especially as in all four countries a very high percentage of the respondents, who had already completed the forms were willing to participate in a telephone interview.

Clearly the page-based layout of the travel diary was the preferred one by the respondents. The trip design was assessed as being less repetitive and easier to complete. The separation of records of journeys from the records for trips and stages entailed in them was extremely successful. Journeys were very rarely underreported. Respondents felt that giving each journey a “name” was a good idea. Also the results of the analysis of journey names used proved that a vast majority of respondents either used the destination or the travelling purpose as a brief description of their journeys. This result supported the newly implemented question order, where purpose and destination were the first questions asked instead of the more common order in travel diaries, which starts with origin and departure time,

continuing with travel mode and purpose, before a question about the destination is asked. Meyburg (1997) recommends designers of travel surveys to provide "logical and intuitively obvious sequencing of blocks of questions and questions within such blocks" without " forcing the respondents to make mental jumps". The questions on the travel were divided into three blocks, of which the first one collected information about what respondents thought was most important, which is the destination, the reason why they travelled to that destination and whether they stayed there overnight. The second block included questions about how the destination was reached: the travel mode and any difficulties encountered while travelling. The third block asked about the cost of the trip, divided by travel costs and costs of overnight accommodation.

Overall, item nonresponse was considerably lower than in the first wave of pilots and resulted mainly from the failure to record "zero" or "not applicable". Whenever certain questions were not answered the main reason was the lack of understanding of the categories provided, resulting in assessing the question as irrelevant or in other cases the simple lack of knowledge about other household members' sociodemographic details.

MEST PILOT SURVEYS (WAVE 3)

The third wave of pilots was based on three elements:

- One identical benchmark survey in all four countries
- One additional test survey in each of the four countries
- Cognitive laboratory pre-tests of the main survey instrument and some aspects of the survey protocol

Benchmark survey

For the third wave of pilots the page-based design of the trip-based travel diary was selected as the instrument for the general survey, which was carried out identically in all four countries. Considering

respondents' reactions and their comments and suggestions in the second wave, some changes were made to the instrument.

The respondents' interest in the survey topic had proved to be one of the most important reasons for participation in surveys. To raise the respondents' involvement two additional items were implemented: a question about the personal assessment of the trip and the offer to inform the respondents about the results of the survey.

Following Ampt's recommendations to reduce respondent's burden (Ampt 1997) a more colloquial language was implemented, i.e. expressions like "mode", "destination" and "origin" were generally avoided.

Also the survey protocol was varied including a mix of methods (mail and telephone) regarding the contact with the respondent (for more detail see Youssefzadeh and Axhausen 1998).

Survey object:	All trips of journeys, involving at least one destination further than 100 km from the current base (reference location) of the respondent.
Survey period:	(reporting period): 8 weeks
Overall approach:	Trip-based, i.e. movements towards the final destinations and back; with some journey level questions, i.e. questions regarding the whole movement from home (reference location) and back
Minimum distance:	100 km from current base (reference location)
Minimum duration:	None
Temporal directions:	Retrospective
Geographical exclusion:	None
Survey package:	Household questionnaire (including questions concerning the household, its members and the vehicles owned by it) Travel diary

Explanatory material:	Examples of journeys and brief explanations included in the travel form Examples and explanations on the household questionnaire
Data collection method:	Selfcompletion mail-out and telephone follow-up
Incentives:	None (Offer of survey results)
Destination area:	Municipality or urban area
Reference location:	Any destination, where the respondent stays for more than one consecutive night.

Additional Surveys

In addition to the identical benchmark survey, there were further elements tested in each country with part of the sample.

Survey No. 1. (France)

An option to avoid memory effects and their results are prospective surveys in which the survey is announced before the actual reporting period begins. To allow comparisons between the retrospective and the prospective method an additional prospective survey was undertaken with part of the sample in France using the same survey material as in the benchmark survey.

Survey No. 2 (Portugal)

Part of the sample in Portugal received the same survey material as in the benchmark survey, but was then phoned after their written reply and questioned about the stages within each reported trip. It was attempted to reduce the burden when filling in the forms by asking the respondents to report only on trip level and still collect information about the stages of the journey using the telephone (where explanations can be given to the respondents more easily).

Survey No. 3 (Sweden)

The pilot surveys of the first and the second wave and also the benchmark survey in the third wave were based on a mixed household/person approach. The sample was person-based and whereas only one person of the household was asked to report their trips, socio-demographics were collected from all household members on one single household questionnaire completed by the person in the sample. This approach raised concerns about privacy and the lack of knowledge about the socio-demographic details of all household members by the respondent. The additional survey undertaken with part of the Swedish sample was a purely person-based approach.

Survey No. 4 (UK)

For the fourth additional survey, carried out with part of the sample in the UK, a trip-based diary was designed using the results of the cognitive laboratory interviews of the first wave of pilots, in which respondents had described their chosen routes on the travel diary. The question about the chosen route added to the trip report was seen as a possible alternative to a stage-based design.

Exercise results

Before the pilot surveys were carried out a set of cognitive laboratory pre-tests were undertaken in Portugal and Sweden to assess the quality of the instrument allowing for changes before the survey was mailed to the respondents.

Again, where possible, the interviews were undertaken in the respondents' homes allowing the respondents to use all the materials they would use under "normal" circumstances, like for example, diaries, maps and timetables. Some respondents also consulted other household members, as would be the case if they participated in the real survey.

As in the first wave the time that the respondents spent on completing the forms and with each part of the questionnaire was recorded. It was noted that the explanatory booklet was ignored in most cases, which explains most of the missing items and the skipping of the "not applicable" category. Those who

used it mainly read it before filling in the forms without referring to the examples while replying to the questions. Only a small minority actually used the explanatory booklet as it was intended, which is reading it before completing the forms and referring to it, if help was needed.

Those respondents, who used the booklet, found that the examples were helpful or very helpful. Those who did not use the example booklet suggested including examples on the forms.

Most respondents found the general layout clear and easy to read. The household questionnaire was rated higher than the travel diary, which was stated by some respondents to be too densely filled, but understandable. The landscape format of the household questionnaire was criticized by many respondents as not being easy and practical.

Difficult areas were in general understanding the concepts of trip and journey and therefore remembering to report the return trip. Respondents often skipped questions when they thought their reply would be irrelevant or when they thought that the question did not apply to them as the right answer would have been “0” or “not applicable” or ”none”. The order of completing the information about the household members which was starting from the oldest member going down to the youngest caused some difficulties as it was often overlooked.

When exact numbers were required, as in the case of the overnight stays at the destination of a trip, the respondents showed severe difficulties. This was partly due to the question wording and partly due to the difficulty of distinguishing the concepts of trip and journey. It was also very difficult for respondents to give estimations, e.g. for the car mileage in the last 12 months or the share of vehicle costs for each member of the household.

In general this proves that questions have to be very carefully worded and the respondents capabilities to understand concepts should not be overestimated, especially when it comes to estimations the quality of the replies provided could have a very wide range and therefore the data should be used very carefully.

Changes made in Wave *3*

Considering the fact that respondents did not use the example booklet, but still found examples helpful, it was decided to include any explanations and examples in the questionnaire. The travel diary was extended by an explanation page and an example of a simple two leg return journey before the trip reporting pages. At the end of the travel form an example of a more complicated three-leg journey was attached.

The household questionnaire was changed to a portrait format over two A4 pages allowing for an additional example column, which was completed with similar but nationally typical examples for each country.

Questions about the share of vehicle costs for each household member were taken out as it proved to be too difficult for the majority of respondents.

A map of the area with a circle indicating the 100-km distance was included in the survey package and some question wordings were further improved to avoid ambiguities.

CONCLUSIONS

The cognitive laboratory exercises proved that caution has to be taken every time a survey is designed. Even though only some socio-demographic information and the travel activities are investigated, researchers are tempted to fall back into a routine of using the same designs over and over again.

To encourage participation the survey topic has to have a certain relevance to the person who has received a survey a package in the mail. This can be partly reached by stating the importance of the survey in a preliminary letter, signed by an “important” person. Another factor is of course the importance of transport and travel in everyone’s daily life. But unfortunately the survey researcher cannot only rely on what he and his client thinks are important and relevant. The respondents want to be involved. They need to feel that the survey was designed for them, which means that the

questionnaires need to be interesting. This has to show in the language used, the clear and professional layout, in the content, the wording and the order of the questions. Some of transport researchers' favourite words, such as "destination", "mode" or "origin", but also the fine line between a journey, a trip and a stage are completely alien to most "normal people". The use of a simple language, of colloquial words cannot be recommended often enough (see Ampt 1997).

In terms of the column design, what seems to be clear and easy for the researcher is not necessarily easy to follow for the respondents. The same is true for the order of questions. Most travel diaries start with the origin of a trip and the time of departure, before they get to the destination, the time of arrival there and finally the purpose of the whole trip. Respondents tend to set different priorities in their thinking procedure. First comes the reason why a journey was undertaken and where it was taken to before thinking of the arrival time. The time of departure and the origin of the trip have almost no relevance to many of them.

In order to collect information separately about respondents' journeys and detailed information about the stages of the journeys or each single leg of the journey it is important to explain the concepts very well and to separate the parts clearly. In the second wave of MEST pilot surveys this separation was achieved with a new concept that worked much better than in the first wave.

What matters to the respondents can vary strongly from what the researcher and the client need. The addition of attitudinal questions about the quality of a journey for example can make a travel diary much more interesting to a respondent and make him happily describe every stage of his journey in detail just in order to be able to then complain about the poor quality of the service provided on a flight or a public transport trip or to moan about road user charges. Designers of travel surveys should always consider what is relevant to the respondent (see also Meyburg 1997).

Once the respondent has made the decision to complete a questionnaire he or she is very keen to do it properly. It is therefore very important that the respondent never faces any ambiguities in the reply categories or the guidance through the questionnaire. All questions and categories must be clear to all respondents. Hoping that those who don't know what a "high speed train" is would simply tick the box

for “other train” (assuming that if they have never come across the expression, they have not used the service) is very dangerous. The more likely reaction of the respondent to an unknown term in the questionnaire is frustration, resulting in item or even survey nonresponse. The same is true if there are not enough categories for all possible responses. A respondent who very often has to choose the category “other” is very likely to feel that the survey was not designed for him and that their response would be irrelevant, which again bears the danger of losing a perfectly willing respondent.

In the whole scope of the MEST project the cognitive laboratory exercises were an invaluable aid to designing the survey instrument for the respondent and evaluating how the requirements put together by the European Commission and EUROSTAT could be implemented in a survey that is understandable across the member countries of the European Union with their different languages and cultures.

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All mentioned deliverables can be downloaded from the MEST website on

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