THE PRESENTATION OF AN ACTIVITY-BASED APPROACH FOR SURVEYING AND MODELLING TRAVEL BEHAVIOUR

Davy Janssens and Geert Wets

IMOB, Instituut voor Mobiliteit, Universiteit Hasselt – Campus Diepenbeek.
Agoralaan Gebouw D, 3590 Diepenbeek – België.
Fax: +32(0)11 26 89 60 – Email: davy.janssens@uhasselt.be; geert.wets@uhasselt.be

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Samenvatting

De voorstelling van een activiteitengebaseerde benadering voor het bevragen en modelleren van verplaatsingsgedrag

Om een betere ondersteuning en beleid voor transportplanners mogelijk te maken, is het gebruik van verkeers- en vervoersmodellen in het verleden vaak aanbevolen geweest door regeringen en onderzoeksgemeenschappen. Activiteiten en verplaatsingsgerelateerde microsimulatiesystemen kunnen leiden tot een manier om voorspellingen te doen van de impact van een bepaalde beleidsbeslissing op zowel een geaggregeerd als gedesaggregeerd niveau, zodanig dat het mogelijk wordt om een gedetailleerdere analyse van de modelresultaten uit te voeren op een manier dat het typisch onmogelijk is met de 4-staps benadering die in het verleden dikwijls werd gehanteerd. Het doel van deze paper is om een belangrijke potentiële bijdrage tot dit onderzoeksveld aan te kondigen door de voorstelling van een omvangrijk en veelomvattend onderzoeksprogramma. Het onderzoeksprogramma bevat 4 werkpakketten: data verzameling, model calibratie, gevolgd door een transitie- en een valorisatie-fase. Het onderzoeksprogramma is door verschillende externe referees beoordeeld en werd door hen als innovatief beschouwd, o.a. omwille van de ontwikkeling van een activiteitengebaseerd transportmodel dat korte termijn rescheduling en lange termijn leercomponenten bevat. Ook de innovatieve datacollectie-methode werd geapprecieerd. Op het vlak van een algemenere bijdrage aan de maatschappij, werden het valorisatie-werkpakket en de mogelijkheden voor toekomstig onderzoek gewaardeerd.

Summary

The presentation of an activity-based approach for surveying and modelling travel behaviour

In order to better guide and substantiate the decisions of transportation planners, the use of traffic and transportation models has been advocated by governments and by research communities. Activity-travel microsimulation systems provide a means of forecasting the impacts of a given policy at the aggregate and disaggregate level, so that detailed analyses of model results can be performed in ways that are generally infeasible with the conventional four-stage approach. The aim of this paper is to announce an important potential contribution to this line of research by the presentation of a comprehensive and extensive research program. The research program contains four main workpackages: i.e. data collection, model calibration, followed by transition and valorization programs. The research program has been reviewed by several external referees and was found to be innovative due to the development of an activity-based transportation model including short-term rescheduling decisions and (long-term) learning components. The innovative datacollection procedure has been acknowledged as well. In terms of broader contributions for society, the reviewers appreciated the valorisation workpackage and opportunities for additional follow-up activities.

1. Introduction

The transport sector accounts for about 25 per cent of the total commercial energy consumed worldwide and it consumes approximately one half of the total oil produced. The International Energy Agency (IEA) predicts that the transport sector will overtake industry as the largest energy user by 2020 (SUT Partnership, 2002). The importance of the transportation area was also evidenced by a report from the United Nations, which stated that the demand for transport services is expected to grow considerably as incomes rise, the trend toward urbanization continues and as the process of globalisation moves forward with expected increases in world trade and personal travel. In order to better guide and substantiate the decisions of transportation planners, the use of traffic and transportation models has been advocated by governments and by research communities. The first type of models that has been widely adopted on a worldwide scale is the four-step modelling approach (Ruiter and Ben-Akiva, 1978). Four-step models are standard methodological approaches which were mainly chosen for their convenient mathematical calculus and for their ability to support the policies of infrastructure expansion (Wilson, 1967, Ortúzar and Willumsen, 2002). While improved four-step models still remain frequently used by practitioners to current date, due to their simplicity and ease of understanding, increased concerns about relatively recent phenomena such as congestion, emission and changing land-use patterns, have motivated governments to consider policies aimed at reducing and controlling them (Dijst, 1997) by means of more advanced methodological approaches. The adopted policies are commonly referred to as travel demand management (TDM) measures, which objective is to (i) alter travel behaviour without necessarily embarking on large-scale infrastructure expansion projects, (ii) encourage better use of available transport resources and (iii) avoid the negative consequences of continued unrestrained growth in private mobility (Krygsman, 2004). In order to effectively implement and analyze these policy objectives, an increasing amount of awareness emerged with respect to the need for improved understanding of travel behaviour. Obviously, the four-step methodologies that were adopted at that point in time and that were mainly focused on policies of infrastructure expansion, were insufficiently able to achieve this. This resulted in a need for travel demand models that embody a realistic representation and understanding of the decision-making process of individuals and that are responsive to a wider range of transport policy measures.

This understanding has lead to the formulation of the activity-analysis framework. The fundamental contributions of Hägerstrand (1970), Chapin (1974) and Fried *et al.* (1977) are the undisputed intellectual roots of activity analysis. Hägerstrand has put forward the time-geographic approach that characterizes a list of constraints on activity participation. Chapin has identified patterns of behaviour across time and space and is more concerned with opportunities and choices instead of constraints. This theory has later been modified by Fried, Havens and Thall (Fried *et al.*, 1977) who have dealt with some more factors including commitments, capabilities and health. These contributions came together in a study of Jones *et al.* (1983), where activities and travel behaviour were integrated. This was the first initial attempt to model complex travel behaviour.

The activity-based approach to travel demand analysis views travel as a demand derived from the need to pursue activities distributed in space. Travel is merely seen as a means to pursue goals in life but not as a goal in itself. Therefore, modelling efforts should merely concentrate on modelling activities or on a collection of activities that form an entire agenda which triggers travel participation. Activity-based travel analysis has seen considerable progress in the past couple of decades and has led to the development of several comprehensive activity-travel models. These models typically fall into one of two categories: utility-based econometric models and computational process models.

The desire to move activity-travel models - both the econometric models and the computational process models - into operational practice has contributed towards the increased interest in microsimulation, a process through which the choices of an individual are simulated dynamically based on the underlying models. Activity-travel microsimulation systems provide a means of forecasting the impacts of a given policy at the disaggregate level, so that detailed analyses of model results can be performed in ways that are generally infeasible with the conventional four-stage approach (Bhat *et al.*, 2004). To date, partial and fully operational activity-based microsimulation systems include the Micro-analytic Integrated Demographic Accounting System (MIDAS) (Goulias and Kitamura, 1996), the Activity-Mobility Simulator (AMOS) (Kitamura *et al.*, 1995), Prism Constrained Activity-Travel Simulator (PCATS) (Kitamura and Fujii, 1998), SIMAP (Kulkarni and McNally, 2001), ALBATROSS (Arentze and Timmermans, 2000), Florida’s Activity Mobility Simulator (FAMOS) (Pendyala, 2004) and other systems developed and applied to varying degrees in Portland, Oregon, San Francisco, and New York.

The aim of this paper is to announce an important potential contribution to this line of research by the presentation of a comprehensive and extensive research program that has been funded by the IWT, which is an Institute for the Encouragement of Innovation through Science and Technology in Flandres. The remainder of this paper is organized as follows. In the second section, an extensive problem formulation will detail upon three important problems which are present in the broader field of activity-based modeling. In order to come to a solution for the problems that were identified above, a research program will be introduced in section 3. Section 4 further elaborates on this research program. In the fifth section, conclusions and expectations for future deliverables have been reported.

2. Problem formulation

Despite this evolution, due to their complexity, activity-based transportation models were not adopted at the same pace by practitioners. Until recently, most Metropolitan Planning Organizations (MPOs) in the United States were still using conventional regional models based on the basic four-step modelling paradigm. For modellers, the advantages of activity-based transportation models in terms of capturing behavioural realism of individuals and their ability to come closer to an understanding and modelling of individual behaviour are clear and strong. For practitioners however, this core concept often proved to be less appreciated or misunderstood in the past since transportation planning decisions are generally based on aggregate forecasts of demand for and performance of transport facilities.

Another factor which is likely to contribute towards a reduced use of activity-based transportation models is the fact that data that is required in an activity-based transportation model are probably more difficult to collect (i.e. require more resources) than in traditional four-step models. Travel surveys, explicitly asking people for their travel behaviour, have long been the dominant form of data collection within transportation research. Evidence have accumulated however that travel surveys under-report off-peak, non-home based trips of short duration (Dijst, 1993). After it has been proven that data collection based on (activity) diary data outperforms a traditional travel survey in several ways (Stopher, 1992; Clarke *et al.*, 1981; Niemi, 1993), this type of data collection clearly became dominant within the research domain. However, the drawback of activity diary data assumes a somewhat increased amount of diligence to fill out and provide this (more detailed) information. Currently, in the United States, it is the experience of most travel survey firms that response rates of the order of 30 percent are about as good as can be obtained. There are several recent technological enhancements that have the potential to ameliorate these methods of data collection and that, at the same time, provide ways of collecting long-term datasets. A problem which is also present in four-step modelling approaches is the difficulty to collect detailed and long range data. It was already evidenced in previous studies that the number of activities that were reported during the second day of a two-day lasting data collection effort, were significantly lower than they were the first day (Zwerts and Nuyts, 2003).

A third problem in activity-based approaches is related with their model formulation. While activity-based transportation models have the potential to lead to more realistic and accurate predictions, a lot of these models still heavily focus on the static correlation between observed travel behaviour and explanatory variables. The static property may not directly hamper predictive results as such, but it restricts a more thorough degree of application, for instance in case something unexpected occurs. An example may be the rescheduling of activities (which means some activities may be executed in another sequence than originally scheduled, some may be completely omitted or others may be inserted) due to several external factors. Ideally, a comprehensive model should be able to anticipate in these circumstances and adapt its behaviour. Until recently, most of the work in this area only involved descriptive analyses (Gärling *et al.*, 1999). Timmermans *et al.* (2001) and Joh *et al.* (Joh, 2004, 2003) elaborated this work and developed a more comprehensive theory and prototype model of activity rescheduling and re-programming decisions as a function of time pressure. Apart from these contributions, the development of a dynamic activity-based transportation model, which is able to incorporate short-term learning (rescheduling of activities) is novel and has not been dealt with in other research efforts. Another aspect of dynamics, which is only very occasionally investigated is the effect of adaptation and long-term learning effects. Some research has been done to investigate the impact of (major) events in one’s personal life on travel behaviour. van der Waerden and Timmermans (2003), van der Waerden *et al.* (2003) and Verhoeven *et al.* (2005) assume that individuals reconsider their transport mode choice due to the occurrence of critical incidents and key events. They identified several possible events, such as moving, getting a driving licence, starting to work, etc. While most results are quantified, the incorporation of events in an operational model, for instance to improve scenario analyses, remains largely unexplored to current date. In the area of long-term dynamics there are two possible ways in which key events and mobility can relate. The first branch assumes that the occurrence of a key event will trigger a process of reconsideration of current behaviour. In this perspective, travel behaviour is often considered to be a habit. In order to break a habit two conditions need to be met: (i) a change to the situational context and (ii) behaviour becoming more conscious and deliberate. As key events often meet these conditions, they can be held responsible for influencing travel behaviour. For example, when a person changes jobs, he decides to take the bus to his new work location instead of commuting by car as he did to his previous job. In this case, transportation behaviour changes due to the occurrence of a key event. However, transport behaviour can also cause a key event to happen. For example, a person commutes to his current job by train, but actually he would like to go there by bike. Therefore he will search for a job which is located closer to his residence or he will think of moving closer to his job location.

3. Overview of the research program

In order to come to a solution for the problems that were identified above, a research program has been initiated that has four main workpackages as shown in Figure 1. The aim of this section is to present and introduce the main parts of the research program, the more detailed subtasks of each workpackage will be described in section 4.

First of all, the project will initiate a survey design method by introducing the use of computer-aided instruments (a hand-held GPS-based logging system and computer-aided software) to conduct travel behaviour surveys. It is difficult to evaluate what the influence of hand-held computer-assisted information systems is on the concerns that were outlined above. Some researchers have argued that data collection is facilitated, while others state that it is experienced as an additional burden. However, it remains indisputable that electronic data collection yields information of higher quality. This was evidenced in Verweij *et al.* (1987) and in Kalfs and Saris (1997). Especially the fact that advanced rules for data quality control can be implemented in this type of data collection, contribute to this. The approach also seems particularly well suited to collect more detailed data (for instance short trips) and long-range data; both are more problematic in traditional data collection efforts, as identified above. Section 4.1 furher details upon the data collection workpackage.

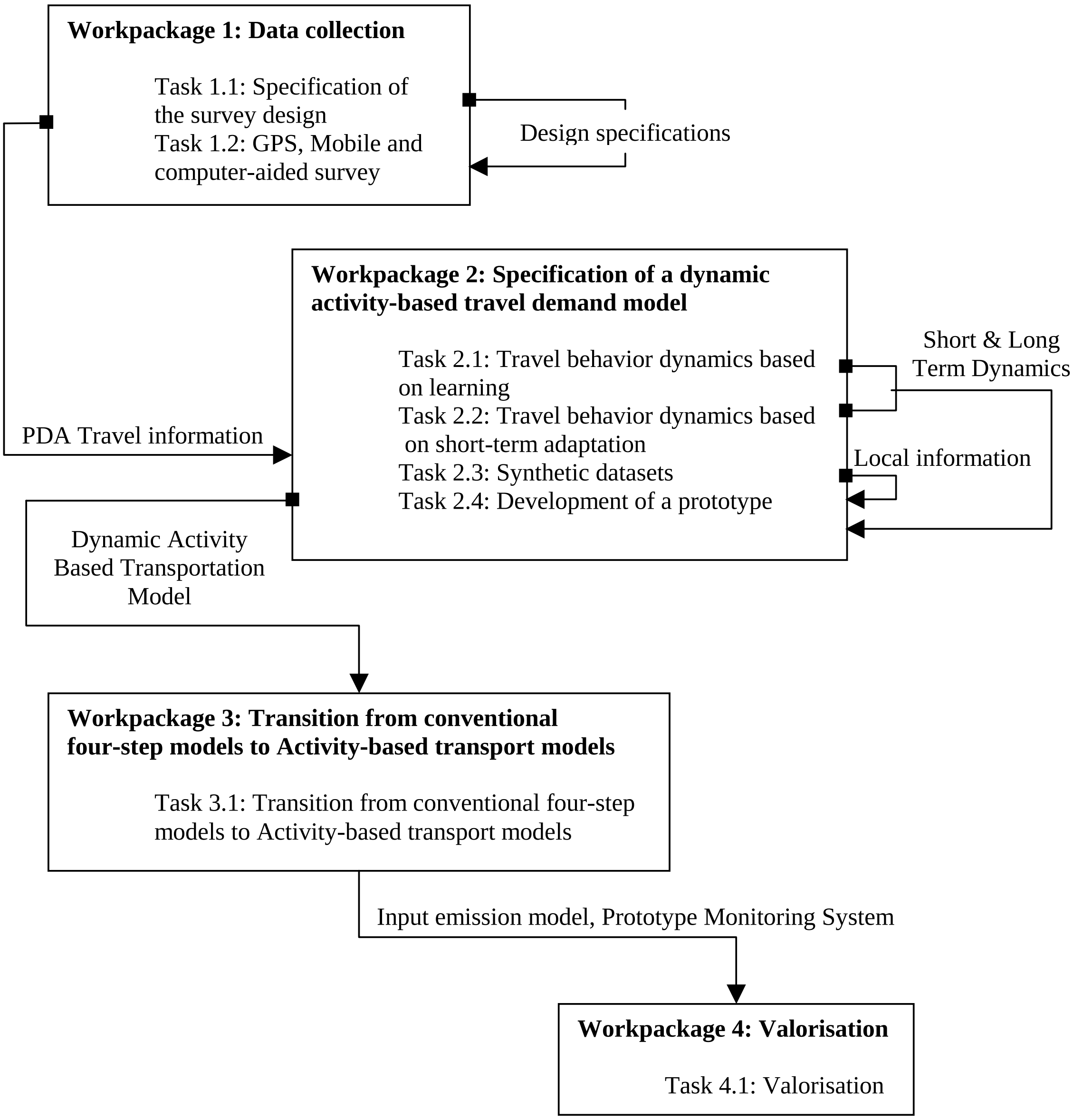

Figure 1: Overview of the research program, divided in 4 workpackages

Secondly, due to the fact that several models still heavily focus on the static correlation between observed travel behaviour and explanatory variables, a dynamic activity-based model will be developed. As identified in the previous section, the static property especially lacks the possibility of short-term adaptation and long-time learning during the implementation of the activity schedules. The development of a dynamic activity-based transportation model, which is able to incorporate learning may provide a solution. Section 4.2 describes the second workpackage in more detail.

Third, once such a dynamic model has been developed, a profound evaluation and transition process will be implemented to facilitate the changeover from the conventional and currently used four-step model in Flanders. As mentioned before, the latter models base their short-term predictions on individual one-way trips made during one peak hour, they lack the interaction with other trips, with the household features, with spatial and temporal characteristics and with the underlying travel behaviour (McNally, 2000). While the core concept of activity-based modelling is well appreciated and understood by practitioners; the increased complexity often hampered their application in practice. For this reason, a process that guides practitioners in this transition phase is needed. The same exercise has been conducted in the United States in a number of cases, where practitioners afterwards acknowledged that activity-based models can be especially attractive for practical planners in view of their direct linkage to the actual planning issues (Vovsha *et al.*, 2003).

Finally, this high-end research program has a strong multi-disciplinary character and offers plenty of opportunities to address additional spin-off activities and research questions. The multi-disciplinarity of this proposal is reflected in a valorisation workpackage which main task is to let several actors of the target sector become involved in the execution of the project. The target sector consists of representatives that are selected from the “mobility” and the “environmental” sector. In addition to this, both a user committee and a valorisation committee have been created that are responsible for the dissemination of the scientific and technical results that come out from the different tasks of the research project and for the valorisation of this knowledge towards a broader range of application domains.

4. Detailed description of the workpackages

4.1 Workpackage 1: Data collection

The data collection workpackage consists of two subtasks, i.e. first, a specification of the survey design and second, the implementation of both a mobile survey through a Personal Digital Assistant (PDA) with GPS technology and an integrated computer-assisted information system that ensures enhanced data quality (Arentze *et al.*, 1999).

With respect to the first subtask, a feasibility study has already been carried out at the current stage of the project. The study describes how the data collection should be effectuated, using innovative devices. Several methodological issues (e.g. phrasing of the questions, sample size, sample origin, sample clustering,…) have been discussed. To current date, a number of these decisions have already been implemented or will be implemented in the near future. The main decisions involve the sample size of the study, which should include 2401 households. Approximately one half of the sample will receive a PDA-module; the other part of the sample will be questioned by means of a traditional paper-and-pencil method. This choice enables us to carry out comparative studies with respect to the behaviour of both target groups in terms of response rates, experience, etc.. The households will be selected using a stratified cluster technique, which ensures a geographical and spatial distribution in the sample which is representative for the study area of Flanders. The survey will ask the members of the selected household to fill out a diary and to report rescheduling decisions (the reasons for rescheduling are reported as well) during a one-week period. In comparison with other activity-based studies, the survey period is particularly long, especially in combination with the high number of households that will participate in the survey. Finally, detailed cost estimates have already been made and a description of logistics and needed CATI-support are currently being investigated and will be reported in the study as well. These and other design specifications will be used as core information in the second task of this workpackage.

The second task involves the design and implementation of the data collection module. In the past, desktop computer-assisted data collection tools were used for filling in scheduling surveys which provided activity-travel diary data to researchers who worked on activity scheduling and execution. However, existing systems such as CHASE and REACT! are not able to trace the actual activity-travel execution due to their mobility constraints and were already criticized due to this limitation in a study by Zhou and Golledge (2004). In order to solve this problem, one might think of a Personal Digital Assistant (PDA) with GPS technology for enhancing the data collection tool's mobility. The potential advantages of using a Personal Digital Assistant with GPS to supplement travel survey data collection are numerous: (i) when using a desktop computer-assisted data collection tool, the respondents have to remember the exact locations of their start and end positions, whereas with a PDA with GPS, trip origin, destination, and route data are automatically collected without burdening the respondent for the data; (ii) as the respondent may forget to report an activity trip, another advantage exists in recovery of unreported trips, as all routes are recorded; (iii) accurate trip start and end times are automatically determined, as well as trip lengths; (iv) the GPS data can be used to verify self-reported data and (v) both the data entry cost and the cost of pre- and post-processing the data, constitute a significant share of the total data collection cost (Kochan *et al.*, 2005). Fortunately, both can be reduced to a minimum with computer-assisted forms of data collection, for instance in the post-processing stage or simultaneously during the data imputation phase in the PDA module. The evaluation of a Personal Digital Assistant (PDA) with GPS technology has only been rarely evaluated in the context of transportation research but the topic is gaining increased attention in recent years. Two examples are the semiautomatic data collection device that is used in the Lexington Travel Survey (1997), and the computer-based intelligent travel survey system that is used by Resource Systems Group, Inc. (1999), which used interactive geo-coding and other intelligent functions that can be provided by GIS to reduce the reporting burden on the survey respondents. Similar functions are planned to be incorporated in the device that will be developed in this project. The system, which will be developed for a Pocket PC, conceptually consists of a Graphical User Interface (GUI), a GPS logger, a data structure (Activity Diary & Household Data and GPS Data), a data quality control module (Data Integrity Checks), a Trip Identification module, a GIS module and a Communication module.

Computer-assisted data collection tools also have the advantage of data quality control. Indeed, a computer system can easily check for anomalies and prompt the respondent for additional information. Errors that report activities where the beginning hour of an activity is later than the ending hour, activity locations that do not seem to exist and many others can be easily checked by the Data Integrity Checks module. More advanced data consistency and data quality rules will be implemented in the system. Previous research was already reported in (Arentze *et al.*, 1999) but it was never applied and tested by means of a PDA system in travel behaviour research. Besides this, the collection of spatial information is often also facilitated in PDA and computer-assisted forms of data collection.

4.2 Workpackage 2: Specification of a dynamic activity-based travel demand model

The aim of the second workpackage is to explore how an activity-based transportation model can be developed that is able to incorporate (short-term adaptation and learning) dynamics. To this end, the second workpackage has been divided into four different subtasks.

4.2.1 Travel behaviour dynamics based on learning

Given the fact that travelers' information is limited, imperfect and often biased, their day-to-day decisions rely on the experience of previous choices. By repeatedly making decisions, an individual acquires knowledge (learns) about his environment and thereby forms expectations about the attributes of the environment. Because an individual does not know which choice is best, it is in his interest to explore different choices in the beginning and become involved in more goal-directed behaviour at a later stage. It may be important from a modelling perspective, to try different choices occasionally and attach a higher weight to more recent experiences, compared to experiences a longer time ago. Two different theoretical foundations can be given for this specification. The first argument is related towards the reinforcement learning literature (Kaelbling *et al.*, 1996), which states that it makes more sense to weight more recent outcomes more heavily as more recent experience may provide more reliable information. The second argument is related to the theory of memory retention (Anderson, 1983), which states that memory is perceived as a decay parameter. In the first argument, the definition of time relates to previous experiences, while in the second argument time depends on clock time. Some of the work relating to learning has been conducted by Ben-Akiva *et al.* (1991), Axhausen *et al.* (1995), Nakayama *et al.* (2001; Nakayama and Kitamura, 2000), Polak and Oladeinde (2000).

One of the most advanced conceptual models to date has been developed by Arentze and Timmermans (2003), who developed a model of learning and adaptation in activity choice, where memory and search play an important role. Individuals explore choice opportunities through search and keep a memory of cumulative reward or punishment based on the implementation experience. The learning mechanism that is proposed, includes a reward function that simulates good or bad outcomes of the implemented actions, a value function that integrated the rewards received in the past to assess the current value of an action, and a policy that defines a choice of an action given a perceived state of the environment and action values.

All these proposed methods attempt to predict a change in the implementation of activity-travel patterns *in response to some external source*. As mentioned previously, the occurrence of critical incidents and key events may be an example of such an external source. Several key events may be investigated in this manner, but an obviously important event is a change in residential, work or educational location ("moving"). However, also other events such as a change in household composition, car availability or household income may also contribute to a new environment that needs to be "learned" by the respondent. There is ample opportunity to further elaborate the conceptualisation of adaptation and learning in a transportation context. Moreover, most of the models focus on an isolated decision dimension and do not account for the impact on the complete activity-travel pattern. Furthermore, operational models are still seriously lacking.

As part of this workpackage, we will therefore develop models of learning in transportation settings, using Arentze and Timmermans' conceptual model (Arentze and Timmermans, 2003) as a starting point. We will assume that by implementing activity-travel patterns individuals learn about their environment and also experience the results of their actions. On the one hand, this will reduce the uncertainty of their perception and knowledge of the environment, on the other hand they can strategically base their new decisions on past experiences, using a mental model. To move this area of research from numerical simulations to empirically estimated learning models, we envision conducting interactive computer experiments in which subjects are confronted with (1) feedback to their choices, and (2) information about their environment. The nature of this feedback will be varied such as to accommodate different degrees of error, bias, and nonstationary environments. The series of repeated measurements will then provide the input necessary to estimate the parameters of the learning models.

4.2.2 Travel behaviour dynamics based on short-term adaptation

In comparison to long-time learning, though still limited, more work has been done about short-term adaptation based on within-day rescheduling. One of the major problems in individuals' scheduling is that people frequently want to do more than they are able to do given the limited amount of time that is available. To solve conflicts in a short-term, individuals may consider several strategies such as re-sequencing activities, compressing activity durations or changing priority. In some of the work by Gärling *et al.* (1999), it is indeed stressed that anticipated time pressure is an important factor controlling the frequency of activity scheduling and that it is an additional factor constraining the feasibility of schedules. Doherty and Axhausen (1999) suggested another conceptual model of scheduling behaviour. In this work scheduling is assumed as a multi-stage process, which distinguishes between routine scheduling decisions and short-term, impulsive decisions. Again, probably one of the most advanced works has been proposed by Joh, Arentze and Timmermans (Joh *et al.*, 2003). The work proposed is quite comprehensive since it allows modelling the dynamics of activity scheduling and rescheduling decisions as a function of unexpected events during the execution of activity programs. Although these studies are theoretically appealing and key concepts are supported by numerical simulations, this line of work has not yet resulted in a fully operational model of activity rescheduling behaviour.

The aim of this task is to further elaborate this line of research and develop an operational model. To that end, subjects will be invited to complete an stated adaptation experiment. That is, subjects will be faced with different scenarios in which they will experience some delay/constraint restricting them to implement their planned activity-travel schedule. They are requested to indicate what they will change about their planned schedule to cope with the problem: speed up, shorter route, shorter duration, cancel activity, etc or any combination of these adjustments. An online web-based survey was already developed and evaluated in an initial test environment at the current stage of the project. This information is used to (i) identify different decision styles, and (ii) estimate the decision tree parameters that Joh *et al.* (2003) suggested to model short term adaptation. Simultaneously, we will start with collecting information about the activity-travel schedule and about rescheduling decisions using the data collection tool that was described in Workpackage 1 as an alternative way for measuring short-term adaptation. As mentioned before, the system was specifically built to capture short-term rescheduling decisions and reasons for rescheduling.

4.2.3 Synthetic datasets

The third task of the second workpackage deals with the creation of synthetic datasets. The research idea which has been conceived in this task is to simulate a synthetic local travel survey sample dataset, using the available local information in conjunction with national travel (often trip-based) survey data. Local socio-demographic data for the different city regions are available from the National Institute of Statistics (NIS). National travel survey data are available from Zwerts and Nuyts (2003), which are updated on a regular basis and from Hubert and Toint (2002). As an additional data source, we will use the study "Time Use of the Flemish People"- financed by the Flemish Community (Policy Oriented Research Program 97/3/109). For this study, 1533 Flemish people between the age of 16 and 75 kept a diary during one week.

It will be examined whether synthetic data that is built from joining together a different number of data sources (time use survey, national travel survey data, local information) can enhance the data that is used in the (dynamic) activity-based model.

Important research questions will still need to be addressed to join together the different sources of data. Obviously, if this process is of value, it will significantly reduce the costs for local travel data collection. To validate the procedure of creating synthetic local data, the travel surveys that were collected in the city regions of Ghent, Antwerp, Hasselt-Genk can be used as benchmark datasets.

4.2.4. Development of a prototype

The knowledge of the first three tasks in work package 2 is finalized by the development of a prototype system. This means that the learning concept, the short-term rescheduling adaptation model and the development of the state-of-the-art method for producing synthetic datasets are incorporated as independent modules in the system. This will result in a fully operational model that is used to read in data, both from the integrated PDA system (national scale) and from the synthetic dataset module (local scale). The tool is used to help practitioners to facilitate the change from trip-based to activity-based models. Moreover, this tool will enable us to conduct a tangible and measurable comparative study using the same set of data. To this end, the outcomes of the models will be tested by means of different goodness-of-fit measures. These measures remain the same for the dynamic activity-based transportation model that was built and they were already implemented in (and can be adopted from) the Albatross' system, developed by Arentze and Timmermans (Arentze and Timmermans, 2000).

5. Conclusion

This paper has presented an extensive research program which has been reviewed by several external referees and announces an important potential contribution to the current state-of-the-art of activity-based transportation surveying and modelling. It was outlined in the paper that several innovative and specific objectives need to be realized during the execution of the project. Consequently, the specific objectives need to result in a dissemination of the scientific and technical results, which are steered and controlled by a User Committee. In addition to this, a Valorisation Committee has been created to co-ordinate the research output towards a valorisation of the project results. As a result, wider application domains such as spatial planning, location-based services or tourism may benefit from the improved analytical and predictive capabilities of the model that will be developed.

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