

Similar, Yet Different: Some Emerging Trends in Travel Surveys in Australia

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Abstract:

This paper reports upon two major travel surveys being conducted in Australia. The two surveys under consideration are the Victorian Activity and Travel Survey (VAIS) which is being conducted by the Transport Research Centre (TRC) at RMIT University in Melbourne, and the Household Travel Survey (HTS) being conducted for the Transport Data Centre (IDC) within the New South Wales Department of Transport in Sydney. The paper describes the background to the surveys and outlines the methodology being used in each survey. It then shows some of the common themes emerging in the design and conduct of the two surveys. At the same time, it highlights some of the differences between the surveys and gives reasons for some of these differences. In doing so, it demonstrates that the political and organisational climate in which surveys are conducted can be a determining factor in the final design of the survey.

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Introduction

This paper reports upon two major travel surveys being conducted in Australia and shows some of the common themes emerging in the design and conduct of the two surveys. At the same time, it highlights some of the differences between the surveys and gives reasons for some of these differences. In doing so, it demonstrates that the political and organisational climate in which surveys are conducted can be a determining factor in the final design of the survey.

The two surveys under consideration are the Victorian Activity & Travel Survey (VAIS) which is being conducted by the Transport Research Centre (TRC) at RMIT University in Melbourne, and the Household Travel Survey (HTS) being conducted for the Transport Data Centre (TDC) within the New South Wales Department of Transport in Sydney.

This paper will first describe the historical background to the conduct of the current surveys, in so far as it affects the design and conduct of these surveys. Secondly, the organisational and funding framework will be described, since this has been observed to significantly affect the design and conduct of the surveys. Thirdly, the major features of the two surveys will be described. From these descriptions, the common features will be identified and reasons given why these features emerged in both surveys. Next, the features of each survey which are different will be highlighted and reasons given for why each survey has decided upon the specific course of action. Finally, implications for the future design and conduct of travel surveys in Australia and elsewhere will be drawn from the discussion.

Historical background

Melbourne

The conduct of travel surveys in Melbourne dates back to the early 1960s, when the wave of Transportation Studies which had been conducted in the United States reached Australia's shores. In 1964, the Melbourne Metropolitan Transportation Committee organised a detailed study of Melbourne's transport system, including a home interview survey of the travel movements of 28,000 households. To check the forecasts made as a result of this study, a small survey of 3,500 households in ten (out of 56) municipalities was conducted in 1972. These surveys were followed, in 1978-79, by the conduct of a Home Interview Survey for the Ministry of Transport in which information concerning the travel movements of Melbourne residents was obtained from household interviews in 11,400 households. The 1964, 1972 and 1978 surveys were all performed using face-to-face interviews.

In 1986, an Australia-wide travel survey was conducted for the Federal Office of Road Safety, using a self-completion mail-back questionnaire (SOCIALDATA, 1987). This survey was valuable in that it conducted surveys in all Australian state capital cities, as

well as in a number of rural cities of various types. A total of about 4900 households were interviewed in the State of Victoria, of which 3500 were in Melbourne. Unfortunately, because the data was collected for a road safety agency, whose prime interest was in calculating levels of exposure to accidents, the geographic locations of the trip origins and destinations, even though they were recorded, were not coded into the final computer files. Therefore, while the data is very good for some analyses, it is not particularly useful for transport planning work, where spatial information is of major importance.

Sydney

The collection of personal travel data commenced in Sydney in the early 1970s when a large transport planning study, known as the Sydney Strategic Transport Study (SATS) was undertaken. This study was responsible for the first home interview survey of personal travel and some freight movement studies in the metropolitan area. The data was used to develop a strategic plan for investment in transport infrastructure, mainly roads, over the following decade and for the estimation of the Sydney Strategic Travel Model. This travel model followed the traditional four step structure and was considered to be "state of the art" in travel demand modelling at that time.

A large scale household travel survey was conducted again in 1981 and in 1991 with a much improved questionnaire. These surveys were conducted using a face to face interview methodology with a household questionnaire and detailed trip diaries for all members of the selected households for a designated travel day. No substitution was allowed of households or of travel days. Data in 1991 was collected for a full year and from all respondents in selected households for a full 24 hour period. A trip based diary was used with a verbal activity recall method used in the interview to assist respondents to recall trips by associating them with activities undertaken. In 1991 a sample of 12,000 fully responding households was achieved which represented approximately 1 per cent of the population. With a trip rate of 10 trips per household on an average weekday (3.6 per person) this represented a sample of 120,000 trips.

The other main source of personal travel data in Sydney which is used for transport planning is that collected in the Census of Population and Housing by the Australian Bureau of Statistics (ABS) and is known as the "Journey to Work" (JTW) data set. The Census form asks respondents details of their employment including the address of their main employer in the week before the Census and the mode of travel to work on Census day. This data is then coded by the ABS, in co-operation with the Transport Data Centre, to the travel zone system used for the Household Travel Survey data and the Strategic Travel Model. The Census is conducted every 5 years, the last being in 1996.

The 1986 Australia-wide travel survey conducted for the Federal Office of Road Safety was also conducted in New South Wales. A total of about 4300 households were interviewed in New South Wales, of which 3500 were in Sydney. Unfortunately, for the reasons given earlier, little use appears to have been made of this data in Sydney.

Organisational background

Melbourne

The 1964, 1972 and 1978 surveys in Melbourne were all conducted by private consultants on behalf of the State Government. In 1991, the TRC (in conjunction with Denis Johnston and Associates) was commissioned by VicRoads (the Victorian State Road Authority) to conduct a series of pilot surveys for the Melbourne Area Personal Travel Survey (MAPTS). The intention was that the full MAPTS survey would commence late in 1991, based on the lessons learned from the pilot surveys. However, for various reasons, mainly related to lack of funding approval from the State Government, the full survey did not proceed in 1991 or 1992.

In the meantime, the Queensland Department of Transport was interested in conducting a travel survey in South-East Queensland and, after meetings with staff from VicRoads and the TRC, issued a brief in early 1992 for the design and conduct of those surveys. This brief was based largely on the methodology used in the MAPTS Pilot Survey. The TRC bid for and was successful in obtaining a contract to perform the South-East Queensland Household Travel Survey (SEQHTS) for the Queensland Department of Transport. This project commenced in mid-1992 and was finished in mid-1993.

Meanwhile, back in Victoria, little progress had been made for the conduct of the full MAPTS survey. Coincidentally, in November 1992, the State Minister for Public Transport, Mr. Alan Brown, spoke at a seminar at which he told the story of a group of residents in Western Australia who had waited for years for the State Road Authority to build a promised bypass road around their town. Tired of waiting, they hired several D9 bulldozers and some roadmaking equipment, and within a week they had built their own bypass road. He cited this as an example of how the community could no longer expect the government to do everything for them - sometimes it would be best for them to take things into their own hands and take the initiative.

Encouraged by the Minister's words, the staff of the TRC decided to take the initiative and design, fund and conduct the large-scale travel survey which had been deferred for so long in Melbourne (recognising that the most recent large-scale travel survey was conducted in 1978, and the one before that in 1964). It was considered that this survey would provide medium-term financial support for the TRC and, at the same time, be a stimulus for many spin-off research projects for TRC.

The VATS survey, therefore, is financed by the TRC, with data being sold to a range of government agencies (such as State Transport agencies and Local Government Authorities) and private sector organisations (such as private toll-road companies and private bus companies). In this way, the cost of the data can be kept to a minimum for any one subscriber by being able to share the costs among many different subscribers. It also means that the same data is being used by a range of different organisations in the public and private sectors. A range of other advantages and disadvantages of this approach is described in Richardson (1995).

Sydney

Unlike Melbourne, the collection of travel data in Sydney has always been funded and undertaken within the New South Wales Government. The 1971 Sydney Area Transportation Study was conducted by a specially convened team, mainly with traffic engineering backgrounds, in the then Ministry of Transport. The study produced a four volume set of blueprints for the development of road infrastructure in the Sydney metropolitan area to meet the demands of the forecasted rapidly growing population. This study was an excellent example of the state-of-the-art in transportation studies of the day which focussed on engineering solutions to meet projected demand. There was little if any behavioural analysis of travel

The 1981 survey, which saw the development of a much improved trip diary questionnaire, was designed to provide a comprehensive picture of travel behaviour in the Sydney region, while complimenting the 1971 Study. Following this survey, a greater emphasis was placed on analysing the travel behaviour aspects of the data which, along with the outputs of the travel demand model, were used as input to the preparation of a number of planning policy documents. The perspective of transport policy and planning broadened during the 1980s beyond the engineering solution of "more roads", to encompass a wider range of transport and demand management options to address Sydney's ever growing transport needs

However, towards the end of the decade, support for the use of data and models in the planning process began to wane and the funding for the 1991 household travel survey was becoming uncertain. The Transport Study Group had, up to that time, been part of the Ministry of Transport which was the transport policy and planning authority. As the prospects for the 1991 survey became more doubtful, the Study Group was taken in by the road authority which required updated data for recalibration of the Strategic Travel Model to produce updated trip tables. Thus the 1991 Home Interview Survey and a survey of Commercial Vehicles was undertaken.

In 1993, the Transport Study Group was returned to the now Department of Transport, as it was considered inappropriate for the travel data and forecasting model tools for general transport planning to be under the sole control of the road authority. The management of the group is now the responsibility of the Department, but the group is jointly funded by the Department, the road authority and to a lesser extent the other public transport operating and planning authorities. The group, now known as the Transport Data Centre, has been restructured to improve its client focus. It is required to operate on a commercial basis and to be "self funding", financed by the provision of services to major stakeholders and the general sale of data and other services to the transport planning community. A much reduced survey and modelling budget necessitates careful planning and cost effective operations as the Centre is continually accountable to major stakeholders, with further funding provided only on the basis of an acceptable standard of deliverables being achieved.

Descriptions of the surveys

Melbourne

The VATS survey uses a mail-out/mail-back self-completion questionnaire method which has been developed over many years by members of TRC staff. The survey method is based on a design which originated in West Germany in the early 1970s (Brög *et al.*, 1985). The VATS design, however, is substantially different and is based on modifications made in the MAPTS Pilot Survey (TRC, 1992) and the SEQHTS study (TRC, 1993). One major change is that the VATS survey places a special emphasis on the recording of the details of out-of-home activities undertaken by respondents. This is because it is believed that a better understanding of the demand for travel can be obtained by concentrating on understanding the demand for the activities which give rise to that travel. In addition, there is much interest from potential clients (subscribers) in data which describes the type and location of activities undertaken by respondents, irrespective of its connection with travel behaviour. In general, the VATS survey uses the survey design concepts outlined in Richardson, Ampt and Meyburg (1995).

The mail-out/mail-back survey method has six discrete stages:

1. **Initial contact.** This stage is to introduce the respondents to the fact that they have been selected to participate in the survey and to legitimise it in some way. This is done with an introductory letter and informational brochure which is sent just over one week prior to the Travel Day allocated to the household (each household is asked to provide complete travel and activity data for one pre-specified Travel Day).

2. **First mailing.** The first mailing includes the following items:

- A follow-up covering letter
- A household and person form
- Six trip forms (to cover the maximum expected size of the household)
- A trip form with a pre-printed completed example.
- A postage-paid return envelope.

This mailing is sent in an envelope with a postage stamp to make the letter seem more personal. The letters are sent so that they arrive two working days prior to the Travel Day.

3. **First reminder.** This takes the form of a post-card either to thank respondents who have already returned their forms or to remind respondents to return the questionnaire and to allocate them a new travel date (one week after the initial one) in case the forms have not yet been filled in.

4. **Second reminder.** The second reminder is a letter sent in an ordinary business shaped envelope, again signed by the Survey Director. Once again, a new travel date is suggested for those people who have not yet filled in the forms.

5. **Third reminder.** This reminder contains all the items sent in the first mailing with the addition of a cover letter from the Survey Director stressing the importance of cooperation by respondents in returning the forms. Again, a new travel date is proposed.

6. **Fourth reminder.** For this (final) reminder a postcard is again used - but in a different colour. A new travel date is again proposed.

In addition to the postal reminders, a number of other techniques are used to improve response rates and the quality of the reported data. Firstly, for responding households in which there is some question over the quality or completeness of the reported data, telephone interviews are conducted by the data-enterers to clarify any points of uncertainty. Secondly, a sample of responding households is selected for validation interviews, conducted by personal interview. The purpose of these interviews is to check on the manner in which the questionnaires have been completed, and to assess the quality of the reported data (especially relating to the identification of non-reported trips). Thirdly, a sample of households which have not responded after the fourth reminder is contacted personally to ascertain the reasons for their non-response. These non-response interviews proved to be especially valuable in identifying those households which contained stubborn non-respondents, those who were merely forgetful, and those households which did not actually exist (i.e. sample loss). They also give some indication of the travel behaviour of non-respondents.

Sydney

The 1981 and 1991 household travel surveys in Sydney used a face-to-face interview method with a trip diary for each member of the household and a household questionnaire collecting socio-economic and vehicle ownership data.

Before commencing the continuous Household Travel Survey in 1997, a review of survey methods was conducted to determine the survey method to be used. The results of that review are discussed in section 5.3 of this paper. On the basis of this review, it was decided that the 1997 survey would again be conducted using a face-to-face interview and trip diary.

The questionnaire for the 1997 survey is based largely on the 1991 form. However, an extensive user consultation process was undertaken to determine the need for, and use of, each data item so that little-used items could be removed to reduce costs and respondent burden where possible. The most significant deletions in the 1997 survey were questions relating to the travel of visitors to the household on travel day and details of any second job, both of which were collected in 1991. In particular, the information on visitors' travel was not included as this is more difficult to obtain than for household members, but also it represents only a small segment of the "tourist" travel in Sydney. As no other detailed travel data for tourists is collected, it was decided that the Household Travel Survey would focus exclusively on personal travel of residents.

The sampling strategy for the 1997 survey, as in 1991, was designed by the Australian Bureau of Statistics. A two stage cluster design is used, based on Census Collector Districts (CCDs) as the primary units. Selected CCDs are divided into blocks and a single block is selected at random. A cluster containing seven houses is then chosen from each block and each house is assigned a different travel day. A pre-contact letter is mailed to participating households no more than five working days before initial interviewer contact, i.e. no more than ten days before the travel day. Interviewers make their initial contact no earlier than five days before a selected household's travel day. At the initial contact, the household questionnaire is completed, memory joggers are left for all respondents and a time is arranged for the post travel day trip diary interviews with each member of the household, as soon as possible after the designated travel day. Up to three call backs are made to complete the interviews for all members of the household.

The fieldwork is contracted out to a "research organisation" who are responsible for all aspects of the fieldwork management and processing of the data. The questionnaire design, as discussed above, is based on the trip diary developed in the 1981 survey. This design has been proven to work well with respondents, collect the level of detailed unlinked trip data which is required, as well as allow flexibility for the addition of related questions on particular topics of current policy interest. Maintaining the same basic design provides for comparability of data over the survey years. The survey is managed by TDC staff by a full-time project officer under the supervision of a Manager. External expertise was also contracted in 1991 and 1997 to provide advice on the questionnaire and general issues of survey design. In addition, TDC staff are responsible for the database design, validation, management, extraction and analysis of the data.

Common threads

Although the history of travel surveys in Melbourne and Sydney has been somewhat similar, the organisational structures being used for the conduct of the current surveys are substantially different. Nonetheless, there are a number of significant similarities between the two surveys.

Continuous Surveys

Both cities have moved away from seeing the conduct of travel surveys as an "event" towards seeing travel surveys as a "continuous process". The Transport Research Centre decided early on to move to continuous surveys for a variety of reasons, in agreement with a report prepared for VicRoads (Taylor *et al.*, 1992). The Transport Data Centre has also adopted a policy of moving away from its ten yearly collection of data to a continuous survey of personal travel. This policy was one of the recommendations arising from the review of the TDC's modelling and information strategy conducted by the Institute of Transport Studies in 1994 (TDC, 1995). There are a number of reasons for this shift in approach away from a data collection "event" to a continuous survey "process".

Monitoring Economic, Demographic and Behavioural Changes

A continuous survey provides data on the trends in travel patterns and behaviour and reflects changing social and economic conditions. On the other hand, data from an "event" survey reflects only those conditions at that point in time and says nothing about the intervening trends between points. This is a particular problem if those points are far apart in terms of time, and if they happen to coincide with markedly different points of the economic cycle. Such was the case with the 1981 and 1991 data for Sydney. These two surveys were carried out for different geographical regions (the 1991 region was larger than the 1981 region). However, even when adjusting for this, a comparison of the two data sets (IDC, 1996a, Gee *et al.*, 1996) showed only a 1.2 per cent increase in total trips on an average weekday over the 10 year period, despite an increase in population of about 8 per cent. Also evident was a decline in trips to work of about 6 per cent, which was wholly due to a decline in trips by males. On the other hand, the number of trips on the weekend increased by 7.8 per cent and the number of trips to work by females increased slightly.

These changes in travel patterns in part represent the very different economic conditions which prevailed in 1981 compared with 1991. The economy in Australia was in recession in 1991 with an unemployment rate of around 8 per cent in Sydney compared with 5 per cent in 1981. There were also structural changes taking place in the economy with unemployment being experienced most acutely in male dominated industries of construction and manufacturing. There were also severe cuts in middle management employment which particularly affected males. On the other hand, there was a growth in part-time employment and an increase in the female labour force participation rate largely as a result of increased employment opportunities in the service sectors.

There are other changes evident in the data which are indicative of the structural and social changes which were taking place. For example, there were considerable extensions to the shopping hours between 1981 and 1991 which were reflected in an increase in shopping trips especially on the weekends and also by males. Serve passenger trips (that is trips to accompany another person or to drop off/pick up another person) also increased by 5 per cent on weekdays and 10 per cent on weekend days. Again, this was, in part, reflecting an increase in the female labour force participation rate and the increased use of child care services by working parents.

The economic cycle turned upward after 1991 and the unemployment rate has decreased. The structural changes of declining male employment in particular industries and strong female employment in expanding industries have continued, shopping hours have been increased further and other lifestyle changes, such as eating out more frequently and an increase in the use of home services, have also occurred. In 1997 what can we say about the implications of these changes for travel patterns since 1991?

We have nothing but anecdotal evidence. There is the perception that travel has increased. Weekend and off-peak travel also seems to have increased as congestion now extends beyond the traditional peak periods and is also very evident on the weekend. The 1991 data indicated that there had been virtually no change in the mode share of

trips by public transport since 1981. Increasing road congestion and an increasing awareness of, and desire to reduce, the adverse environmental impacts of the high dependency on private car use has placed promotion of the use of public transport high on the political agenda in New South Wales. The public transport operators are claiming increases in patronage in recent years, but there was no data to confirm this or to indicate any shift in mode share.

We have no data on travel patterns in terms of origins and destinations to monitor land use planning policies such as urban consolidation and employment focus on commercial centres, which have been adopted during this period. In short, if we were to continue to follow the 10 yearly survey pattern in Sydney, we would have to wait until 2001 for another data collection and then possibly, if the experience of the past was repeated, a further 1 to 2 years before data was available. This is unacceptable for monitoring of policies which may have been put in place many years before. Travel patterns are becoming more complex and the demands on transport infrastructure increasing to such an extent that current data is needed if that demand is to be managed and policies are to be kept in tune with current conditions.

Data Timeliness

Towards the end of the 1980s in Sydney, political support was waning for the use of data and model outputs in the planning process. There were a number of reasons for this which we will not explore here, but it is sufficient to note that, when the time came in 1991 for the next 10 yearly household travel survey, the political climate was such that the conduct of the survey was threatened (as indeed it was deferred in Melbourne). Fortunately the Sydney survey was conducted, but there was no support for the processing or release of the data, which has only become available in the last couple of years.

Slowly support is gaining momentum for the need for data and modelling as part of the planning and policy decision making process. However that support will only be maintained if the data, and modelling outputs are demonstrated to be an integral part of that process providing current and relevant input to infrastructure and service level planning. It is believed that this is best achieved by the operation of a continuous survey which is seen as providing up-to-date data. As mentioned previously, structural changes in the economy and social and lifestyle changes have meant rapidly changing travel demands and travel patterns in the urban area. Data that is even a few years old is perceived as not reflecting these changes.

The value of the continuous survey process has been well demonstrated in Melbourne, where the VATS survey has been running continuously since December 1993. In that time, responses from a total of about 20,000 households have so far been obtained. During that time, the data has been used in the development of the State Government Transport Strategy for Melbourne, the development of a Transport Strategy for the City of Melbourne, the evaluation of a \$2 billion private toll-road project, and a range of studies in the lead-up to privatisation of the public transport system. All of these studies required up-to-date data, and could not rely on the previous 1964 and 1978 data. The 1994 and 1995 VATS data are now available from the TRC, while the 1996 data will be

released in mid-1997. The environment has changed so much in Melbourne, in terms of raised standards and expectations, that planners in the various agencies are now complaining about having to work with the "old" 1994 data.

Spreading of Workload

The multi-year nature of the VATS and HTS surveys means that initial survey costs can be reduced because it is not intended to collect all the required data in a short period of time. It also means that useful longitudinal data can be collected to monitor changes over time (albeit changes measured from a repeated cross-sectional survey). By resampling of households surveyed early in the process, panel surveys of various types could also be conducted.

The VATS survey collected information from about 7,500 households in 1994, and about 5,000 households in 1995 and 1996. It is anticipated to collect data from another 5,000 households in each of 1997 and 1998. Whether the survey continues beyond its initial 5-year lifetime will depend on the political and financial climate. It is possible that some subscribers will consider that they have enough data from the first five years of the survey to last them for some time. However, with the privatisation of the public transport system due for completion by the end of 1998 and the opening of the City Link toll-road in 1999, it is considered that there will be sufficient demand for ongoing VATS data to monitor the effects of these changes to justify its indefinite continuation.

In the 1991 Sydney survey, a final sample size of 12,000 households was achieved. The new continuous HTS targets a final sample of 3,000 households per annum so that over a 4 year period the same sample size would be accumulated as in the 1991 survey. It is considered that an initial sample size of 3,000 households in the first year will be sufficient to provide indications of broad trends and would even be sufficient for estimation of new components of the Sydney Strategic Travel Model, such as a new mode choice model. Of course, as the sample size increases it will provide data which is statistically significant at a lower geographic level and will provide for sound analysis of more detailed trends and greater degrees of market segmentation.

The multi-year nature of these continuous surveys also means that the daily workload is kept within manageable proportions and can be handled by a relatively small team. The VATS project currently employs two full-time research assistants who administer the survey and coordinate the data entry and editing processes, one half-time computer programmer, five part-time data entry staff, three part-time telephone editors, six part-time field interviewers for the validation and non-response interviews, one part-time client support manager, and two part-time project directors. In total, about eight full-time-equivalent staff are employed on the project in the collection and editing of the data on a continuous basis.

When the continuous HTS is established in Sydney it will be managed by one full-time project officer within the TDC under the supervision of a manager who has a number of other responsibilities. Database management will represent about 25 per cent of the time of a database officer who also serves all TDC's other database needs. The fieldwork will continue to be contracted out on an annual basis with a rollover of the

contract based on performance review. This is considered to provide economies of scale as well as being more cost-effective, and certainly less bureaucratically cumbersome, than directly employing fieldwork staff by the Department. This is also in line with the practice of out-sourcing of non-core activities, now prevalent in state and national governments in Australia.

Development and Maintenance of Skills

An administrative advantage of the continuous survey is that staff and procedures can be put in place and maintained on a continuing basis. This ensures a continuation of knowledge and skill levels rather than the practice in the past where there was an accumulation of those skills at the time of the survey but which declined in the inter-survey period only to have to be re-established again. The multi-year nature of the survey also means that there is scope for learning and improving the survey method. While major changes are not possible (without destroying the major advantage of comparing results over time) it is possible to incorporate procedural changes which improve response rates, respondent understanding, and cost efficiency of the survey.

Funding Advantages

The spreading of costs for the continuous surveys brings advantages in finding the funds for the survey. With the previous "event" surveys, there was an uneven requirement for funds so that large amounts had to be found at the time of the survey. If the political climate was not conducive to providing this funding, the survey could be in jeopardy. With the "continuous process" survey, the financial burden can be spread over many years and allowances can be made in advance for inclusion of modest amounts in forward budget projections.

It is acknowledged that a withdrawal of funding could occur at any time during a continuous survey. However, it is anticipated that if the survey is progressing successfully and producing relevant results its prospects of continued financing are enhanced. The threats to survey funding are minimised in the approach taken with the VATS survey, where the funding comes from several sources in the public and private sectors. Even if one subscriber did decide to withdraw, or merely to discontinue funding for a fixed period (as happened in the VATS survey), the project would not be in as much jeopardy as it would be if there were only one large subscriber. Because the survey is ongoing, it is also possible to enhance the financial viability of the survey by adding to the sample being collected to cover special needs. For example, if a particular local government area wants a higher coverage of residents of their area for a specific project, then these addresses can simply be added to the sample and incorporated into the normal daily workload of the survey office. The additional surveys can be conducted at marginal cost, without the time and cost needed to ramp-up a survey of this nature. The new data is also completely consistent with all the other data collected in VATS, and can be incorporated in the total VATS database by the use of appropriate weighting procedures.

Travel Diaries

Both the Melbourne and the Sydney surveys have opted for a travel diary, rather than an activity diary. The reasons for this are largely summarised in the report to IDC as a result of the Pilot Survey (AGB McNair, 1996), where an activity diary was seen to have the disadvantages of:

- not generating any extra trip reporting compared to the travel diary;
- higher printing and postage/interviewing costs (because of its longer length);
- more complex logic, which leads to more errors in its completion;
- higher processing costs to counteract the error rate; and
- respondent and interviewer disfavour; both groups found it harder to follow and more intrusive.

Both Sydney and Melbourne collect detailed travel data using a 24-hour travel diary, which uses the concepts of an "unlinked trip" where trip details are obtained for each leg of a journey, rather than just the journey as a whole. In addition, both use a "verbal activity recall framework" where questions are framed in an activity context (i.e. "what did you do next?") with travel being just a means to get to that activity.

Prior Testing of Methods

In line with the philosophy expressed in Richardson, Ampt and Meyburg (1995), both the Melbourne and Sydney surveys were preceded by extensive Pilot Testing to determine the most appropriate survey method to be adopted. The VATS survey benefited by having Pre-Pilot and Pilot Surveys done as part of the initial MAPTS study for VicRoads, a Pilot Survey as part of the SEQHTS study for the Queensland Department of Transport, and again a Pilot Survey specifically for the VATS project (Ampt, 1993). For the MAPTS Pre-Pilot Surveys, six different methods were tested:

1. **Phone** as the initial contact.
Mail out a **Stage based -1 day** Household and Person Form
2. Mail a letter as initial contact
Mail out a **Journey based -1 day** Household and Person Form
3. Mail a letter as initial contact.
Mail out a **Journey based-2 day** Household and Person Forms
4. Mail a letter as initial contact
Mail out a **Stage based-1 day** Household and Person Form
5. Mail a letter as initial contact.
Mail out a **Stage based-2 day** Household and Person Form
6. Personal initial contact and interview - **Stage based-2 day**.

As a result of these tests, Method 1 (the phone survey) was removed from further consideration because of its low response rate (only 23% of those households originally selected produced a final response), while Methods 2 and 3 were discarded because they did not provide unlinked-trip, stage-based data (given that Methods 4 and 5 were shown to work quite well from a respondent's point of view). A summary of the results obtained from Methods 4 through 6 are shown in Table 1.

Table 1 Summary of Melbourne MAPTS Review of Methods

	Mail-out/Mail-back One-day Stage-based	Mail-out/Mail-back Two-day Stage-based	Personal Interview Two-day Stage-based
Response Rates	52%	51%	66%
% Reporting Trips	81%	83%	95%
Trips per Person	3.5	3.6	5.3
Trips per Traveller	4.3	4.4	5.6
Marginal Cost per Household	\$38	\$50	\$88

As a result of this evaluation, Method 4 (the one-day, unlinked-trip, mail-out/mail-back survey) was selected for further testing in the MAPTS Pilot Survey. In an attempt to address the issues raised in the Pre-Pilot, four additional features were added to the Pilot survey:

- The wording and layout of the questionnaire were changed (based on the pre-pilot) to make it easier to complete and clearer to respondents that **all** travel movements were required.
- Respondents were **phoned** if there was a query about the data, and if a phone number was given.
- **Validation interviews** were carried out with a sample of responding households to check for under-reporting of travel and to try to understand any further problems respondents may have with the layout, wording or methodology.
- **Non-response interviews** were carried out with a sample of non-respondents to try to understand the reasons for high level of non-response.

The SEQHTS and VAIS Pilot Surveys enabled further testing and refinement of the one-day, unlinked-trip, mail-out/mail-back survey method. The use of the validation and non-response interview surveys was improved in the SEQHTS Pilot, and a variety of respondent observation surveys were conducted in the VAIS Pilot to test the understanding of various questions.

In addition, because of the continuous nature of VAIS, each year of the survey serves as a Pilot Survey for the next year. For example, the first year of VAIS was used to test the effectiveness of using stamps on the return envelopes (compared to using reply-paid post) in an effort to improve response rates. On the basis of these tests, it was found that no significant difference existed, and hence the less expensive reply-paid post method was adopted for the later years of VAIS. In addition, reconsideration of the method of accounting for non-motorised trips and non-response effects has resulted in an increase in the number of trips per person and per traveller for the self-completion survey, while ongoing monitoring of survey costing has resulted in a better estimate of the marginal cost of Method 4 (including the validation and non-response interviews) of \$65 per responding household.

In a similar way in Sydney, before embarking on the new Household Travel Survey, which is to commence in June 1997, the TDC conducted a review of survey methods and survey instruments. It was important in a climate of limited and tightening public sector funding, and some scepticism towards the collection of this data, that the most cost effective method was used, whilst still ensuring the highest possible data quality.

Three survey methods and two diary formats were tested giving six fieldwork options. The collection methods tested were: face to face interviewing, drop off/ mail back self enumerated questionnaire and mail out/mail back self enumerated questionnaire. Each of these methods were tested using an activity diary and a traditional trip diary. Due to a limited budget, the sample size aimed for in each option was 50 households (slightly smaller samples were achieved in each case). Thus only very broad indicators of each option could be evaluated. Each option was evaluated in terms of response rate, trip enumeration, data quality, range of data items and cost, as summarised in Table 2.

Table 2 Summary of Sydney HTS Review of Methods

	Trip Diary			Activity Diary		
	FF	CO	MO	FF	DO	MO
Gross sample size	84	91	120	42	91	120
Final sample size	38	36	49	18	44	48
Response Rates (fully reporting HH)	45.2%	40.4%	40.7%	43.9%	49.4%	39.5%
People reporting trips	93%	93%	83%	92%	81%	85%
Accurate reporting of last trip	88%	65%	76%	53%	44%	38%
Fully completed trip details	94%	79%	69%	95%	92%	78%
Average trips per person	4.6	3.8	3.7	4.7	2.8	3.3
Average trips with estimated walk trips	4.6	4.1	3.9	5.0	3.0	3.5
Average number of car trips	2.8	2.2	2.8	3.6	2.2	2.4
Marginal cost per responding HH	\$139	\$147	\$139	\$149	\$158	\$168

FF - Face to face personal interview

DO - Drop off/mail back self enumerated questionnaire

MO - Mail out/mail back self enumerated questionnaire

A full discussion of the results is reported in TDC (1996b) and Peachman and Mendigorsin (1997). In summary, it was decided that the face to face interview method using a trip diary would be used for the survey. Although the review did not conclusively demonstrate the advantage of a trip diary over the activity diary, it was decided to stay with the format used in the previous surveys. This provided comparability of data and presented some economies in the development of the questionnaires, as they could largely be based on those used in 1991. In addition some difficulty was found by the respondents in the Review in understanding the approach of the activity diary, which is demonstrated by the much lower percentage of respondents who followed their activity/trip pattern through for the full 24 hour period, accurately

reporting their last trip as "to home". It was also considered that the "trip approach" was still most appropriate for providing data suitable for the travel demand model. Although the model is undergoing extensive review and re-estimation is proposed, it is not anticipated that the TDC will be developing an activity model approach in the near future.

It was also decided to continue to use the face-to-face interview, for although in the Review the response rate using this method was considerably lower than expected, and much lower than previously experienced (a response rate of 62 per cent fully responding households was achieved in the 1991 survey), the cost per interview to achieve the same data quality was similar for the face-to-face and self-enumeration methods in the Review report. The actual marginal cost per responding household in the Review study for a mail-out/mail-back method was around \$95. The \$139 marginal cost reported in Table 2 is the estimated cost by the market research firm to carry out the required follow-up procedures to achieve a comparable data quality in the mail-out/mail-back method as in the face-to-face interview. The Review found that considerable expense was incurred in follow-ups to bring the self-enumerated questionnaires to the same level of completion as that achieved in a personal interview. These costs are current commercial market research costs in Sydney which reflect a significant profit margin and high unit labour costs at all levels.

Thus given the apparent comparability of costs, the perceived higher data quality which is achieved by a personal interview, the comparability with previous years, design economies by using the existing questionnaire design, the opportunity to include a greater range of data items and the flexibility to include in-depth, attitudinal and even stated preference questions in future years, the decision was made in favour of the personal interview method.

Supporting Activities

It was realised at the very start of the VAIS survey that the travel survey in itself would not be sufficient. One of the problems with previous travel surveys in Melbourne had been that the data had not been used sufficiently to justify the cost of the survey. This was because the travel survey data was isolated from other types of data and analytical techniques which might provide support. Access to the data was also restricted, with one government department having full control over access rights. It was therefore decided to encase the travel survey within a supporting framework of complementary databases, analytical techniques and support services. In conjunction with the funding mechanism of subscriptions, it was from these ideas that the Victorian Integrated Travel, Activities and Land-Use (VITAL) project grew.

The VITAL project consists of eight major components. Six of these components fit together to form the basis of the VITAL toolkit, they are united within the framework of a Geographic Information Systems representation of spatial data, and are supported by a Data Support Centre.

The components of the VITAL project are:

Emerging Trends in Travel Surveys in Australia

- The Victorian Activities & Travel Survey (VATS)
this survey, as described above, is the centrepiece of the VITAL project.
- Land-Use Information
this database assembles information on land-use characteristics in urban areas of Victoria, in a format suitable for transport and land-use planning purposes. It involves innovative use of non-traditional data sources to establish a finely-grained and updatable information base of activity characteristics at origin and destination sites. The main output of this component of VITAL is a detailed employment database at a high level of spatial resolution, plus a database of approximately 50,000 geocoded landmarks in Melbourne.
- Transport Network Information
this database assembles information on transport networks in urban Victoria, in a comprehensive and consistent GIS format. It covers road networks, public transport systems, and bicycle networks. The public transport network information includes timetable information for use in various modelling activities. The road network is derived from the street data files supplied with the MapInfo GIS package, which covers every street in Metropolitan Melbourne.
- System Monitoring
the project monitors the performance of the road and public transport systems, using data from various road traffic sources and from automatic public transport passenger counting systems. This data provides useful control totals for comparison with the expanded population results from the VATS survey.
- Special Surveys
as part of the VITAL project, the IRC undertakes special surveys of travel behaviour and attitudes which integrate with the base data held in the VITAL Toolkit. These surveys include attitudinal surveys, stated preference surveys, in-depth surveys (using the HATS survey methodology), on-board surveys, and surveys with geographical biases for clients interested in specific regions only.
- Demand and Supply Modelling
to fully utilise and extend the life of the data held in the various data bases described above, the IRC is developing demand and supply models of the transport system, describing the operation of the physical system and the responses of consumers to changes in that system. New public transport modelling systems are currently under development, while the demand modelling will focus on activity-based approaches to understanding the demand for transport, using the detailed activity data collected in the VATS survey. The VITAL data will also be used to develop modules for use with the TransCAD modelling package.
- Geographic Information Systems framework
all the databases and modelling programs is integrated by means of a Geographic Information System (GIS) package. This GIS framework allows seamless transfer of data, and consistent spatial definitions, between the various components of the VITAL Toolkit. It allows geocoding of destination information, multiple layers of

network information, and graphical input and output. The VITAL project initially adopted the MapInfo GIS package, and is currently converting this information to a TransCAD platform, but the base data can be transferred to other packages such as ArcInfo

- Data Support Centre
to ensure that the VITAL toolkit is used to its full extent, subscribers and users are assisted by means of a Data Support Centre which helps users in framing their questions, accessing the data, running the models, and interpreting the answers

The Sydney HTS is also part of the package of data and modelling outputs provided by the TDC. Unlike the previous situation in Melbourne, the TDC and its predecessors have always provided or aimed to provide (funding and political climate permitting) the full range of data and modelling tools for comprehensive transport planning in the Sydney metropolitan region. This package includes:

- The Household Travel Survey (HTS)
as described above, this provides a detailed picture of personal travel. The data is used for descriptive analysis for understanding travel patterns as well as for estimation of components of the travel demand model.
- Commercial Transport Study (CTS)
this study supplements the data of the HTS by providing data on commercial vehicle travel in the Sydney region. A commercial vehicle survey was conducted in 1991 along with the 1991 personal travel survey by sampling from the population of vehicles registered in the region. The TDC believes that this did not adequately represent the commercial vehicle flows, nor was a forecasting model able to be developed from this data. The TDC is currently exploring methods of collecting data on, and forecasting commercial vehicle travel. This data and modelling capability is of a high priority given the growing demand placed on the urban transport network by commercial vehicles.
- External cordon surveys, traffic counts and related data
such data as is required to validate the outputs of the travel demand model are either collected by specially designed surveys or are already available through the operations of the road authority.
- Transport demand modelling
the TDC has a Strategic Travel Demand Model for forecasting travel demand in the Sydney metropolitan area. This model follows the traditional four-step structure. It is currently being reviewed to improve its predictive and policy analysis capabilities.
- Transport networks
the TDC, in co-operation with the road authority, is also responsible for maintaining the current and future Sydney road network representations for assignment of the output from the travel demand model for evaluation of infrastructure projects and management of the network. TDC also has a public transport network which

includes a suburban rail service, harbour ferry services and an extensive public and privately owned bus route system. These networks are held in the Emme/2 software format.

- **Land-use data**
this data is required at the travel zone level as an input to the Strategic Travel Model for forecasting future travel demand. Currently only three variables are used (population, employment and workforce), but these are not available from other government planning agencies at the low geographical level required by the travel model. TDC is currently working on a land-use forecasting model to derive these zonal forecasts from more aggregate level data.
- **Geographical Information System**
GIS are used extensively in TDC for the integration and display of data and model outputs for easier policy interpretation by clients. The GIS platform is particularly useful for capture and checking of data associated with the transport networks and the travel zone system. All survey data, including the Census Journey to Work data, is coded using data from the TDC's GIS land-use files. The TDC primarily uses the ArcInfo package, but can provide output to clients in MapInfo format if required.

This package of data and modelling tools is available from the TDC to all government transport planning and operating authorities for use in the evaluation of infrastructure projects for all modes, service level planning and transport policy assessment and implementation.

Different directions

Despite the similarities outlined above, there are a number of differences in the approaches being adopted in Sydney and Melbourne.

Survey Instrument

Following intensive Pilot Surveys in both Sydney and Melbourne, different survey methods were adopted in each city. Melbourne is using a mail-out/mail-back, self-completion questionnaire with extensive phone and interview survey follow-up processes. Sydney is using face-to-face personal interviews. The reasons for the different methods selected in each city are partly historical (Sydney has always used face-to-face interviews), but are also due to differences in judgement about the relative merits of each method. Both Sydney and Melbourne agree that face-to-face interviews provide the best opportunities for flexible data collection with the highest levels of data quality. However, the IRC considered that the cost advantages of the mail-out/mail-back method (as noted in Table 1) provided better value-for-money than the face-to-face interviews. On the other hand, the TDC Pilot Surveys conducted in Sydney found much higher marginal costs for all survey methods, with no advantages for mail-out/mail-back surveys, thereby tipping the value-for-money balance in favour of the face-to-face interview surveys.

Conduct of the Fieldwork

Different procedures are being used in each city for the conduct of the survey fieldwork. The VAIS survey has been designed and is being conducted by the TRC itself, while the Sydney HTS is being conducted for the IDC by the Hunter Valley Research Centre. The TDC had previously commissioned AGB-McNair Pty Ltd to conduct the Pilot Survey evaluations. The TDC has been responsible for the design of the survey, and will be responsible for analysis of the final data.

Funding and Organisational Structure of the Project

One of the underlying reasons for many of the differences in the two surveys lies in the nature of the funding for each of these survey efforts. As noted previously, the VATS survey is financially underwritten by the TRC (and RMIT University) with the costs being recouped by sales of the data and associated services to the public and private sectors of the transport, and related, industries.

On the other hand, the Sydney HTS, and the other activities of the IDC, are funded by the NSW Government, supplemented to a minor extent by sales of data. The funding within Government comes from across the transport portfolios, i.e. both roads and public transport modes are equally represented. Additional support and funding is also provided by related portfolios such as the environment and land use planning agencies. This "joint ownership", or stakeholding, in the TDC and its outputs is important in ensuring that data and models which meet the needs of these stakeholders are provided, and that a core set of data and modelling tools is available for comparable evaluation of projects.

It was considered important in the state of New South Wales that this core information, which forms the basis for transport planning decision making, should be held within Government. In that way, it is auditable by Government and available for public scrutiny particularly in relation to infrastructure evaluation projects. The increasing role of private sector financing in funding transport projects and the rigorous environmental impact assessment process is making this even more important.

By comparison with the Government-funded model used in Sydney, the design of the VITAL project, and its funding by means of subscriptions, has resulted in a range of advantages and disadvantages, some of which were expected and some of which came as surprises. The advantages include:

- each subscriber gets a full copy of the survey data unit records at much lower cost than if they had conducted their own survey. This sharing of costs between a number of subscribers is a major advantage
- because the data is collected by an independent agency (the TRC) there is much greater credibility bestowed on the data by all subscribers. In the past, if the data had been collected by a road agency, then it may not have included questions of relevance to a public transport agency. Even if it had, there was a degree of

suspicion as to whether the survey was biased towards the needs of the agency which collected the data.

- the non-exclusive nature of the VAIS data subscription has resulted in several government agencies, and private companies, having copies of the data on their own computer systems. This means that no one agency or company has exclusive control over the data. This means that data cannot be suppressed, nor can incorrect analysis or interpretation of the data go unchecked. This has brought about a certain degree of "democratisation" of the data; anyone who is willing and able to buy the data can have access to it. This introduces an amount of "contestability" into the use of statistics and data to support an argument. Advocacy groups can no longer pull statistics out of the air to support their own case, since they realise they can be challenged by a range of other groups who also have access to the raw data.

The VITAL project has, however, created a number of problems which would need to be addressed in any replication of the project, including:

- there is a need for the IRC (and RMIT University) to continually underwrite the initial data collection and database development costs. These costs are substantial (about \$500,000 p a) and must largely be paid before any data is sold to clients.
- initially, before any data was collected, there was a need to gather subscriptions on the basis of a promise of deliverables. Fortunately, this was possible on the basis of the past record of the IRC in the conduct of surveys of this type.
- there is a need for continual performance on the part of the IRC, since the next year's subscriptions depend on performance in the current year. This places pressure on the study team, but ensures that performance remains a high priority.
- some subscribers may be sensitive to the release of information from the survey, before they have had a chance to assess the political implications of the results. This is especially the case for government agencies which have, in the past, had much tighter control over the release, or non-release, of data and results.
- several groups who, in the past, could arrange access to the data at minimal cost now feel that they are being denied access to the data. In particular, university researchers and consultants who previously used the data for a variety of purposes now find that they would have to pay commercial rates to access the data. Consultants working for a subscriber can use the data for that particular engagement, but cannot take the data to use on other projects. The case of university researchers, and research students, outside of the IRC will need to be considered in more detail as the VITAL project attains financial stability.

Future directions

Commercial Travel Surveys

As noted earlier, the IDC is exploring methods of collecting data on, and forecasting commercial vehicle travel in the Sydney metropolitan area. Commercial vehicle traffic is making an increasing contribution to the demand for road infrastructure and having an increasing impact on the urban environment. The collection of data for this sector is more complex and more difficult than for personal travel but one which must be addressed to fully understand and manage the travel demand in metropolitan areas. To obtain a complete picture of commercial vehicle travel in the urban area and to collect data which provides the necessary detail for infrastructure planning and is suitable for forecasting, a number of different surveys will need to be conducted. These will include driver surveys, number plate surveys and company based surveys. This data, along with macro economic data on commodity flows and activity by economic sector will be brought together in a matrix estimation procedure to provide the trip tables required to represent current and future demand for commercial vehicle travel. Similarly, the TRC has recently commenced the planning and design of the Freight Activity and Commercial Travel Survey (FACTS) to collect information on freight and commercial travel movements in the urban areas of Melbourne. The FACTS project is designed to run as a parallel survey activity to the VAIS survey as a continuous process, as will be the case in Sydney.

Use of Novel Data Collection Methods

Given the rate at which technologies are developing in the field of GPS and related areas, it is likely that such techniques will increasingly be used for routine travel surveys (especially for tracing freight vehicle movements and public transport fleet movements). In addition, the integration of traffic control system information and public transport automatic ticketing information with the data collected from ongoing travel surveys promises to provide a database which is rich in both breadth and depth.

Conclusions

The goals for the TDC and the TRC through the implementation of a continuous survey of household travel and commercial vehicle travel are to be seen as an active and integral part of the planning process. If high quality data can be collected in a cost-effective manner, which is making a demonstrable contribution to the policy debate, then hopefully its survival will be ensured. It is believed that this can be achieved more successfully by putting in place the management and survey procedures which provide a continuous stream of relevant data rather than presenting bureaucrats with the prospect of resurrecting a dinosaur every ten or so years.

The Sydney and Melbourne surveys have shown that continuous travel surveys are valuable and practical, yielding timely and relevant data to assist in policy analysis and system design. The advantages of continuous surveys have been shown to be

substantial, both in financial terms and in terms of the quality of data that can be collected though such surveys

While both Melbourne and Sydney have opted for continuous surveys, there is no requirement that such surveys be identical (although that would have been desirable for national comparisons of travel patterns). The choice of different survey methods and modes of survey administration demonstrate that the political and organisational climate in which surveys are conducted can be a determining factor in the final design of the survey

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