

Traffic Impacts of Pedestrianisation

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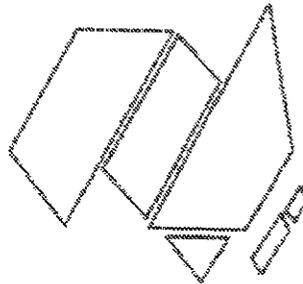
Abstract:

On March 28, 1992 Swanston Street Melbourne, was closed to vehicular traffic as part of a significant pedestrianisation scheme. As there are only a limited number of North-South traffic arteries in inner Melbourne, the question of the fate of the traffic that used Swanston Street inevitably arose. This paper describes research which was conducted to determine the changes in trip-making behaviour as a result of the closure of Swanston Street, of those drivers who used Swanston Street. The results of the research indicate that, contrary to the opinions of some planners prior to the closure, an insignificant volume of the former Swanston Street traffic has 'disappeared' from the road network, either as a result of drivers changing mode or ceasing to make trips.

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1. INTRODUCTION

The Swanston Street Walk

On March 28, 1992 Swanston Street, Melbourne, was closed to private vehicular traffic as part of a significant pedestrianisation scheme. Prior to its closure, Swanston Street was one of inner Melbourne's major north-south vehicular arteries and was used by over 28,000 vehicles per day, twenty thousand of which was through traffic. Alternative routes for this traffic were limited by the rail lines and the Yarra River on the south side of the city. There are only five bridges and one railway underpass, including the unpedestrianised south end of Swanston Street, that provide realistic crossings for the displaced traffic.

The pedestrianised section of Swanston Street is now officially known as the Swanston Street Walk. The Swanston Street Walk is part of the Central Area Transport Strategy (CATS) released in 1991 (Victoria Transport 1991). A major feature of CATS was to create a pedestrian emphasis in the central city, with Swanston Street being converted to a European style concourse. The final plans of the Swanston Street Walk are given in Figures 1 and 2.

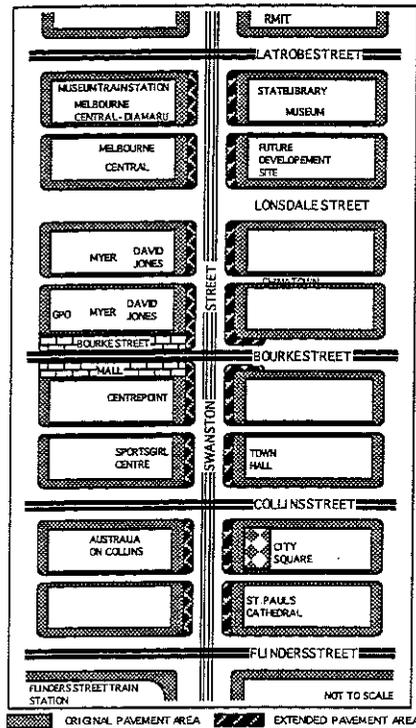
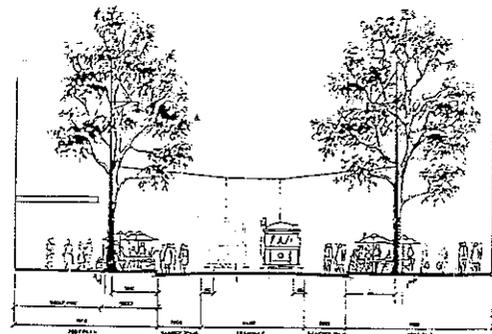


Figure 1
Plan of the Walk



The original footpaths have been extended by 3.8 metres. This allows a 2.8 metre wide shared zone between the tram zone and the footpath. This zone can, on different occasions, be used by service vehicles, emergency vehicles, parades and pedestrians.

Source: MCC (1991), p 20

Figure 2
Cross Section of the Walk

The strategy also proposed improvements to public transport and a traffic management plan for traffic bypassing and accessing the central city (Figure 3). These routes are not new roads but roads on which significant improvements were made to increase their capacities.

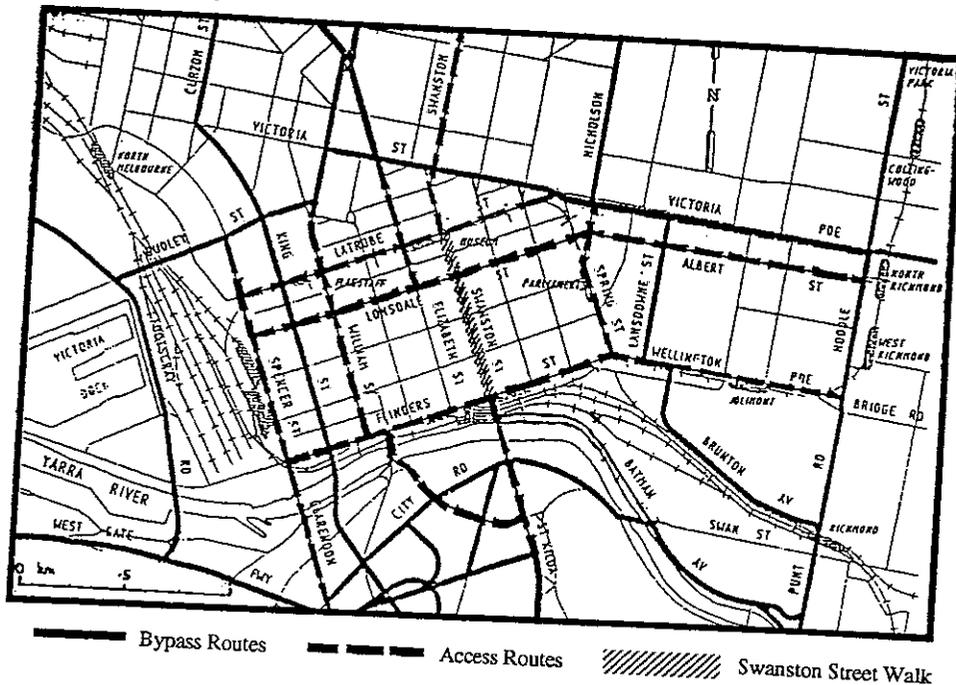


Figure 3. Nominated City Bypass and City Access Routes

The objectives of the Swanston Street Walk and CATS, as outlined by the Melbourne City Council, were to (MCC 1991):

- improve the environment for pedestrians and pedestrian related retail activities;
- improve pedestrian access and public transport in Swanston Street;
- improve public transport access to the Central Activities District;
- decrease the general convenience of the private use of cars in the city and thereby support long term transportation, social and environmental objectives;
- improve the urban environment in the central area through a modal shift from the car to public transport;
- assist the diversion of through traffic around the city heart by traffic management and minor roadworks.

Reasons for the Study

The closure of Swanston Street was historically important and was preceded by considerable public debate. A topic arousing great speculation was the effect of the closure on the trip making behaviour of the drivers who used the street.

Some groups and planners - eg. neighbouring city councils, the Retail Traders Association and sections of the general community - suggested traffic chaos as a result of the increase in traffic on the alternative routes into and around the central city. Other planners - eg. Newman, Kenworthy, Monheim (Flannigan 1992) and Yencken (ABC 1991) - predicted that a significant proportion of the traffic that used Swanston Street could simply 'disappear', either onto public transport or as a result of people ceasing to make trips altogether. These predictions were based on investigations in European cities where traffic that had previously used the pedestrianised streets 'disappeared' (Monheim 1991). Monheim reported that in some cases up to eighty percent of the traffic had 'disappeared'. However the data used to obtain this information was based solely on traffic counts on parallel routes in the vicinity of the pedestrianised streets and no data was collected to determine the alternatives chosen by the traffic that had 'disappeared'. For example, were people still driving but using routes other than those included in the traffic counts and hence in reality had not 'disappeared' from the road network, or had there been a modal shift to public transport?

Drivers can react in a number of ways to changes in the transport system. In the case of pedestrianisation the drivers may:

- cease making the trip altogether;
- make the trip to a different destination. eg. shop at a suburban centre;
- make the trip from a different origin. eg. move residence;
- change the mode by which they make the trip. eg. use public transport;
- bypass the area completely;
- use a parallel route in the vicinity of the pedestrianised street;
- use the same route as far as the pedestrianised area. This is possible for those drivers who have their origin or destination within or near the pedestrianised area.

The only traffic that would appear in traffic counts on the parallel routes after closure is that which actually uses the parallel routes. In the other cases the traffic would be classified as 'disappeared': however in reality, it could still exist on roads other than those used for the traffic counts. The only car traffic that has truly 'disappeared' is that which shifts onto public transport and that which ceases making a trip altogether. In all the other cases the car traffic has simply rearranged itself.

The apparent disappearance of traffic may also be due to the displacement of traffic that originally used the alternative routes on to routes not used in the traffic counts. This 'ripple effect' was noted in a report by the Greater London Council (GLC 1973) on pedestrianised streets.

Objectives of the Study

The objective of this study was to predict, prior to closure, and assess, after closure, drivers' reactions to the pedestrianisation of Swanston Street in terms of their trip-making behaviour. Most of the debate on the effects of the Walk on traffic was conducted by planners, politicians, journalists and traders. The arguments presented by both sides were based either on experiences in other cities or their own perceptions of how traffic would be, and ultimately was, affected. Nobody had sought the opinions of those people mostly affected by the closure, the drivers who used the street.

This study consisted of two parts. The first part was conducted prior to the closure of Swanston Street. Predictions of the likely changes in trip-making behaviour were made using qualitative information obtained from a series of focus group interviews with drivers who used Swanston Street. Since attitudes and beliefs of drivers shape perceived changes in trip-making behaviour, these had to be investigated in order to understand and predict likely changes in behaviour, hence the use of focus group interviews.

The second part was conducted after Swanston Street was closed to traffic. Actual changes in trip-making behaviour were assessed using quantitative data obtained from a questionnaire survey.

A secondary objective of the study was to assess the effectiveness of qualitative information as a basis for predicting likely changes in trip-making behaviour. This was done by comparing the predicted reactions with the actual reactions.

2. METHODOLOGY

Part One of the Study

The survey conducted prior to the closure of Swanston Street was in three stages:

- a vehicle observation survey of Swanston Street;
- a questionnaire survey of Swanston Street users;
- in-depth focus group interviews with Swanston Street users.

The ultimate aim of this part of the study was to predict drivers' reactions to the closure of Swanston Street in terms of their trip-making behaviour. These predictions were based on the results of the focus group interviews. The first two stages of the survey were conducted in order to select suitable participants for the focus group interviews.

Vehicle drivers who used Swanston Street were the target population of the survey. In order to obtain a representative sample of Swanston Street drivers information on the trip patterns were obtained using a mail-out questionnaire. In the vehicle observation survey registration numbers of vehicles using Swanston Street were recorded and forwarded to VicRoads who returned the corresponding addresses - for privacy reasons, owners names were not provided nor were registration numbers linked with addresses. Note that this technique can no longer be used as VicRoads will not match number plates and addresses for transport surveys. The questionnaires were then posted to these addresses. The distribution of questionnaires at traffic lights was considered but was not utilised as respondents' addresses were needed for the follow-up survey conducted in the second part of the study

The Questionnaire

Responses to the questionnaire provided the following information:

- the time of the trip;
- the suburbs of the origin and destination of the respondent's last trip that included Swanston Street;
- the reason for the trip;
- the suburbs and reasons for any stops made during the trip;
- any comments that a respondent may wish to make.

The questionnaire was designed so that respondents could easily complete it regardless of how many links were in their trip. The survey design used an innovative method to gain this information. An open-ended question asking the respondents to

describe the last trip they made using Swanston Street was used (Figure 4). The trip examples provided on the questionnaire clarified the nature of the information required

2. Thinking about this trip, could you please describe it giving the suburbs where you started and finished the trip, and any stops you made during the trip. Also include the main reason for the trip and the reasons for any stops.

Some examples:

start	reason for stop	stop	main reason for the trip
I drove from home in Prahran.	picked up a friend in South Melbourne	then drove to work in Carlton.	
end of trip			
After I finished shopping at Myer, I drove from the Wilson carpark in Lonsdale Street then I stopped in Brunswick to visit a friend then I drove home to Essendon.			
After finishing a plumbing job in North Melbourne, I drove to my next job at a house in St. Kilda.			

Your trip:

Figure 4. Question Asking for Trip Description

This method of gaining trip information had not been tried before and was preferable to a questionnaire asking the respondent to answer a series of individual closed questions. A questionnaire using a series of closed questions was designed initially but was not used because the final design had the following advantages:

- fewer questions were required making the questionnaire shorter and simpler;
- the trip examples made it clear what was meant by the word 'trip' and how the trip was to be described;
- the use of individual questions asking for origin, destination, stops and the activities at these locations may lead to confusing answers as respondents may not be sure of exactly what is meant by these words;
- the main purpose of the questionnaire was to screen participants for the group discussion sessions so:
 - a decrease in response rate was tolerable as long as enough people were able to attend the interviews;
 - statistically accurate origin-destination data was not necessary;

The date and time of the respondent's last trip were elicited, in a closed question format, so that the respondent would recall a specific trip on Swanston Street before describing their trip verbally.

The questionnaire also included a section asking for comments on the Walk so that the attitudes of the Swanston Street users to the Walk could be assessed. Many authors (eg. Richardson & Meyburg (1990), Dillman (1978)) also suggest that a general comment question at the end of a questionnaire can increase response rate because it makes respondents feel better about the survey. Respondents may consider their opinions are being assessed even though, in reality, their comments may be irrelevant.

The Focus Group Interviews

By conducting the focus group interviews it was possible to get qualitative data on drivers' reactions. It is recognised that the reactions of individuals are influenced by how they perceive changes to the transport system and their attitudes to different parts of the transport system. To obtain an understanding of peoples' perceived reactions to the closure and the reasons for their behavioural changes these factors would need to be considered. Some of the factors investigated were:

- attitudes to public transport;
- the reasons why people used Swanston Street;
- attitudes to the Swanston Street Walk and perceptions of its effects on traffic flow into and around the city;
- perceptions of the trip time increases caused by using the alternative routes;
- perceptions of the traffic problems on the alternative routes.

Levin (1981) conceptualised the role of attitudes in travel behaviour as depicted in Figure 5: he claimed his concept to be in general agreement with that of other authors on the subject.

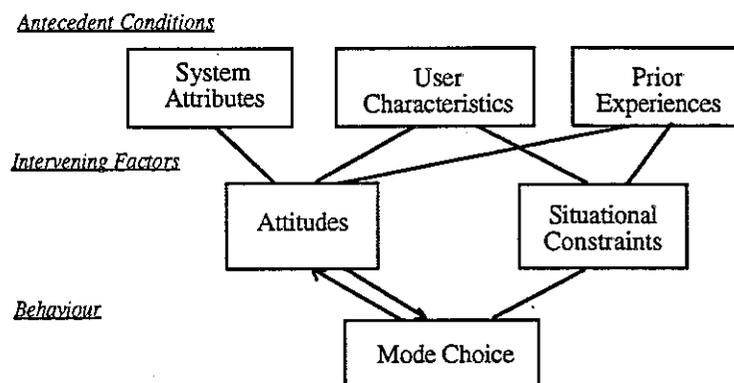


Figure 5. The Role of Attitudes in Travel behaviour

The results obtained from the discussion sessions were qualitative, rather than quantitative. This type of data was necessary to ensure that the respondents' motivations and attitudes were identified and available for understanding and predicting their changes in trip-making behaviour. However, some limited quantitative data on the likely route choices and changes in trip durations was obtained.

Selection of Participants

A stratified sample of respondents was chosen to participate in the group interviews. They were selected to represent all Swanston Street users, based on combinations of the following:

- origins and destinations
- reasons for making the trip
- time of day the trip was made
- attitudes to the closure of the street

The respondents invited to each session were selected to ensure that differing attitudes towards the Swanston Walk and differing trip patterns were represented at each session. This increased the likelihood that the changes proposed by each individual could be tested against reality by calling on the differing experiences of the other members of the group.

Experience has shown that most research issues can be addressed with no more than six to eight groups and that four groups are often entirely adequate (Goldman 1987). In this study six focus group interviews were conducted, including a pilot interview. Twenty-four respondents were interviewed. There were five respondents at one session, four at four sessions and three at the final session. It was planned to have up to five people at each session however some respondents did not attend. An extra session was considered, to make up for those respondents who did not attend, but the information in the later sessions was becoming repetitive so an extra session was not warranted.

Structure of the Interview Sessions

During the interviews the respondents described, and drew on maps of the city, trips they made using Swanston Street, and their proposed alternatives for each trip. The feasibility of each of the suggested alternatives was then discussed by the group to ensure that they were indeed realistic proposals. The discussions focused on the following aspects of trip making behavioural reactions:

- the reasons respondents had chosen, or not chosen, to make the trip by public transport. They were also asked why their current trips were not made by public transport.
- the reasons respondents had chosen specific alternative routes, the problems associated with each route choice and how these problems could be alleviated.
- the reasons respondents (if any) chose to avoid the trip or make the trip to a different destination instead.
- the effect of the proposed alternative trip on trip duration.

In the event of a non-feasible alternative being suggested it was believed that interaction between the group members would provide realistic solutions. Care was taken by the moderator to avoid identifying non-feasible solutions and suggest possible alternatives. However, when prompting of discussion was necessary, leading questions such as, "Wouldn't public transport now be a better option?" were avoided and instead questions like, "Have you considered the use of public transport?" or "What if...?" questions such as, "What would be your reaction if your proposed route is going to increase your travel time by twenty minutes?" were used.

Detailed probing of the activities of each of the respondents, prior to and after each trip, was also undertaken so that the feasibility of possible longer trip times was investigated. Jones (1981) noted that activity approaches bring a sense of perspective to travel behaviour and treat travel as an integral component of an activity pattern and hence can identify both the direct and secondary impacts of transport policies. He identified unstructured interviews as a method for gaining information on activity patterns.

Part Two of the Study

The second part of the study was conducted using a mail-out/mail-back questionnaire. The questionnaire was sent to all the respondents who provided origin-destination data in response to the questionnaire used in the first part of this study.

The questionnaire had the following objectives:

- to determine actual reactions to the pedestrianisation of Swanston Street;
- to obtain feedback on driver attitudes and opinions of the Swanston Walk and the city bypass and access routes.

Each questionnaire included a description of the trip described by the respondent on the first questionnaire, hence every questionnaire was different. This served as a reminder to the respondent of the trip they described on the first questionnaire.

Responses to the questionnaire provided the following information:

- changes in trip-making behaviour;
- route choices for those respondents who continued to drive;
- changes in trip duration;
- reasons for changing trip-making behaviour;
- comments on the Walk and city bypass and access routes.

3. SUMMARY OF THE FINDINGS

Predicted Changes in Behaviour

Each participant in the focus group interviews predicted they would most likely continue to make their trips by car, but on parallel routes, once Swanston Street was closed.

However, five of the respondents indicated that if trip times were greatly increased then they would consider other options. Two said that they would consider public transport if the car trip was significantly longer, and if better parking was available at their respective train stations. The two people who made shopping trips to the city said that they would consider using regional centres if traffic in the city conditions in the city deteriorated and if on-street parking problems were exacerbated. Another person claimed that if the traffic "*became diabolical*" she may consider changing her residence to the same side of the city as her workplace.

While the sample was too small to make these predictions statistically valid, they clearly show that an insignificant volume of traffic was expected to 'disappear'. People would only consider options other than using one of the parallel routes if the traffic became intolerable. The respondents also had a negative attitude to public transport. They claimed that it was slow, expensive, unreliable and not a realistic option when travelling from one side of the city to the other. This reinforced the prediction that their would be little 'disappearing' traffic.

Another interesting finding of the group interviews was the correlation between peoples attitudes to the Walk and their predicted increases in trip durations: the more opposed a person was to the construction of the Walk the greater their expected increase in total trip time.

Quantitative results obtained from the interviews are outlined, and compared to the results of the follow-up survey, in the following sections.

Actual Changes Trip-making Behaviour

The changes in trip-making behaviour of those people who responded to the follow-up questionnaire are listed in Table 1. Each of the respondents who had changed their trip-making behaviour as a result of the pedestrianisation of Swanston Street continued to make their trips by car but on alternative routes.

Table 1. Changes in Trip-Making Behaviour

	number	percentage
no longer make the same trip	16	15.1
now use public transport	1	0.9
delivery drivers or sales reps. (use the same routes)	5	4.7
still drive but use a different route	84	79.2
Total	106	100

Respondents who no longer made the same trip did so for reasons other than the closure of Swanston Street. Seven respondents had moved workplace and two had moved residence. The remaining seven respondents said that the trip described by them on the first questionnaire was a rare event and that they had not made the trip since. The one respondent who said she used public transport did so because she no longer had access to a free company carpark. The five respondents who made delivery or sales trips in the central city continued to make these trips. They used the same routes to access the city but their routes within the city differed slightly as they could not use Swanston Street: the Walk was under construction at this time.

The remaining 84 respondents continued to make their trips by car but via alternative routes. All but two of these respondents changed route because of the closure of Swanston Street - one changed route because his passenger had changed workplace within the central city and the other had always used the alternative routes of King or Spencer Streets to bypass the central city: his trip as described in the first questionnaire was a rare event

The responses clearly show that there has been no 'disappearing' traffic as a result of the pedestrianisation of Swanston Street. Some of the respondents no longer made the same trip - in terms of origin and destination - but this was not caused by the closure of Swanston Street. It was the result of the ongoing changes in residency and workplace: these trips would be replaced by other people moving residency or workplace, resulting in no overall changes in traffic patterns.

Changes in Route Choices

The percentage of drivers using each of the alternative routes is given in Table 2. These results were calculated using the route choices of the eighty-nine respondents (including five delivery drivers) to the follow-up survey who indicated that they still made the same trip by car but on a different route. These percentages are compared to the percentages predicted from the responses of the twenty-four participants in the focus group interviews

Table 2. Percentage of Swanston Street Vehicles Using each of the Alternative Routes

	actual	predicted
Eastern Alternatives	45	52
Punt Road	23	25
Princes Bridge/Russell Street	15	14
Princes Bridge/other Street	5	13
Church Street & Burnley Street	2	0
Western Alternatives	43	37
Queens Bridge	9	12
King Street	27	14
Spencer Street	2	4
Footscray Road	5	7
Continue to use the same route to access the CBD(as far as the Walk)	12	11
Total	100	100

The number of respondents using alternatives to the west of Swanston Street is higher than predicted, and the proportion of traffic using King is significantly different than predicted: over twice as many respondents use King Street. This was at the expense of the other routes on the western side of the Swanston Street and the Princes Bridge.

A component of the predictive error would be due to the small number of participants at the group interviews. The participants provided realistic predictions of their own alternative routes. However, as only twenty-four people participated in the focus group interviews, the numbers were too few on which to base predictions of route choice for the general population - that is, all drivers who used Swanston Street.

Changes in Trip Durations

The actual increases in trip durations for each of the alternative routes are given in Table 3. These were calculated using responses to the follow-up survey. The predicted increases are those predicted by the participants in the focus group interviews.

Table 3. Average Reported Increases in Trip Durations

route	predicted time increase (min)	actual time increases(min.)			
		peak		off-peak	
		average	standard deviation	average	standard deviation
Princes Bridge/Russell Street	<5	5.3	6.7	1.4	5.0
Princes Bridge/other streets	<5	0	0	-	-
Punt Road	10	6.4	6.4	4.0	4.9
King Street	10-20	3.4	5.2	3.0	8.0
Footscray Road	5-10	10	5	-	-
Spencer Street	<5	10*	-	5.0*	-
Queensbridge	5-10	6.4	7.5	5.0*	-
Church Street	-	20*	-	-	-
Burnley Street	-	15*	-	-	-
Average	7.5	6.0	6.6	2.7	5.9

- indicates the route was not used

* only one respondent used these routes

These results show, on average, there has been an increase in travel times for those drivers who used Swanston Street. However, 6.7 percent of the respondents reported that trip times had decreased and a further 40.0 percent reported that trip times were the same. Changes in trip times did vary over the same routes as indicated by the standard deviations.

The actual increases in trip times were similar to, or less than, the times predicted by the participants in the focus group interviews. The only figure that was significantly different was for King Street. The predicted increase was 10-20 minutes whereas the actual changes in trip duration averaged 3.4 minutes. There are two possible reasons for this. Respondents had a negative attitude to the use of King Street, probably based more on its reputation as a slow street than on experience. These respondents may have thought that the increases in trip times would be high, especially once Swanston Street was closed as King Street would have to take even more traffic. The other reason is the traffic amelioration measures conducted by VicRoads significantly improved traffic flow on King Street.

4. CONCLUSIONS

Actual Changes in Behaviour

All respondents who had changed their trip-making behaviour as a result of the pedestrianisation of Swanston street still continued to make the same trips, by car but on different routes.

This result indicates that an insignificant amount of the former Swanston Street traffic has 'disappeared' from the road network, either as a result of drivers changing mode or abandoning trips. From the focus group interviews it was expected that people could change mode if trip durations were significantly increased. However this was not the case, hence the fact that there was no 'disappearing' traffic was not unexpected.

Prior to closure some planners had predicted that some traffic could disappear from the traffic network. These predictions were based on experiences in European cities where often public transport is upgraded in conjunction with pedestrianisation. However in Melbourne more emphasis was placed on increasing the capacity of the road network into and around the central city with very few improvements made to public transport. A condition for decreasing traffic generation is to decrease overall road capacity. This was not achieved by the closure of Swanston Street due to the increase in capacity on the alternative routes.

Predictions of 'disappearing' traffic in European cities are also often based solely on traffic counts on a number of routes in the vicinity of the pedestrianised street. These traffic counts merely provide an indication of the amount of the former traffic that has 'appeared' on the routes used in the traffic counts. They do not explain what has happened to the traffic that did not show up in these traffic counts or address the possibility that the apparent 'disappearance' of traffic could be due to the displacement of traffic, that already used these alternative routes, onto routes further from the central city.

By surveying drivers who used Swanston Street it was possible to determine what had actually happened to the former Swanston street traffic.

Predicting Changes in Trip Making Behaviour

The use of purely quantitative data to predict how drivers would react to the pedestrianisation of a street is insufficient. Attitudes to, and perceptions of, change influence peoples reactions to change hence qualitative data is required in order to predict, and understand changes in trip-making behaviour as a result of a change to the transport system.

By interviewing actual users of Swanston Street, an understanding of how and why drivers would alter their trip-making behaviour was gained. It was possible to investigate if a person would react in a manner other than changing route choice and also to investigate attitudes to, and perceptions of, change. The focus group interviews also provided an indication of likely route choices, changes in trip duration and timing,

attitudes to different aspects of the transportation system, problems with the alternative routes and measures that could be taken to improve the alternative routes.

The predictions on changes in trip-making behaviour did prove to be realistic. However, the number of respondents was too small to provide statistically reliable predictions of route choice. If realistic predictions of route choice were required then greater numbers of participants would be needed in the focus group interviews.

Further, as only drivers who used Swanston Street were surveyed, the method used in this research provided an understanding only of the fate of the traffic that used Swanston Street. However, pedestrianisation may also effect the traffic on the routes in the vicinity of the pedestrianised street: traffic volumes on these streets could be significantly increased. To understand how pedestrianisation affects traffic on these routes drivers on these routes would also need to be surveyed. Indications of how trip times on these routes have been altered, how these drivers, if any, have changed their trip making behaviour and if there has been a displacement of traffic from these routes could then be determined. It would then be possible to estimate the magnitude of the 'ripple effect' on the traffic network caused by pedestrianisation. Only after accounting for this 'ripple effect' can any reported decreases in vehicles on the inner city routes then be attributed to 'disappearing' traffic.

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