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Paper title: **Car pooling – targeting for success**

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Abstract (200 words):
Over recent years there has been increasing recognition of the benefits of developing comprehensive and sustainable urban transport systems. In particular, at both the state and federal level, there has been growing interest in the development and implementation of travel behaviour change programs, such as TravelSMART. These programs aim to reduce people's dependency on the car by encouraging them to choose sustainable travel modes such as cycling, walking and public transport. They also aim to reduce car usage through alternative measures such as car pooling. While the benefits that can be derived from car pooling, for both individuals and the broader community, can be significant, the schemes have generally failed to make any significant impact on travel behaviour. One of the central reasons for these problems stems from inadequate planning prior to implementation and a poor understanding of what can realistically be achieved. Formal site based schemes are a particular example of where pre-implementation planning can be critical to the ultimate success of the programs. For without adequate planning the wrong type of scheme may be applied. However, with correct analytical techniques these potential problems can be identified and overcome before unnecessary funds are expended and the failures begin to undermine the credibility of the schemes.

Introduction

Over recent years there has been increasing recognition of the benefits of developing comprehensive and sustainable urban transport systems. In particular, at both the state and federal level, there has been growing interest in the development and implementation of travel behaviour change programs, such as TravelSMART (TravelSmart, 2004b).

Programs like TravelSMART aim to reduce people's dependency on the car by encouraging them to choose sustainable travel modes such as cycling, walking and public transport. They also aim to reduce car usage through alternative measures such as car pooling (TravelSmart, 2004a).

While the car pooling programs have provided encouraging results in specific locations, such as universities (eg. (La_Trobe, 2003, Monash, 2003)), they have generally failed to make any significant impact on travel behaviour in the broader community. A fact evidenced by the high numbers of single occupancy vehicles using our roads (see Figure 1).

The reasoning behind the failures has tended to be linked to the level of promotion, scope and scale of incentives, and the degree of in-kind or direct financial support (ICARO, 1999). But these are not the only factors defining the success or failure of the schemes. Indeed if a car pooling scheme is not applied in the appropriate location, and under the appropriate conditions the likelihood of it succeeding is remote.

To avoid these problems, and achieve the greatest benefits from the implementation, it is essential that all aspects of the scheme be considered prior to implementation occurring. Importantly this planning must commence prior to the scheme and its location even be selected.

This paper provides a brief overview of the concept of car pooling, and an insight into the importance of detailed analysis in the preliminary planning required to deliver a successful scheme.
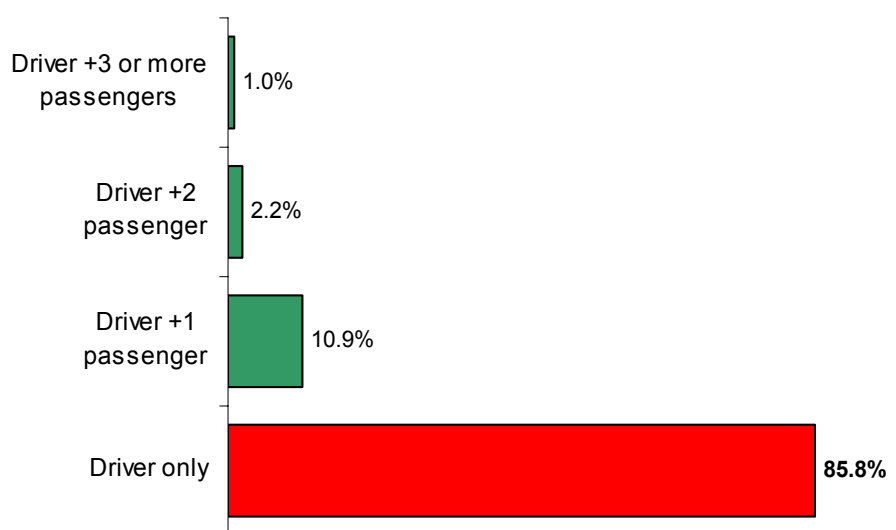

Figure 1: Vehicle occupancy levels for commuters in Melbourne (VicRoads, 2003a)

Car Pooling

At the broadest level car pooling, or ride sharing, can be defined as any process that facilitates a car driver giving a lift to another person.

The very nature of this arrangement means that fewer vehicles and less resources will be used. From the individuals perspective those benefits include:

‣ Reduced travel costs
‣ Reduced travel time
‣ Less vehicle wear and tear
‣ Reduced need for a second car
‣ Incentives

Benefits can also be derived for both organisations, and the community through areas such as:

‣ Lower traffic and reduced congestion
‣ Safer roads
‣ Reduces pollution
‣ Improved amenity
‣ Reduce parking requirements

Most car pooling currently occurs through informal arrangements. Those car pools are predominantly with family members or friends. These forms of car pools are however, largely beyond the control of external agencies, as such their ability to develop further is somewhat limited.

The other major form of car pooling are formal schemes, which rely on arrangements being made between broader groups of people who may not necessarily know each other. These forms of schemes have gained more attention due to there growth potential and the ability of external groups (such as the state and federal governments) to influence their uptake and impact.

There are considered to be two broad categories of formal car pools:

‣ Site Based: which look at single locations
‣ Area Based: which combine locations into larger groups

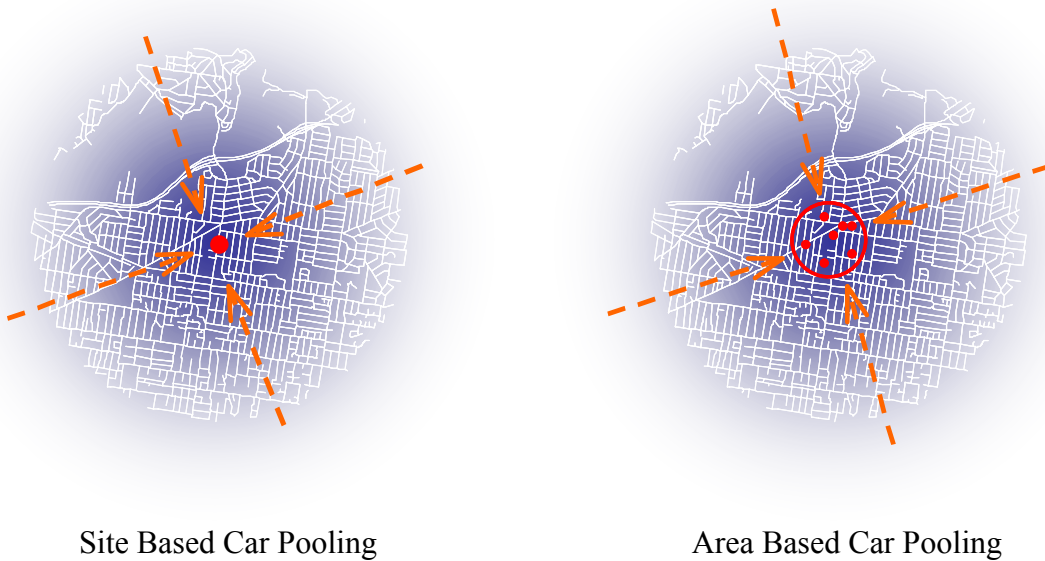Site Based Car Pooling   Area Based Car Pooling

Figure 2: Site and area based car pooling

Of the two forms site based schemes tend to be easier to implement and have an intuitive appeal, primarily due to:

▸ They focus on a specific common destination
▸ They are inherently suited to employment based schemes where there is multiple origins and a common destination
▸ People tend to be more open to participation due to the greater 'commonality' engendered as a result of working at the same location.
▸ There is a greater likelihood of a compatible match between people as work hours and employer expectations are generally similar

They are most commonly seen in larger employer sites and universities.

Implementation

There are essentially three different phases involved in taking the concept for a car pooling scheme through to implementation. Those being:

Phase 1. Identification & Scoping

▸ Identification involves identifying where there is a need and a justification for car pooling
▸ Scoping involves defining the size and format of the scheme to be implemented

Phase 2. Setup

▸ Setup involves the development of the car pooling scheme consistent with the plan
▸ Involves both the physical side of the car pooling scheme (eg. databases, allocated parking bays, etc), and the 'soft' aspects (eg. promotion, incentive programs, etc)
▸ Also involves identifying a coordinator and establishing the program with staff and management

Phase 3. Follow-up & Support

▸ Ongoing involvement is essential to maintain and enhance the scheme
▸ Information and continued promotion are important in establishing, and reinforcing, long term behavioural change
▸ Administration and ongoing monitoring/review is an important element in ensuring the continued efficiency and effectiveness of the scheme

Generally speaking the majority of effort has tended to be focused on the setup phase, and to a lesser extent the follow-up and support. However, of the three phases the one that is arguably the most important is the identification and scoping, as it defines the type of scheme that should be implemented, and the factors necessary to ensure a successful system.

Despite its importance, the identification and scoping of car pooling schemes is often neglected. As a result schemes often rely on the assumption that participants will actively embrace the concept and that matches can be successfully found for those that do participate.

Unfortunately neither of these situations can be guaranteed, and as a result organisers, participants and supporters often become disillusioned. The participants themselves may also be actively discouraged from participation if matches are not available or incentive programs are poorly targeted or unappealing.

Whatever the circumstances a well targeted and scoped system will ensure that funds are appropriately allocated to viable schemes, and that enthusiasm is not undermined through poor planning.

Where possible the investigation and scoping should include:

▸ A spatial analysis to determine the likelihood of matches given a particular scheme and approach. This will also lead to a decision on whether a site based or an area based system will be used.
▸ An estimate of the number of potential participants - to scope the amount of matching required, and define the level of administrative input/effort.
▸ An estimate of the likely frequency of matching (in terms of effort required and necessity for the use of software)
▸ An estimate of the likely cost of implementing the scheme, including the capital costs, likely cost of incentive programs, and administrative support.
▸ Identification from participants of their desired incentives, which may logically lead to a choice being offered to participants.
▸ A review of potential issues, including those related to compliance and enforcement

In the context of this paper it is not possible to discuss each of these aspects in detail, however detailed analytical methods can be applied to each of the aspects identified.

However, in order to provide an insight into the benefits that can be derived from a comprehensive pre-implementation analysis one of the more interesting and important aspects has been selected and reviewed in the following section.

Case Study

One of the most fundamental aspects of the identification and scoping phase is an analysis of the feasibility of the system being proposed. In particular:

▸ Is the type of scheme proposed appropriate for the location
▸ Is it likely to achieve the desired result

Answering these questions is clearly critical in determining whether the scheme should be implemented, and if so in what form. Despite its importance this form of pre-implementation analysis is rarely if every conducted in a rigorous manner.

To provide an illustration of how this form of analysis can be conducted and the importance of the result to the success of the scheme, the remainder of this section presents an analytical case study based on actual data and real conditions.

The selection of the test was based on aspects of car pooling that are generally considered to be likely candidates for car sharing. The broad characteristics of the system tested are:

▸ A formal employer site based scheme (where there are regular work hours),
▸ A site located in the inner-middle suburbs (where public transport is less effective and parking is generally less restricted than CBD locations)
▸ Small to moderate size employers, with up to 1,000 people
▸ The home location of employees is unknown

To provide additional context the city selected was that of Melbourne, Australia, which has approximately 3.5 million people in the metropolitan area.

The Analysis

In undertaking the analysis of this potential scheme it is important to consider both the spatial and demographic characteristics of the city as well as the characteristics of the site.

The first and most important element in this context is the spatial distribution of residences throughout the city, as this provides an indication of the residential density of the population. In situations when the home location of employee's is unknown (as was the case in this example) this information can be obtained from generally available census data

In this example the census zones were also used to define the boundaries of the car pooling 'pick-up' areas (ie. the catchments). The area sizes defined were based on the standard ABS Statistical Local Areas (SLA's), as shown in Figure 3. Using these zones limited the maximum travel distance between driver and passenger homes to approximately 5kms.
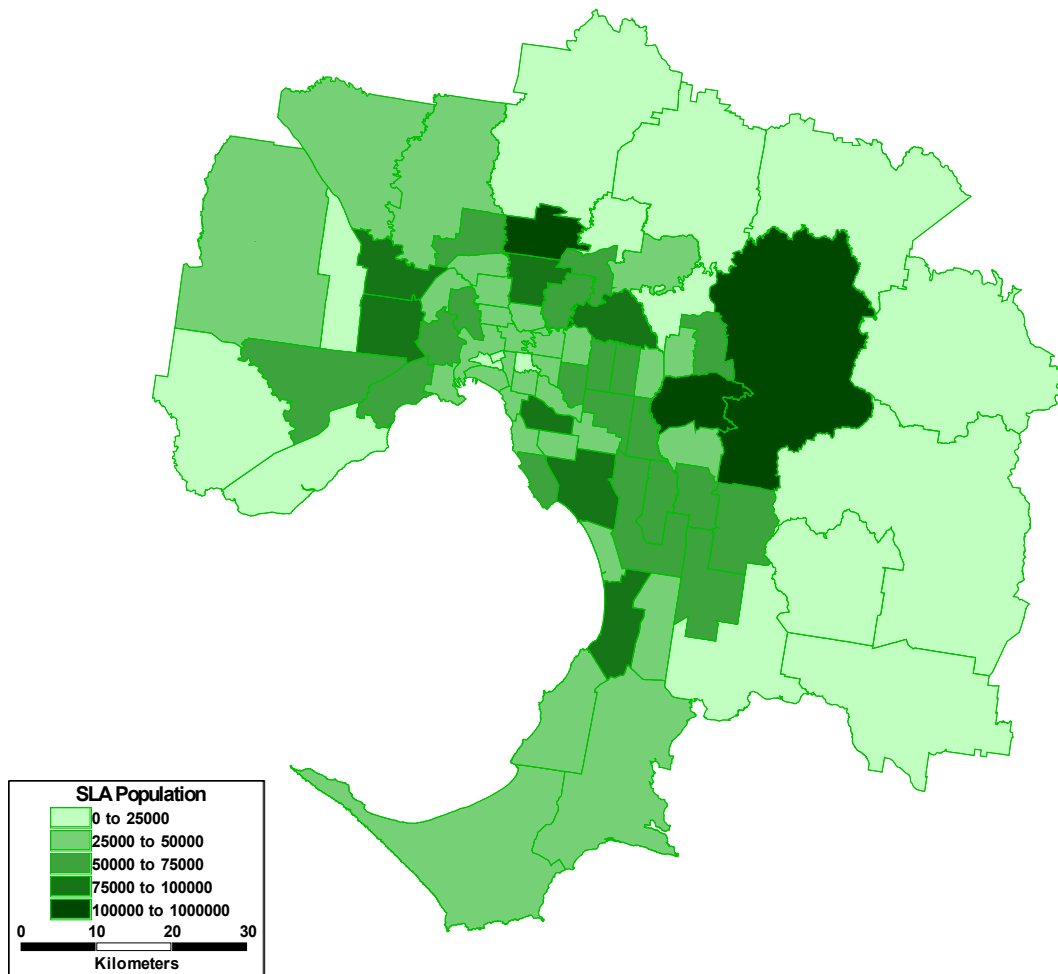
Figure 3: Residential population in Melbourne (Census 2001)

The second most important element in the analysis is the proportion of employees who live in each of the zones. In lieu of specific information on home location, this can be estimated by considering the average trip length distribution of commuters. In this example that information was derived from the Melbourne VATS survey of Home-Based-Work trips, which is shown in Figure 4.
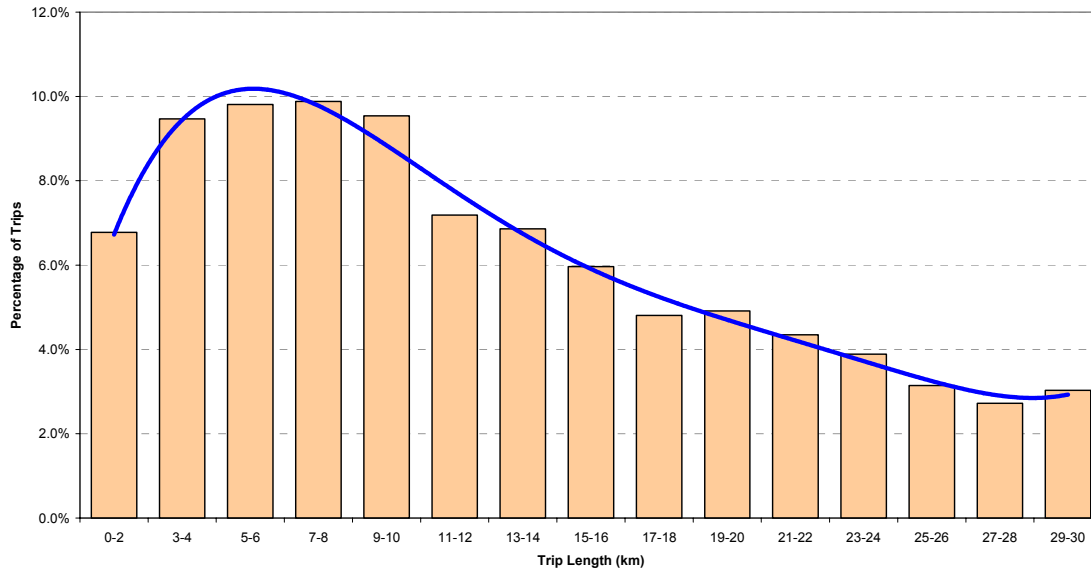
Figure 4: Trip length distribution (home-based-work)

The final point to consider is the proportion of drivers that are able to, or prepared to, car pool. This can be derived from an examination of local schemes and/or any relevant literature material that may be available. Local Melbourne schemes have registered numbers of between 10% and 20% (RACV, 2003, VicRoads, 2003b, La_Trobe, 2003), while international research has suggested this value may be closer to 30% (ICARO, 1999). For the purposes of this case study the proportion has been assumed to be 20%.

The basic relationship between these factors can be simplistically represented by the formula:

$$\begin{matrix} Number\,of \\ matches \end{matrix} = \begin{pmatrix} \%People\,likely \\ to\,share \end{pmatrix} \times \begin{pmatrix} Company \\ size \end{pmatrix} \times \begin{pmatrix} \Pr obability \\ from\,a\,zone \end{pmatrix} \times \begin{pmatrix} Zone \\ Population \end{pmatrix}$$

from which the number and percentage of cars saved can be determined.

By performing these calculations for each of the zones within Melbourne it is possible to calculate the impact that car pooling can potentially have for different company sizes, as shown in Figure 5.
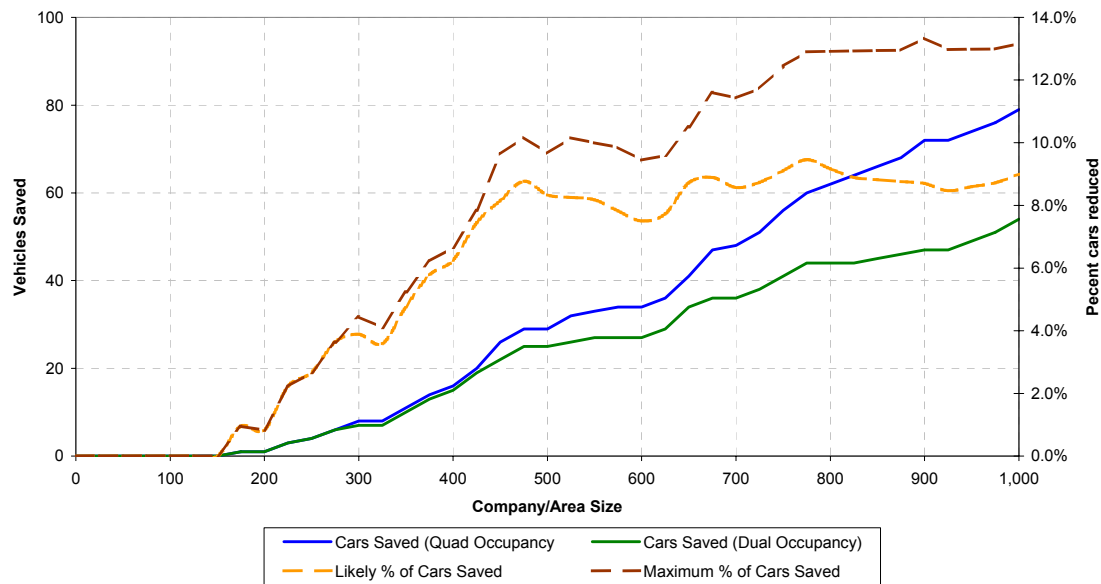
Figure 5: Impact of car pooling

There are a number of factors that are immediately apparent from this example:

▸ The benefits don't accrue until the size of the company exceed approximately 175 people
▸ Once benefits do accrue they do so at a roughly linear rate of approximately 1 car saved for every 10-15 people in the company
▸ More cars are reduced when people are prepared to car pool with more than two people, but these differences only become apparent once the company size exceeds approximately 450 people

Each of these factors are principally due to the amount of housing options available in large cities, and the relatively random distribution of the employees that results. As a consequence, unless a company is of relatively large size, it is unlikely that people from the same organisation will live near each other. This significantly reduces the chance of finding a fellow ride sharer in reasonable proximity to their home.

Another notable outcome of the analysis shown in Figure 5 relates to the percentage of vehicles that can be saved as a result of car pooling. As can be seen, the percentage of cars saved asymptotes as the company size increases, which is due to the same spatial dispersion issue described above.

Essentially until the company size is relatively large (approximately 500 for dual occupancy vehicles and 800 for quad occupancy vehicles), not everyone who wishes to car pool is able to find a suitable match. Once the company size exceeds the values mentioned further growth is limited by the number of people prepared to participate in the program.

To provide some context to these results it is worth noting the distribution of company sizes currently registered within Victoria (see Figure 6). Based on those employee numbers less than 0.1% of companies in Victoria are large enough to justify their own site based scheme.
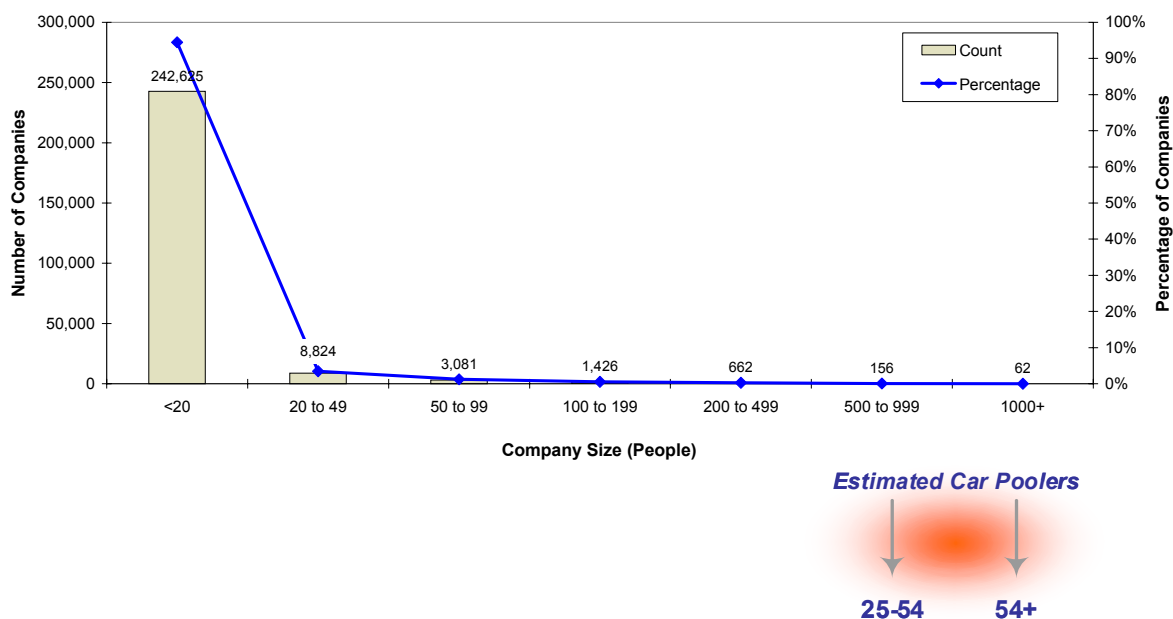
Figure 6: Victorian distribution of companies (ABS, 2002)

Pre-Implementation Planning

A superficial review of the results from the analysis would suggest that the prospects for car pooling would be limited.

However, rather than being discouraging this form of analysis serves to highlight that with some appropriate planning car pooling can be successful when the right conditions prevail. Indeed, the analysis provides a number of valuable insights that will allow an effective strategy to be developed to efficiently use the scarce financial resources that are available, and increase the likelihood of success.

While the analysis provided in the case study is only part of the full review that should be undertaken, there are a number of important conclusions that can be drawn:

▸ Marketing and promotional efforts to encourage car pooling, for site based schemes, should be targeted at companies with employees in excess of 500 people
▸ To encourage smaller firms to participate, an area based scheme would be more appropriate than a site based scheme
▸ Alternatives methods of matching could be considered to increase the likelihood of finding a match. In particular route based matching may increase the viability of site based schemes for smaller companies.
▸ The estimation of the number of people car pooling provides valuable scoping information for the design of the scheme. In particular it allows an indication of the number of car pool parking bays that are required, and the level/cost of incentives that will need to be provided.

Collectively this simple analysis provides valuable information on the type of scheme that should be applied, under what conditions it is likely to be successful and important factors influencing the cost of applying the scheme.

Conclusions

Car pooling has for a number of years been considered a viable facet of travel behaviour change programs due to their ability to reduce road congestion while also delivering benefits for the participants.

Yet despite the obvious benefits, car pooling has generally failed to make any significant impact on travel behaviour due in part to inadequate planning prior to implementation and a poor understanding of what can realistically be achieved.

One of the most fundamental aspects of the pre-implementation planning is the identification and scoping phase, which assesses the feasibility of the system being proposed. In particular providing insights into whether the type of scheme proposed is appropriate for the location, and whether the scheme is likely to achieve the desired result.

By incorporating factors such as spatial, demographic, and travel characteristics into the analysis it is possible to determine factors such as:

▸ The type of scheme that should be used,
▸ The expected number of participants in the scheme,
▸ The viability of different matching methods, and
▸ Scoping factors such as number of parking bays required and cost of incentive schemes

All of which leads to a clearer understanding of the potential of the car pooling scheme, and the mechanisms through which they can be successfully implemented in an appropriate and cost effective manner.

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