Traffic demand reduction strategies: the potential role of Park and Ride

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Abstract

Within the framework of this paper the potential role of Park and Ride as an effective traffic demand reduction strategy is examined by using a case study. The case study is the city of Thessaloniki, Greece which has a population of around one million inhabitants and is the second biggest city in the country. The preferences and intentions for Park and Ride, as stated by the users of six parking stations located in the perimeter of the central area of Thessaloniki, are presented and discussed. The questionnaire-based survey took place during the period November-December 2004 and a total number of 196 valid questionnaires were collected. Results have shown that the potentiality of a bus based Park and Ride scheme seems to be very poor since 96% of the drivers walk from the parking station to the final destination and only 3% use buses in the existing situation.

Keywords: Park and Ride, traffic demand, transport strategies.

1 Introduction

Park and Ride has been considered, since the decade of 1990s, a demand management tool, primarily used to confront traffic congestion problems in urban areas by combining private car trips and public transport trips. The Park and Ride facility clearly fits the definition of a multimodal and intermodal facility [1]. It is argued that problems like congestion, peaking, parking, accidents, pedestrian conditions and environmental conditions have been a factor in the decentralization of the inner city [2]. The success of Park and Ride has to be justified in terms of politics and economics (facilitation of visitor growth without encouraging traffic growth) [3]. There are a number of different types of
Park and Ride schemes ranging from seasonal services to those operating throughout the week all year round [4]. It is well known that traffic congestion appears where traffic volumes exceed the capacity of the road network. As a result of traffic congestion delays are observed and there are also negative effects on safety and the environment. Air pollution and traffic noise are among the most important negative effects due to traffic congestion. This fact imposes an external cost to the society and more especially to the residents of the areas where traffic congestion appears. There has been a lot of experience gained so far from the implementation of Park and Ride schemes in various cities worldwide. A Park and Ride scheme was introduced in Singapore in 1975 as a bus-based scheme and then in 1990 it was revived as a massive-transit-based scheme [5]. According to a users' survey in Singapore it was found that cost savings were a major incentive for participating in the scheme (76% of the users cite “cost savings” as a main reason for participating in the scheme) and it was suggested that tighter financial restraints should be employed for those who want to enter and park in the Central Business District. The provision of Park-and-Ride services is also introduced in a number of local authorities in Scotland [4]. An evaluation framework for ITS applications for Park and Ride schemes in Scotland was developed by Oscar Faber in year 2001 [6] including among other, details of the ITS applications used at Ferrytoll Park and Ride.

Employers can also introduce Park and Ride services in order to reduce the number of commuter trips made by their employees in their private cars. The results of a Stated Choice survey which took place in the University of St Andrews, UK, concerning the forecasting of the demand for an employee Park and Ride service, showed that the share of car drivers switching to Park and Ride would be relatively low unless supported by measures designed to make parking on-site less attractive such as introducing parking charges [7].

There is of course the question whether bus-based Park and Ride schemes actually meet their objective about the reduction of traffic in the areas where they are implemented. The examination of eight case studies in the UK has shown that “the main effect of the schemes is traffic redistribution, and that their role within traffic restraint policies is unlikely to be directly one of traffic reduction” [8].

Although congestion and consequently the need for traffic reduction measures mainly appear in urban areas, there are circumstances where the same need appears in the case of rural areas. This is the case of the Upper Wharfedale area of the Yorkshire Dales National Park where road charging in combination with a Park and Ride alternative was examined [9]. The results of the research have shown that the specific combination has the potential to significantly reduce car traffic volumes in the National Parks of UK. It must be mentioned at this point that the Park and Ride service operates using midi buses to meet a high level of demand.

Another important subject about the Park and Ride schemes refers to the selection of the optimal location for the Park and Ride facility and the parking charges. Work on this subject has been recently made by Wang J.Y.T. et al. [10,11]. The model developed for this work features a linear city with a highway
and a rail line that can be accessed at all points along the travel corridor, and all trips are bound to the city centre.

Within the framework of this paper the potential role of Park and Ride as an effective traffic demand reduction strategy is examined by using a case study. The case study is the city of Thessaloniki, Greece that has a population of around one million inhabitants and is the second biggest city in the country. The city central area is characterized by severe traffic problems since a percentage of 25% of all daily trips (that means around 400,000 trips per day) actually has one or both ends in this area [12]. The situation becomes worse in term of congestion and delays when the distribution of trips per transport mode is considered: a percentage of 40.6% of trips are made by private cars (30.5% as a driver and 10.1% as a passenger). The public transport system of the city consists of buses but future plans include the construction of a metro. The share of Public Transport in 1998 was 27.5% while ten years before it was 36.39%.

2 Parking in the central area of Thessaloniki

Parking in the city centre is one of the most important problems of Thessaloniki and affects not only the traffic but also the environmental conditions in the area [13,14]. The Municipality of Thessaloniki in collaboration with the Organisation for the Master Plan and the Environmental Protection of Thessaloniki assigned a study in 1996 [15], aiming at the design of parking policy in the five districts of the Municipality. According to the results of this study there are around 6,600 parking places offered off-street in various parking stations found in the city centre. These parking stations are situated not only in the perimeter of the city centre but also in the so-called hyper centre and they attract a significant number of drivers on a daily basis and especially during peak hour periods. Parking demand is so high in the city centre that almost 11,000 drivers illegally park their cars on street.

Despite the fact that the authorities decided to improve the level of service offered by the Public Transport system and to extent the network of bus lanes in the city centre (today there are bus lanes in three basic roads crossing the city centre, namely Mitropoleos, Tsimiski and Egnatia) the majority of people continue to use their private cars in order to visit the area. Apart from the introduction of bus lanes no other measures have been taken in order to restrict the use of private cars in the central area.

The introduction of a Park and Ride scheme in the city centre is considered by the authorities as one of the measures that may contribute to the reduction of traffic taking into account the results from similar schemes implemented abroad. Today there is not any organised action by the authorities to support and promote Park and Ride. Therefore there is the need for investigation of the potentiality for the implementation of such a scheme. Herein below the results of a research concerning the acceptance of such a scheme by the potential users in Thessaloniki are presented. The research was carried out by the Department of Transportation and Hydraulic Engineering, Faculty of Rural and Surveying Engineering, Aristotle University of Thessaloniki [16].
3 Park and Ride potential users survey findings

Six parking stations are selected in order to carry out the survey. The position of the six parking stations is presented in Map 1 together with the major bus lines serving their impact area. As shown in Map 1, two of the parking stations are situated in the eastern part of the city centre and the rest four parking stations are situated in the western part of the city centre. All parking stations examined in the survey are located in the perimeter of the city centre. The type and capacity of the parking stations together with their charges are presented in Table 1.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Type</th>
<th>Capacity</th>
<th>Charges for private cars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eleftherias Sqr.</td>
<td>At level</td>
<td>250</td>
<td>1,2 euro/h</td>
</tr>
<tr>
<td>2</td>
<td>Port (inside the Thessaloniki Port Authority area)</td>
<td>At level</td>
<td>400</td>
<td>1 euro/h</td>
</tr>
<tr>
<td>3</td>
<td>Port (inside the Thessaloniki Port Authority area)</td>
<td>At level</td>
<td>250</td>
<td>1 euro/h</td>
</tr>
<tr>
<td>4</td>
<td>Kountouriotou</td>
<td>Multilevel</td>
<td>850</td>
<td>4 euro/h (1st hour)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 euro/h (any added hour)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>116 euro/month</td>
</tr>
<tr>
<td>5</td>
<td>YMCA area</td>
<td>Multilevel (underground)</td>
<td>1100</td>
<td>4 euro/h (1st hour)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 euro/h (any added hour)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>170 euros/month</td>
</tr>
<tr>
<td>6</td>
<td>Tsirogianni ex camp</td>
<td>At level</td>
<td>480</td>
<td>Free (Municipal parking station)</td>
</tr>
</tbody>
</table>

The questionnaire-based survey took place during the period November-December 2004 and a total number of 196 valid questionnaires were collected. The questionnaire consisted of 28 questions and was addressed to the users of the six parking stations who were considered as potential users of a Park and Ride scheme. The basic objective of the survey was to identify the existing trip characteristics of the users of the parking stations and at the same time to investigate their preferences and intentions on the introduction of a Park and Ride scheme in the city centre. The most important findings of the survey are presented in the following paragraphs. The majority of the drivers (62%) spent less than 30 minutes to drive from their origin to the parking station. Their main trip purpose (70%) was “from home to work and vice versa” and also “business reasons”/trips made in the framework of their work (see Figure 1).
Map 1: Parking stations in Thessaloniki city centre considered within the framework of the potential Park and Ride users' survey.
Figure 1: Trip purpose.

Figure 2: Use of the specific parking station for the specific trip (per week).

Figure 3: Level of satisfaction concerning the accessibility of the parking station (as perceived by the users).

Figure 4: Transport mode used from the parking station to the final destination.
Figure 5: Time taken for the trip from the parking station to the final destination (in minutes).

Figure 6: Reason for not using Public Transport for the trip from the parking station to the final destination.

Figure 7: Willingness to use a bicycle for the trip from the parking station to the final destination (if the provision of bicycles is free from the parking station).

Figure 8: Walking time for the present situation (potential bicycle users).
A percentage of 29% of the drivers made this trip once a week while 31% made this trip 5 times a week – that means once per typical weekday. Most of the drivers (41%) used the same parking station at least once a week (see Figure 2). The majority of the drivers (61%) parked their cars between 1-3 hours. It is very interesting to notice that a percentage of 59% considered that the parking charges were at a very satisfactory or satisfactory level. Most of the drivers (72%) stated that they were very satisfied or satisfied by the parking stations. Almost the same percentage stated that they were satisfied with the level of accessibility of the parking stations (see Figure 3).

It is also important to notice that 96% of the drivers continued their trip on foot from the parking station to their final destination in the existing situation while only 3% used buses (see Figure 4). It must be mentioned at this point that according to a questionnaire based survey in 1991 concerning the parking station of the Tsirogianni ex camp, a percentage of 74,8% of the drivers used to continue their trip on foot to the final destination [17]. It is very interesting to remark that 13 years later (present research) the respective figure is 74% which proves that people’s attitudes on this subject hasn’t changed over the past 13 years. The respective time for the trips to the final destination was less than 5 minutes for 45% of the drivers and between 6-10 minutes for 29% of the drivers (see Figure 5). The reasons for not using buses mainly referred to the fact that the majority of the final destinations lay in a short distance from the parking stations (46% short trips) while a considerable percentage (17%) stated that they preferred to walk (see Figure 6). A percentage of 66% of the drivers suggested that “walking” was the optimal way to continue their trip from the parking station to the final destination.

The possibility for the use of a bicycle as an alternative transport mode for the driver to continue the trip from the parking station to the final destination was also examined in the framework of the survey. A percentage of 60% of the drivers stated that they would use a bicycle (if the parking station could provide one free of charge) to continue their trip from the parking station to the final destination (see Figure 7). It is important to mention that 23% stated they would do so only in the case that the appropriate infrastructure would be available (e.g. bicycle lanes). More than 1/3 of the potential bicycle users were between 25-35 years old and a little less than 1/3 of them were between 36-45 years old. Finally, the time that half of the potential bicycle users spent in the existing situation in order to walk from the parking station to the final destination was less than 5 minutes (see Figure 8).

4 Conclusions

The majority of the drivers using the parking stations have as a trip purpose “work” and “business reasons”. This means that the value of time for the majority of them is high. A percentage of 60% use the parking station for 1-3 hours. It is worthwhile to mention that most of the drivers are satisfied with the parking stations (59% with the charges, 72% with the services and 73% with the accessibility level). Potentiality for a bus based Park and Ride scheme seems
to be very poor since 96% of the drivers walk from the parking station to the final destination and only 3% of the drivers use buses in the existing situation. The main reason (46%) for this refers to the fact that these are short trips (less than 5 minutes) and therefore it is not worthwhile to take a bus. Another interesting finding is that quite a lot of drivers (17%) have stated that they prefer to walk from the parking stations and they will probably continue to do so even in the case of a Park and Ride scheme. Nevertheless 1/4 of all drivers have stated that they do not use public transport since they are discouraged by the lack of availability of buses in the near area of the parking stations.

Finally, drivers show a very positive attitude (60%) towards the possibility to use bicycles in order to continue their trip from the parking station to the final destination if bicycles are provided free of charge from the parking stations. The existence of the appropriate infrastructure (e.g., bicycle lanes) will provide an additional incentive concerning the use of bicycles. Further research that would include other users of the road network (apart from the users of parking stations) would provide more robust conclusions on a possible introduction of a Park and Ride scheme in the city. The introduction of a special mini/midi bus service connecting all parking stations would also provide an incentive for a Park and Ride scheme but a feasibility study (to determine the demand and cost) is needed at first in order for this measure to be justified.

References


