

Paratransit regulation in Rio de Janeiro: a comparison of two surveys 1

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PARATRANSIT REGULATION IN RIO DE JANEIRO: A COMPARISON OF TWO SURVEYS

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1 - INTRODUCTION

Public transport systems play an important role in urban centres by determining to the population the available accessibility levels on their daily trips. In Brazilian cities as a consequence of the low level of services provided by conventional transport services one could see the expansion of paratransit operation in busy corridors. Paratransit options are available not only in Brazil but also in many cities of developed and developing countries. Although some legal services operation exists, most of them operate illegally. These illegal services develop on heavy urban routes where curbside conflicts may occur. Bus systems are generally the main competitors with new paratransit operations. As passengers congregate at the curb, waiting for a bus, paratransit operators interlope on the scheduled service and passengers will probably board the vehicle that comes first. Many authors (Tanaboriboon and Agad, 1990; Tanaboriboon and Madrona, 1990; Boyle, 94; Dourado, 1995; Cervero, 1997) have presented and discussed a wide range of paratransit services and their comparative benefits and drawbacks. The paratransit sector, generally speaking, ranges from one-person “rickshaws” to 25-passenger minibuses. In the case of the Brazilian cities, until recently, old buses have been the most common type of paratransit operation, competing with scheduled bus services along busy routes. Since the mid 90’s van services have become very popular in most cities, especially when running services on longer distance operations routes, where an available seat during the whole trip is an essential attribute to any user.

The main objective of this paper is to present and discuss two public transport users' surveys where the quality of services provided by paratransit operation (low capacity vehicles such as vans and Volkswagen type "kombis") are compared. It is important to highlight that the surveys were carried out in the city of Rio de Janeiro in two different and specific periods. During the first survey (1998/1999) paratransit services operated illegally without any regulation. Later on, in the case of the second survey (2002/2003), services run under the municipality and the state authority regulation, established respectively in 2000 and 2001. The contrast and comparison of the results achieved in those surveys emphasize important aspects related to low capacity vehicles operation in developing countries. Besides a well designed regulation framework, other important aspects should be considered simultaneously to guarantee the quality and safety of the service provided, attracting, as a consequence, more users to public transport systems operation. Section 2 presents general comments on paratransit operations around the world, section 3 describes briefly the Rio de Janeiro current public transport system, section 4 compares the two paratransit users' surveys and finally section 5 presents the main conclusions of the paper.

2 - GENERAL COMMENTS ON PARATRANSIT OPERATIONS

Urban centres have normally to face two basic restrictions which make difficult the search for a reasonable solution to transport problems. On the one hand there is the problem of road capacity. Urban areas are generally densely populated which makes road expansion difficult and more expensive. On the other hand there is also the environmental capacity restriction. It is possible that some roads could be able to still cope with higher traffic flows (those operating under saturation levels) but could be operating at extremely high pollution levels. This implies on high levels of pollutant concentration at different areas and do not guarantee an acceptable air quality. It also appears that if transport sustainability is considered, it would not be possible to indefinitely increase private car use in urban areas without generating more externalities. Many researches recognise this fact and suggest actions that take into account traffic demand management as a means of improving traffic flow and accessibility in urban areas (Banister 1990, Himanen 1993; Royal Commission on Environmental Pollution 1994; APTA 1996; Bradshaw et al., 1998; Cervero, 1998).

Low capacity vehicles, have been operating in many cities as an alternative to public transport for different reasons. Most of these services are classified as paratransit. Some examples comprise: auto rickshaws and cycle rickshaws, responsible for 15% of the public transport market in India (Umrigar et al., 1991); tuk-tuks (a three wheeled motorcycle) and silor-leks, (a small four wheeled vehicle) play an important role in providing speedy movement to persons as well as goods in Bangkok, Thailand (Tanaboriboon and Agad 1990, Tanaboriboon and Madrona 1990). Other low capacity vehicle systems to passenger transport in different cities are presented in Dourado (1995). Low capacity vehicles are currently very popular in Brazilian cities as a means of school transport.

Despite of many different vehicle design characteristics that could exist, a comparison between vans operation in Brazil and minibus operation in countries such as Great Britain could be drawn. Minibuses began operation in Britain even before the urban bus industry deregulation. Meanwhile it was only after deregulation (1985) that this service has considerably expanded. To a country used to transport users in double-deck buses on most urban routes, the minibus operation motivated a lot of research and market analysis (Banister

and Macket,1990; White 1991; Banister, 1992; White et al., 1992; White and Cassidy, 1993; White, 1995).

According to White and Cassidy (1993), almost 9,000 minibuses were operating by the end of the 80's in Britain. They consider that on major trunk routes where the conventional bus offers a frequent and reliable service, the conversion to minibus operation would be disadvantageous. Banister (1992) considers that minibuses fill the gap between regular-sized buses and taxis and increase the feeling of a personal service and of improvement in safety perception by passengers. Minibus operation allows a more close contact between driver and passengers. As an example of successful minibus operation, White (1991) reports the case of the city of Exeter where between 1984 and 1990 the total number of bus passengers transported increased from 14,000 to 40,000 per day, nearly 200% increase. It is important to highlight that the number of bus passengers in that country has been historically falling. In cities such as Swansea and Newbury car users were attracted by a high frequency service that besides reducing driving stress avoids the time spent in searching for a parking space (White and Cassidy 1993).

Banister and Macket (1990) consider that minibus operating as a feeder system to trunk routes would probably be more efficient than operating on high density bus routes. In congested roads, minibus operation would not be advantageous to conventional buses in terms of travel time. It is also considered that on radial bus routes minibuses could operate as express services charging different fares and offering a special service. Even considering the capacity and body design differences between minibuses and vans, one could identify some operation similarities. Both vehicles can offer faster and more frequent services than conventional buses. Reliability is generally also high. On the other hand the motivation to run such a service appears to be very different when comparing these services. In the case of the UK, minibus operation expanded after deregulation and basically as an alternative to operators to reduce increasing operating costs in most routes. In the case of Brazilian cities the main success of van operations could be related to the low level of services provided on conventional public transport.

Van operations are very successful in some Brazilian cities. In São Paulo although only 2,200 vehicles have been licensed to regular operation, the estimate is that almost 10,000 vehicles, considering the regulated fleet and paratransit, are operating in most corridors (Technibus 1996). The estimate for the city of São Paulo is not precise and other sources consider that paratransit operation could have reached 15,000 vehicles, responsible for a 10% decrease in bus passengers carried in 1996 (BENT 1997). Although assuming some lack of precision on these figures, there is evidence that the impact of van services over the conventional transport system is a significant one, in the case of Brazil.

In Porto Alegre, a southern Brazilian city, vans operate under regulation and operate on specific routes. There is integration between vans and the conventional transport system. According to Costa et al. (1997) the system began operation in 1976/1977 with the main objective of attracting the private car user. The system currently operates with more than 400 vehicles distributed among 28 routes and carrying almost 10% of the total number of passengers transported by bus. Fares charged are around 1.5 to 2.0 times higher than that charged by conventional buses, depending on the distance travelled. Users of the service consider it very good in terms of comfort, travel time, vehicle maintenance and driver behaviour.

From a total number of 18,000 licensed vans in the state of Rio de Janeiro, the estimate is that around 10,000-12,000 vehicles are operating as paratransit in the Metropolitan Region only. This paratransit fleet is almost 50% higher than that of conventional buses operating in the municipality. There are currently 50 route associations of van operators in the city. Bus operators consider that in 1997 14% of passengers originally transported by bus (980 thousand passengers) shifted to vans during the January-July period only. This figure could be considered a high one, and could not be officially confirmed due to a lack of control and enforcement in the state of Rio de Janeiro.

According to the municipal transport authority the estimate is that 200 thousand passengers are travelling by van every working day on long distance routes. Van operators estimate that this figure is around 350 thousand daily passengers. In an attempt to reach a more balanced figure one could consider the operation of 8,000-10,000 vehicles in the city. Taking into account only 2 trips in the morning period and other two trips in the evening period (inter peak period trips are not considered here) and an average of 10 passengers per trip, a total of 320 - 400 thousand passengers could be travelling by van every day. Even considering the subjectivity in the previous estimate and the difficulty in finding reliable figures, it is reasonable to conclude that the number of transported passengers could be closer to those estimated by the municipal authorities and vans operators – 200-350 thousand passengers per day- than the figure provided by bus operators. The important aspect to be considered here is that van services are still attracting a lot of users and is considered a reliable service with acceptable quality levels when compared to buses.

3 – RIO DE JANEIRO PUBLIC TRANSPORT SYSTEM

In the city and the in state of Rio de Janeiro, even considering that the state paratransit regulation and the one designed for the city of Rio de Janeiro have attempted to impose certain levels of discipline in the alternative transport market, a more balanced operation seems to be still far of being reached. Innumerable factors, such as the arrival in the transport market of new operators, new route associations, internal divergences between those route associations, lack of resources and agreement of the managing agencies, the improvement of conventional bus services and other transport systems, has made it difficult the integration of paratransit services. With this, the quality of the whole public transport service has been harmed and the solutions are even more difficult to be reached. There are already 15,000 vehicles running services in metropolitan routes (according to DETRO, the state agency responsible for the regulation of those services) and almost 10,000 vehicles running city routes (according to SMTU, the municipality agency responsible for regulation transport services) without reaching a satisfactory solution.

The city of Rio de Janeiro run a group of regulated transport systems that includes buses, suburban trains, taxis, ferries and still only one tram route operating in the district of Santa Tereza. Although the number of bus passengers is still decreasing, buses are the main means of public transport in the city, being responsible for about 80% of the daily public passengers demand. The fall in the public transport demand, although bus operators consider a consequence of the competition with illegal transport operation, could also be explained by the increase of the private fleet in the last decade. From 1995 the 2005, the yearly average

growth of this fleet was about 4% according to Detran (the department responsible for licensing vehicles). Table 1 shows the average number of passenger trips each day by public transport in the city of Rio de Janeiro.

TABLE 1 – Public Transport Modal Split – Rio de Janeiro - 2005

Means of Transport	Daily Passenger Trips	Percentage
Bus	5,000,000	80,0%
Underground	400,000	6%
Suburban Trains	380,000	5,9%
Ferries	50,000	2,3%
Paratransit	360,000	5,8%
Total	6,190,000	100%

Source: Designed by the authors, based on data from Rio Ônibus; Metrô-Rio; Supervia; Barcas S.A. (private operators of the public transport system)

The fierce competition between paratransit and conventional transport systems has contributed to a fall in demand between 1995 and 1998. In 1999 Balassiano and Braga (1999) estimate that vans and kombis operation, were responsible for carrying 5% of the passengers traveling by public transport, excluding taxis passengers. According to the authors, the rapid increase in the private fleet also contributed to this scenario.

In an effort do halt the loss of demand, conventional public transport operators emphasized some aspects regarding paratransit such as lack of security, absence of free trips to retired people and students, etc. Between 1998 and 2000, investments carried out in the region, after a privatization period of conventional transport systems of higher capacity such as trains and the underground, had produced a partial recovery of the lost demand to paratransit systems. However, the trend of fall in the demand for bus services, was not reverted (Guerra, 2002). Not even the growth and the diversification of differentiated bus services, between 1997 and 2000, including the implementation of special fares and discounts by conventional transport operators had been able to modify the trend of increasing paratransit operations.

The great difficulty of the state and the city authorities was, since the beginning of paratransit operation, to recognize that the alternative transport systems operating as a feeder to higher capacity ones could turn into an acceptable solution for the problem. For most transport experts, the competition, in the market, among different transport means was not the best way to improve services and attract new users to public transport (Cervero, 2000; Orrico Filho and Santos, 1996; Araújo et al., 2003).

Araújo (2001), Guerra (2002) and Barboza (2003), describe in their studies the existence of intense competition among the alternative transport system (paratransit) and other means, specifically buses. Guerra (2002) affirms that about 90% of the services operated by kombis type vehicles in a great number of districts and municipalities of the Metropolitan Region have total coincident routes with almost all regular bus routes. The author evidences that only 8% of the services operated by kombis present minimum overlapping on those routes. The author highlights that only a minority of those routes offers a new linking route, not currently explored by conventional transport services.

In the case of the services operated by vans, the situation was also not different. It was observed that they run in most radial routes towards the city centre (Araújo, 2001). The operated routes are in most cases, the same of those run by regular buses, however not necessarily with total coincidence. For running generally high extension routes (more than 40km), in some parts of the route paratransit can opt to operate in less congested corridors.

Paratransit services operated by low capacity vehicles in the city are functionally organized under two distinct forms: independent operators and route associations that incorporate operators of diverse routes (Araújo, 2001). The great difference between route associations and independent ones is the fact that the last group does not follow any norm (administrative or operational). They generally run services and have schedules on higher demand corridors.

Although in some countries the route associations have reached higher development stage as described by Cervero (2000), in Brazil, and more specifically in Rio de Janeiro, this development is still not evidenced. Currently route associations offer very limited benefits to their affiliates and the most representative form of support is legal assistance, what perhaps reflects the current stage of illegality and irregularity that involves the majority of the operators (Guerra, 2002).

One perceives that the possibilities of survival of this kind of paratransit services in the medium and long run, in a highly competitive market such as the one existing in Rio de Janeiro, depend very much on the role played by route associations and according to Balassiano and Braga (1999), only about one third of the operators have previous experience in the transport sector. The authors still highlight that it is imperative in a market of this nature, that operators have an accurate knowledge of the costs incurred in running those services. Araújo (2001) evidenced, when analyzing routes operated in the Metropolitan Region the total informality in the appropriation of operating costs. The author still considers that, the environment at this stage of the regulation period, for paratransit services in Rio de Janeiro, could justify the fact that operators ignore the need to adequately appropriate operating costs of the services provided.

Thus, the characterization of the services operated by low capacity vehicles in the city and metropolitan region evidences the low level of organization of the sector and the difficulty for establishing a more balanced economic result in the different operated routes. The lack of a strategic vision of the service, and also not considering the need of establishing a reasonable operational criteria that take into account the perception of the user and the level of quality on services, results in a loss of captive users and a gradual loss of demand. This situation could be considerably aggravated on the long run with the introduction of electronic ticketing by the conventional transport system. For those, employed in the formal market and subsidized by their companies with travel vouchers, there will be only one alternative to travel that is traveling on regulated transport systems. Vans and kombis would not accept electronic tickets from their passengers because they would not be integrated to the whole conventional system.

4 - THE QUESTIONNAIRE SURVEY

Van services are currently operating on municipal routes and also on links between different municipalities of the metropolitan region of Rio de Janeiro. There is competition on the road between conventional buses and vans. Van services are operating on the same bus routes and stopping at bus stops to board and alight passengers, as mentioned before. Most of the competition is between vans and buses due to the high level of bus use in the city (responsible for carrying almost 80% of public transport passengers - see table 1).

Assuming the popularity of those paratransit services in a city such as Rio de Janeiro, it was considered important to carry out a survey to identify some important aspects and characteristics of services provided. The main objectives of the survey (in both moments) were: a) to characterise the van user (age, sex, education level, salary, profession); b) to identify the main reasons leading those users to travel by van and the frequency travelling; c) to characterise the van service (origin and destination, average travel and waiting times, fare charged, the existence of integration with other transport systems); d) to know the users' perception of the level of service provided.

For the objectives a, b, and c, the questionnaire utilised questions with multiple choice answers and some questions with open answers (allowing more than one answer for the same question). In the specific case of those questions dealing with the perception of the level of service provided, it was adopted the attitudinal scales technique. According to Richardson (1985) attitudes are a pre-disposition to react negatively or positively to some institutions, concepts, etc. These attitudes could be measured through attitudinal scales and in the questionnaire survey the linear bi-polar continuous semantic differential scale was chosen. The attributes selected (comfort, travel time, safety, etc.) were evaluated by respondents and a mark in the range 0-10 was obtained for each attribute. The survey was carried out by one interviewer, during a six month period in both surveys. Users were interviewed at random at boarding stops in the city centre and other busy boarding and alighting points. During the first survey (1998/1999) 253 respondents answered the questions and in the second survey (2002/2003), after the introduction of regulation to paratransit services, 263 respondents contributed with their answers.

4.1 - The user's characteristics compared

Among the sample 57.00% of respondents were female (1998/99). This figure was slightly lower in the second survey (55.51%). Meanwhile women are still travelling by van services more than men. In the survey carried out in 1998/99 most users were aged between 18 and 45 years old, with 46,6% (118 respondents) in the age group 18-30 and 45,5% (115 respondents) in the age group 30-45. Only one respondent was over 65 while 1.2% of the respondents were under 18. One possible explanation to this fact is that those over 65 and students going to or coming back from school travel free on the conventional bus service. Results were somehow different in the second survey. The age group with respondents between 18 and 45 years old also formed the majority of travellers (77.94% - 205 respondents). Again it was low the number of users aged above 65 (1.52%). The number of travellers aged below 18 was also low in the second survey (4.94%). Although with services running currently under regulation, establishing that 2 passengers in each vehicle trip could be carried for free (old aged citizens and students), drivers try to avoid them boarding the service.

The majority of the respondents were secondary school or university level in 1998/99 (44.3% and 38.3% respectively). In the second survey those respondents at secondary school level was very similar while those at university level decreased significantly (47.33% and 19.09% respectively). This difference could be explained by a possible decrease in the level of services provided and those with a higher level of instruction are generally more susceptible to services' levels.

Those respondents (1998/99) earning less than 5 minimum wages (around US\$600.00) were 33.00%, while 41% earn between 5 and 10 minimum wages (US\$600.00 - US\$1200.00). In the second survey passengers earning less than 5 minimum wages increased to 59.32% while those earning between 5 and 10 minimum wages decreased to 23.19%. It is clear that the largest group of passengers travelling by van earn less than 10 minimum wages. Considering that vans were more expensive than other public transport services in 1998/99 (as will be shown later), it appears that those on lower income had been pushed to travel on a more expensive service. After regulation the fare charged by van services decreased due to a more intense competition with bus operators that diversified their fleet and services, incorporating mini-bus services on busy routes. Thus, with lower fare levels in van services, those earning less than 5 minimum wages have increased their number of trips. It is not clear at this stage the reasons for realizing more trips (percentage) those earning between 5 and 10 minimum wages. One possible explanation is that for those with higher income levels, boarding the first vehicle stopping at the bus stop (vans or buses) was not much different.

Another aspect identified during the first survey (1998/99) was that most users were involved on commerce or services activities (almost 71% of respondents). This high figure was expected to occur as most services activities are concentrated in the city centre. Almost all respondents - 243 (94.6%) - affirmed that the main purpose of the trip was to work. In 2002/03 a similar pattern of users involved with commerce or services activities was found (63.14%). Again most of them were travelling to work in 2002/03 (88.59%). It can be seen that most van users do not belong to higher income groups (more than 10 minimum wages) and are generally using the service on their working trips.

4.2 - Main reasons to use the van service

The questionnaire survey (1998/99) showed that most users travelled previously by bus (171 respondents - almost 64% of answers). Only 6.7% stated travelling previously by car. Those travelling on non-regular or special buses were 16.4%. It is important to highlight that some respondents travelled previously by more than one means of transportation. In 2002/03 those users previously travelling by bus were 81.75% and those previously travelling by car were 7.6%. A possible explanation for this percentage increase (shifting from bus to vans), could be explained by a higher level of bus service now available, but also charging higher fares (especially on new services run).

Most users in 1998/99, travel by van on all working days (74.7%). This can be an indication that those travelling by van are frequent users of the service and possibly captive ones. In 2002/03 the same pattern was identified, with 74.9% using the service every working day.

The main reasons mentioned by users to travel by van in 1998/99 were: the speed of the service (24.0%) and the comfort provided (14.2%). Respondents were allowed to give more than one reason for travelling and a total of 437 responses were achieved. It is interesting to

observe that the great majority of other answers (apart from speed and comfort) were related to the poor level of services found in other means of public transport systems. In 2002/03 the main reason to travel by van was still speed (travel time - 46.20%) followed by the comfort provided (16.85%). The percentage increase in the number of respondents travelling by van due to a lower travel time could be explained by huge traffic congestions currently occurring on busy routes. Low capacity vehicles, with stopping fewer times to board passengers are advantageous when compared to conventional buses.

4.3 - The characterisation of the service

Most respondents use van services to travel to and from the city centre (76.30% - 1998/99) (67.81 – 2002/03) showing that they rely on the service not only on the home-to-work trip but also on the return trip. It is important to observe that most respondents travel distances over 40km to the city centre. Almost 42.00% (1998/99) and (31.41% – 2002/03) stated they were travelling from municipalities located in the metropolitan region at distances between 40-60km while 21% (1998/99) and 32.95 (2002/03) came from districts in the city at the same distance range. It was also identified that 10.00% (1998/99) of respondents were travelling to a specific district which is located 25-30km away from the city centre while this figure is slightly lower, in 2002/03 – 8.43%). One possible explanation for the high number of respondents travelling towards this district is the poor conventional bus service provided by two bus operators. These operators are currently running special minibus services on this route in an attempt to recover the ridership lost to van services.

Almost 60% (1998/99) and only 23.66 (2002/03) of respondents stated they wait less than 10 minutes for the van at the stop. Those saying that the waiting time was less than 5 minutes were 32% while waiting between 5 and 10m minutes were 27.3% (1998/99). Only 8% of respondents stated they generally wait more than 20 minutes for the van service (1998/99). Traffic congestion is probably increasing in the city based on figures of the survey carried out in 2002/03. Those respondents with waiting time between 10 and 20 were 36.64% and those waiting more than 20 minutes were 29.7%. Thus those waiting more than 10 minutes for a vehicle were 66.34% in 2002/03.

Another important aspect related to the level of service provided is the travel time. The majority of respondents stated that their travel time was between 30 and 60 minutes in the 1998/99 survey. The same pattern was found in the 2002/03 survey with 40.70% stating the same range of travel time. Those saying their travel time were between 30 and 45 minutes were 43.1% while travelling between 45 and 60 minutes were 32.4% in the 1998/99 survey. It is important to recognise that it is possible that some of those users could have underestimated their travel time. Because the trip is comfortable and quicker than by other means of transportation, there is the possibility that they perceive travel time shorter than it really is. The estimate is that those travelling from districts and municipalities at distances between 40-60km have travel times between 70-80 minutes. In the case of the 2002/03 survey those travelling between 30 and 60 minutes were lower, possibly again, reflecting an increase in traffic congestion.

Most users spent more money on their daily van trips (1998/99). Almost 81% stated that the fare charged was more than 4 times higher than the bus fare. Almost 44% of respondents were being charged 5 times the bus fare. This fact could reinforce the current strategy to improve service levels on conventional public transport systems. Although van fares were much higher than that charged by other means of public transport, the possibility of travelling in a reliable

service, with more comfort and with lower travel and waiting times were considered important attributes by those users (1998/99). Currently van operators were forced (due to the competition with legal mini-bus operation) to charge fares similar to minibuses in order to keep their demand.

Finally in the characterisation of the service it can be seen that integration with other transport systems was poor in 1998/99. More than 85% of respondents stated they do not use other means of transport to complete their journey. Only 9.5% of respondents travel on a bus-van integrated trip. The integration with other means was higher in the 2002/03 survey with 37.26% stating the existence of integration with buses or suburban trains. These figures possibly highlight the difficulties currently faced by van operators after regulation.

4.4 - The users' assessment compared

As previously mentioned passengers were asked to assess the quality of service provided by vans. An average mark (0-10) was obtained considering all respondents' answers based on the bi-polar scale. Table 2 shows the average mark and the standard deviation for each attribute of the trip considered in the assessment during both surveys.

TABLE 2 - VANS' ATTRIBUTES ASSESSED AND COMPARED

Attribute	Average (Standard deviation) – 1998/99	Average (Standard deviation) – 2002/03
Comfort	7.91 (2.01)	6.58 (3.08)
Safety	6.86 (2.24)	6.87 (3.01)
Travel time	7.65 (1.76)	7.83 (3.42)
Waiting time	7.08 (2.53)	5.91 (3.29)
Fare	5.52 (2.08)	5.88 (3.20)
Vehicle maintenance	8.08 (1.94)	7.37 (2.73)
Driver behaviour	7.23 (2.56)	6.84 (2.93)

From the comparison performed in table 2 it is noticeable that average scores indicate, especially in some aspects a decreasing level of service regarding van services operations. Statistically compared, the level of comfort, waiting time and maintenance, have clearly decreased when compared the two surveys (before and after regulation). Those attributes are important ones and users are not satisfied, especially in relation to the comfort attribute. Safety was considered at the same level in both surveys, based on the scores attributed by the users' responses. This is a contradictory finding, considering the general body aspect of the vehicles running those services. Most of them have no maintenance at all, and this fact was clearly identified by users. Average score was 8.08 in 1998/99 and decreased to 7.37 and this result is statistically different. Other attributes such as travel time, and behaviour, although getting a lower score in the 2002/03 survey, could not be considered different statistically speaking. Finally the higher score related to fare charged (although not statistically reflected) could show the "fare battle" between van and buses operators. Van operators were forced to lower the fare previously charged in order to try to keep their patronage.

In general it seems that the level of service was higher in the past than it is in the most recent survey. Possibly, the supply of different new bus services together with fare differentiation imposed by bus operators are in fact turning more difficult the competition for passengers to van operators.

5 - CONCLUSIONS

There is a dynamic process of technological development in the transport sector where sophisticated new systems are generated. On the other hand conventional medium and low capacity road transport systems will possibly continue to play an important role in Brazilian cities. Although private car use will undoubtedly increase in developing countries' cities, it must be considered that unlimited car use is not sustainable on the long term especially in urban centres (Banister 1990, Royal Commission on Environmental Pollution 1994, Technology Foresight 1995, APTA 1996; Cervero, 1998; Bradshaw et. al, 1998; Pereira et al., 2002; Balassiano, 2004)

Brazilian cities should consider the improvement of transport systems such as buses, trains, underground and ferries that should operate adequately and under co-ordination, in an attempt to avoid the passenger shift to private car use. Low capacity systems are operating in many Brazilian cities and it is important to properly regulate this service operation. These vehicles could be considered an intermediate option to taxis and buses. If van services operation could contribute to reduce private car use, a better environment will probably be generated in urban areas and an improvement in road and transport capacity will possibly occur.

The questionnaire surveys showed that due to a higher quality service in 1998/99 on van services, a significant number of passengers have shifted from other means of public transport systems to vans. They spent more money travelling by van and have opted to travel on a more reliable and comfortable transport service. It was clear that the conventional public transport services were inadequate and were not offering a reasonable level of service. With a higher level of quality in public transport systems, the probability of passengers shifting to vans from other means of public transport would certainly be lower.

The second survey carried out in 2002/03 confirmed what was mentioned in the previous paragraph. Bus operators are currently offering a better level of services on most routes and decide to face the "van competition" introducing minibuses on almost all routes operated. This strategy not only reduced van operator's patronage but also fostered integration among buses, underground, suburban trains and ferries.

It was also clear that regulation alone was not the main aspect to be dealt with, when facing competition among paratransit and conventional transport services. It seems that if enforcement is not adequately implemented, all regulations could make no sense at all. The level of service currently provided by van operators (legal and illegal ones) is much lower than that of the beginning of operation in the mid 90's.

The integration and co-ordination of van services to the conventional transport system could contribute to two different objectives: increase the public transport supply and attract the private car user offering a differentiated transport service. Currently integration among all conventional public transport operators, although on its first stage, shows the potential to car users to transfer some of their daily trips to a reliable and comfortable public transport system. It is a matter of time to have other routes integrated in a second stage of this scheme and

possibly users will benefit from a better and cheaper public transport. Besides this, operators would benefit with lower operating costs and possibly an increase in patronage.

It is also possible that some kind of private car use restriction would have to be considered as part of a coherent policy aiming at improving the quality of life in urban areas in the city of Rio de Janeiro. The strategy proposed in this paper to operate van services (integrated to conventional public transport) is certainly not an innovation but could generate benefits to the community. The existence of cities with a pleasant environment, low levels of air and noise pollution and where safety is preserved could be viable in the near future.

REFERENCES

- APTA (1996). Mobility for the 21st century – a blueprint for the future. American Public Transport Association's Mobility for the 21st Century Task Force, October.
- Araújo, A. M. (2001). Uma contribuição metodológica para o cálculo dos custos do transporte alternativo por vans. Tese de MSc, PET/COPPE/UFRJ, Rio de Janeiro.
- Araújo, A. M., R. Balassiano, S.K. Ribeiro. (2003). Operação de sistemas de transportes sob demanda como estratégia de redução de emissões de CO₂. In: Anais do XVII ANPET – Congresso de Pesquisa e Ensino em Transportes, Novembro.
- Balassiano, R., M.G.C. Braga. (1999). Buses & vans – assessing public transport competition in Rio de Janeiro. Sixth International Conference on Competition and Ownership in Land Passenger Transport, 9 - 23, Cape Town, South Africa, September.
- Balassiano, R. (2004). Um procedimento metodológico para priorização de intervenções de gerenciamento da mobilidade. *Revista Cetrama* 1, 27-34.
- Banister, D. (1990). Environmental keys to the 21st century: a greenprint for urban transport. Working Paper 2, Planning and Development Research Centre, University College London, July.
- Banister, D. (1992). The british experience of bus deregulation in urban transport: lessons for Europe. Working Paper 5, Planning and Development Research Centre, UCL, London.
- Banister, D., R.L. Mackett, (1990). The minibus: theory and experience, and their implications. *Transport Reviews*, Vol. 10, 3, 189-214.
- BENT (1997). Em São Paulo, ônibus perdem 10% de passageiros para peruas. *Boletim Executivo de Notícias de Transporte*, 279, Ano VI, 25 de junho.
- Barboza, K. F. (2002). Regulamentação do transporte público alternativo: a experiência brasileira. Tese de M.Sc., COPPE/UFRJ, Rio de Janeiro.
- Boyle, D.K. (1994). Jitney enforcement strategies in New York city. *Transportation Research Record* 1433, 77-186.
- Bradshaw, R., S. Cooper, S. Ferril (1998). An international review of mobility management initiatives. Paper presented at the 8th WCTR, Antwerp, Belgium.
- Cervero, R (1997). *Paratransit in America*. Praeger.
- Cervero, R. (1998). *The transit metropolis*. Island Press.
- Cervero, R. (2000). Informal transport: mobility options for the developing world. Prepared for United Nations Commission on Human Settlements (Habitat), Nairobi.

- Costa, M.B.B. et al. (1997). O único sistema de lotação regulamentado no Brasil: concorrente ou substituto? Monografia, Porto Alegre.
- Dourado, A.B.F (1995). Transporte “informal” x “formal” verdadeira ou falsa questão? *Revista dos Transportes Públicos*, Ano 17, 66, 1º Trimestre, pp. 81-91, ANTP, São Paulo.
- Guerra, J.O. (2002). Uma proposta de utilização de veículos de baixa capacidade no transporte urbano de passageiros. Tese de MSc, PET/COPPE/UFRJ, Abril.
- Himanen, V. (1993). Possible transport policies for urban areas during the 1990's. *Transportation Planning and Technology*, **17**, 331-339.
- Orrico Filho, R, D, E.M. Santos (1996). O mercado de transporte público urbano por ônibus: que contestabilidade? In: *Ônibus Urbanos Regulamentação e Mercados*, L.G.E., 45-82.
- Pereira, C. M. C., A.M.Araújo, R. Balassiano (2002). Integração de sistemas de transportes como estratégia de gerenciamento da mobilidade. In: *Anais do XVI ANPET*, Novembro.
- Richardson, R.J. et al (1985). *Pesquisa social métodos e técnicas*. São Paulo: Atlas.
- Royal Commission on Environmental Pollution (1994). Transport and the environment. Eighteenth Report, HMSO, London, October.
- Tanaboriboon, Y, V.B. Agad. (1990). Bangkok's indispensable mode of public transport. In : *Land Transport and Development - International Conference*, Dunkirk, 18-22 June, 341-346.
- Tanaboriboon, Y., L.G. Madrona. (1990). Silor leks: a novel solution to the mobility problems in the developing countries - a case study in Bangkok. In: *Land Transport and Development - International Conference*, Dunkirk, 18-22 June, 347-352.
- Technibus (1996). O avanço dos lotações. *Technibus*, **6** (35): 14-15, dezembro.
- Technology Foresight (1995). Progress through partnership - transport. Office of Science and Technology, HMSO, London.
- Umrigar, F., P. Sikdar, S. Khanna (1991). Measuring the effectiveness of urban bus systems in India under existing organizational set ups. In: *PTRC - Urban Transport in Developing Countries - Lessons in Innovation*, London, 160-169.
- White, P. (1991). Three years' experience of bus service deregulation in Britain. Paper for Plenary Session and Workshop 6, at the *Second International Conference on Privatization and Deregulation in Passenger Transportation*, Tampere.
- White, P., S. Cassidy (1993). The contribution of marketing to economic performance of mini and midi bus operations since 1986. Paper for *Sixth Annual Minibus Conference*, Swansea Institute, Swansea.
- White, P.R., et al (1992). Cost benefit analysis of urban minibus operation. *Transportation* **19**, 59-74.
- White, P.R. (1995). Deregulation of local bus services in Great Britain: an introductory review. *Transport Reviews* **2**, 185-209.