Markets and Roles for Paratransit Services in an Integrated Urban Transportation System

Workshop 1 Resource Paper
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Attention has focused recently on the role that paratransit can play in meeting public policy goals in urban transportation \((1, 2)\). The combined effects of significantly higher costs for automobile transportation and the apparent lack of success of conventional transit in achieving meaningful increases in ridership have forced transportation planners and researchers to consider alternative solutions to the urban public transportation problem. The concept of paratransit as both an alternative and a complement to present transportation services emerged from this review, which in turn has led to a more careful examination of the urban transportation marketplace and the relative roles of each mode and service.

An understanding of the market for paratransit service is essential to the proper definition of the role it could play in an integrated urban transportation system. Major legal and financial issues relating to paratransit are being raised and must be settled before the role of paratransit in future urban transportation systems can be defined.

1. How can paratransit and conventional transit work together as an integrated system to improve transit level of service?
2. What impacts can paratransit have on total urban transportation investment requirements and system performance? More specifically, what effects can paratransit have on projected conventional transit resource requirements and system design?
3. What effects will expanded paratransit service have on projected conventional transit resource requirements and system design?

Urban transportation policy in the next few years will be influenced by planners' and policy makers' perception of paratransit. The goal of this paper is to compare and contrast conventional and paratransit markets and service characteristics in order to define appropriate areas for integration of all forms of conventional and paratransit services.

URBAN TRANSPORTATION MARKET

To understand the role of paratransit services in an integrated urban transportation system, one must understand the structure of the urban transportation market and the nature of both conventional and paratransit service options. Many characterizations of the urban transportation market are possible; the characterization presented here is intended to highlight those aspects of the market that affect the roles of conventional transit and paratransit services with respect to each other and the automobile. More
detailed analyses of the paratransit market are available (1, 2).

The market factors identified here that are most relevant to the choice between and among the private automobile, conventional transit, and paratransit are origin-destination patterns, regularity of trip making, congestion, and auxiliary transport of goods.

Origin-Destination Patterns

Current origin and destination patterns have a profound effect on transit system performance. Suburbanization is a root cause of the decline of public transportation services and the bane of recent efforts to recapture lost riders. The following breakdown of trip origins and destinations is used to highlight important features in each marketplace.

<table>
<thead>
<tr>
<th>Origin</th>
<th>Destination</th>
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<tbody>
<tr>
<td>Suburb</td>
<td>Same or adjacent suburb</td>
</tr>
<tr>
<td>Suburb</td>
<td>Nonadjacent suburb</td>
</tr>
<tr>
<td>Suburb</td>
<td>Central city</td>
</tr>
<tr>
<td>Suburb</td>
<td>CBD</td>
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<tr>
<td>Central city</td>
<td>Central city</td>
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<tr>
<td>Central city</td>
<td>CBD</td>
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<td>CBD</td>
<td>CBD</td>
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</tbody>
</table>

Figure 1 shows these same markets.

The distinction made in this paper between central city and CBD hinges primarily on automobile parking. In the CBD, automobile parking requires direct or indirect payment by the user. In the central city, which refers to the built-up area surrounding the CBD, parking is generally (although not always) available at no direct cost to the user through on-street parking or restricted parking lots. Although exceptions to this generalization abound, the distinction between free parking as a luxury provided to valued employees or customers versus free parking as an obligation of an employer or business establishment is valid.

The relative performance of transit and automobile in these 7 marketplaces has been well described qualitatively by Ward (3) and by Ward and Paulhus (4). For the automobile driver or passenger, trips wholly contained within the suburban fringe are well served from both a service and cost viewpoint; but the transit dependent receives poor, if any, service in this environment. As a consequence of this (and many other factors), proportionately few transit-dependent persons (other than children) live in suburban areas, resulting in little impetus within the general public to markedly improve transit service for such trips.

Suburban extensions of rail or bus express services provide high levels of service from suburban to central city or CBD once the system has been accessed. Suburban access to and egress from express services is the weakest link in
conventional transit service. However, the majority of new investment in public transport is being poured into just such systems despite the lack of a "solution" to the access-egress problem in the suburbs. The suburb to CBD and especially the suburb to central city are consequently the markets where the greatest increase in transit use is likely to occur, but the extent of the shift will depend primarily on the success in solving the access-egress problem in the suburbs.

Trips originating and terminating wholly within the central city or the CBD represent the best market for transit services, but are a small fraction of total area trips. The keys to the expansion of transit's share of this market are (a) the attraction of more trips downtown by transit in the first place, with the resulting lack of the private automobile alternative for intra-CBD or central city trips, and (b) the willingness of officials to innovate and experiment with services not now available.

Regularity of Trip Making

Diurnal peaking in urban transportation systems arises from the concentration of commuter trips in the morning and evening. Commuter trips are virtually always "planned" in advance and generally do not vary by time of day, day of week, or trip ends. In general, the more regular the trip is, the more susceptible it is to public transportation (other things being equal) since (a) the individual has more opportunity to explore either conventional or paratransit alternatives to the private automobile and (b) the ability of transit to provide quality service is enhanced if it can be "scheduled" in advance.

Although the proportion of regular trips tends to be highest during peak hours, a distinction should be made between regular and irregular trips rather than simply between peak and off-peak trips. Many peak-hour travelers do not make regular trips and consequently may not be easily attracted to public transportation even if reasonable alternatives exist.

Congestion

The diurnal peaks are associated with the severest levels of traffic congestion. In the absence of congestion, automobile driving is generally considered at least a neutral event and more frequently a source of pleasure and relaxation. As long as the sense of steady progress is maintained, drivers seem not to mind the exclusion of other activities and the personal risks inherent in driving. Traffic congestion is typically absent in the off-peak hours throughout the metropolitan area and in many suburban locations in peak periods as well. Under both conditions, conventional transit use is observed to be small, and little public demand for additional service exists among persons with access to an automobile.

Where congestion does occur, only exclusive right-of-way services offer advantages for public modes. The majority of conventional and paratransit services, which share facilities with private vehicles, now offer no direct relief from congestion. Congestion relief can only be achieved by paratransit if priority on the highway system is given to paratransit (and conventional transit) vehicles.

Auxiliary Transport of Goods

One of the frequently overlooked virtues of the automobile is its superb performance as a conveyance for personal goods. The entire market for shopping trips has a heavy bias toward the automobile for this reason, for conventional transit imposes severe limits on goods transport. The shopping habits of the transit dependent (who are often criticized for poor household management) are due in no small part to the limitations imposed by conventional transit. The prevalence of taxi use by this same group derives in part from the same failure of conventional transit to accommodate goods transport.
Consideration of these market characteristics reveals that the potential for conventional transit service to significantly expand, by itself, is limited. Trips made by automobile owners on uncongested facilities, trips that involve auxiliary goods transport, trips made on an irregular basis for which alternative options are unknown, and trips made in insufficient numbers to justify scheduled conventional service constitute the majority of urban area travel demand.

CONVENTIONAL AND PARATRANSIT SERVICES

The spectrum of urban transportation markets is served by an equally diverse array of conventional and paratransit services. The basic services in each of these categories are listed below:

<table>
<thead>
<tr>
<th>Conventional Transit</th>
<th>Paratransit</th>
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</thead>
<tbody>
<tr>
<td>Rail rapid transit</td>
<td>Demand-responsive transit</td>
</tr>
<tr>
<td>Light rail transit</td>
<td>Shared ride</td>
</tr>
<tr>
<td>Commuter rail</td>
<td>Exclusive ride</td>
</tr>
<tr>
<td>Express bus</td>
<td>Pooling (car, van, and bus)</td>
</tr>
<tr>
<td>Exclusive right-of-way lane</td>
<td>Rental car</td>
</tr>
<tr>
<td>Shared right-of-way lane</td>
<td>Limousine</td>
</tr>
<tr>
<td>Conventional bus</td>
<td>Jitney</td>
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<td></td>
<td>Special services to transportation dis-</td>
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<tr>
<td></td>
<td>advantaged</td>
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<td></td>
<td>School bus</td>
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The distinctions between paratransit service categories are based on factors such as the geographic markets served (areawide versus corridor versus point-to-point service), limitations on service to specific target groups, and for-hire versus self-drive vehicles.

Conventional Transit Characteristics

At the root of the failure of conventional transit in several of the urban area transportation markets is the emphasis on "mass" services. Conventional transit service has the following characteristics.

1. High-density travel markets are given first priority. In medium and large urban areas significant numbers of people and institutions depend on mass movement at low cost.
2. A corresponding emphasis is placed on large production units, typically serving no fewer than 40 to 70 passengers and often more than 1,000 passengers at one time.
3. A diurnal peak is much more pronounced than that present in the urban transportation market at large because of the selective market penetration of conventional transit, i.e., an abundance of peak-hour commuters and a dearth of off-peak travelers.
4. A large and highly structured organization is available to meet the large peak-hour demand for service. The smooth operation of even a large bus system is a complex task often underrated by the industry's critics. The management of conventional transit is unable to respond to marketplace shifts on less than a seasonal basis without taking extraordinary steps, a result of the inherent complexity of the interrelations within each system and the additional complexity of institutional barriers imposed by union contract agreements, governmental regulatory processes, and management itself.
5. A large organization has the inherent ability to "see" the totality of its operation and its marketplace, especially given the monopoly position of conventional transit.
Conventional transit systems similarly have the resources to engage in formal planning and to work with all levels of government through both official and unofficial channels.

6. Large amounts of public subsidy are provided. The industry is consequently responsible to the political system as well as to the marketplace it serves. An alternative characterization of this situation is that the individual fare does not by itself "justify" the provision of service. Consequently, the operator must have justification beyond the fare box to offer service, especially new service that will create additional financial burdens.

Taken together, these characteristics create an impression for the general public that conventional transit is "unresponsive" to their needs, i.e., the bus comes too early or too late, should make this additional stop, jog over to this street, make that extra loop, and so on. Although conventional transit operators are often genuinely unresponsive, it is unrealistic to expect that conventional transit can ever deliver "personalized" service given (a) the fundamental diversity in individual travel needs and tastes and (b) the constraints under which conventional transit must operate.

In many urban transportation markets the ingredients that will sustain conventional transit are not present. Providing large units of unchanging transportation through the mechanism of a rigid, slow-moving bureaucracy simply does not and can never satisfy the travel requirements of trips confined to suburban areas, nor will a large portion of suburb to central city trips be satisfactorily served at reasonable cost to the user or the public. Even in the central city and CBD, where travel volumes are greatest, transit is limited in the service it can provide by its need to meet peak-hour requirements (which dictate vehicle size), its reliance on rigid operating procedures (which prevent management from responding to rapid changes in travel demand or to minor differences in service requests), and its reliance on public subsidy.

**Paratransit Characteristics**

Paratransit services have been operated for years, but have only recently been identified as an aggregate force in the urban transportation market, a force that many feel has great potential to ameliorate problems of present urban transportation services. Although characterizing paratransit service is more difficult than characterizing conventional transit because of the heterogeneity of the services, the following generalizations are offered.

1. Service is oriented toward individual travelers or small groups with similar or identical origins and destinations. Service is perceived as personalized, and the operator is not constrained to provide only those services that are desired by large numbers of people.
2. The unit of production is small since mass markets are not served. Vehicles seldom seat more than 12, and use of standard-sized automobiles is most prevalent.
3. Although peaking characteristics exist in paratransit (especially for pooling), the effect is moderated by relatively better off-peak demand and by the fact that supply may often fall short of demand during peak periods, especially with taxis.
4. The organization that delivers paratransit service is frequently small (the major exception to this being the rental car business). These small organizations usually have a flat management structure that puts decision makers very close to the actual productive resources and the marketplace. Constraints on service flexibility are seldom imposed by labor or management, although government regulations may be a major factor.
5. Small organizations, while well run on a day-to-day basis, are often poorly managed over the long run because small organizations lack the time and talent to become involved in long-range planning. Although paratransit operators in the aggregate may have significant impact on the urban transportation scene, they individually cannot command the attention of public officials and planners. Managers of small paratransit operations typically do not see themselves as part of the "big picture."
6. Paratransit operators seldom receive any direct public subsidy for their services. The consequences of this are numerous and far-reaching. Particularly significant are the necessity of responding rapidly to shifting market conditions and the fact that the customer's fare is the sole reason for providing service. Alternatively, provision of desirable but noncompensatory service requires either a direct, cross, or indirect subsidy.

Paratransit services then are seen to differ on almost every account from conventional transit service. Not only are the services themselves physically different, but the markets served are currently quite different. It is precisely these differences that must be exploited if the full benefits of service integration are to be achieved.

Summary

Considering together the characteristics of the urban transportation market and the relative strengths and weaknesses of conventional and paratransit, the following conclusions can be drawn.

Conventional transit performs well in an environment where

1. Large numbers of travelers are making trips with substantially the same origin or destination or travel corridor at the same time;
2. Congestion levels are sufficiently high to make automobile driving unpleasant;
3. Auxiliary goods transport is not a requirement of the trip;
4. Trips are planned sufficiently far in advance or are sufficiently common to the traveler that the public transportation options are known; and
5. The cost of the public transport alternative compares favorably with automobile costs.

Paratransit performs well in an environment where

1. The numbers of travelers with similar demand patterns are small and can be served by custom designing a service to meet their specific needs (however, the total number of travelers who could identify with one of these small service groups may be a large portion of the total traveling public);
2. Congestion levels may or may not be severe since the user is not confined to service in high-density corridors and may be using paratransit for many reasons besides congestion avoidance;
3. Auxiliary goods transport may be required;
4. Trips need not be planned in advance, or the user may require minor service adjustments to meet unpredictable changes in travel plans; and
5. Cost savings over private automobile use are available or restraints exist that inhibit private automobile use or a private automobile is temporarily unavailable [cost savings for shared-ride services over private automobile exist over a broad range of conditions and under a variety of circumstances (5)].

CONVENTIONAL AND PARATRANSIT INTEGRATION

The integration of conventional and paratransit services offers exciting possibilities for the exploitation of the strengths and weaknesses of each to improve urban transportation. Improvements both in the quality of services offered and the total cost of public transportation services are possible. The following service integration concepts offer potential benefits.

1. Flexible-route paratransit services can be used in suburban areas as an alternative to poorly used fixed-route transit or as a feeder to fixed-route, line-haul services. These flexible-route paratransit services include for-hire services such as
demand-responsive vehicles and shared-ride taxi and private or quasi-private services such as car pools and van pools.

2. Pool-based services for both collector and line-haul services can be used when line-haul transit is unavailable or is already fully used. Pooling provides a low-cost alternative to expansion of conventional peak-hour services. Cities that cannot in the foreseeable future generate conventional transit corridor volumes that exceed the capacity of mixed or exclusive pool lanes may be well advised to avoid large capital costs for new conventional transit facilities in favor of low-cost paratransit options or mixed conventional and paratransit options such as exclusive lanes on freeways.

3. Shared-ride paratransit vehicles can share exclusive transit highway lanes, and concomitantly the exclusive-lane facilities can be expanded to keep level of service high. Preferential treatment of shared-ride vehicles on public facilities will add a service advantage to the cost advantage.

4. Additional service options in central city and CBD can be provided that vary in price and service quality from conventional transit. As the impressive use of taxis proves, a significant number of travelers are willing to pay premium price for premium service. Of particular importance here is jitney service that can offer a better service for a higher price than conventional fixed-route transit, thereby allowing better segregation of markets and services. The present lack of a service intermediate between fixed-route bus and exclusive-ride taxi can be remedied via paratransit.

5. Services offered at different periods of the day can be varied to achieve better use of labor and to match services offered to travel demand. This implies a shift in the off-peak away from lightly used corridor-based transit and the substitution or addition of flexibly routed services. Late evening fixed-route service is a prime candidate for such a substitution, using either flexible-route transit vehicles not needed in suburban areas in the evening or opening up service opportunities to for-hire private carriers (jitneys, shared-ride taxis) who would work in a complementary manner with remaining conventional services.

6. Paratransit operators can be used to provide special transportation services to groups who are unable to use either the private automobile or conventional transit because of physical or mental limitations.

7. Existing paratransit services can be combined to improve resource use. School buses, for example, are grossly underused at present. Transit services that are concentrated in the off-peak could make use of school buses and reduce total investment in capital equipment.

8. Taxi and limousine service can be more effectively used to increase productivity. This is particularly important in special transportation markets such as transportation terminal access where many travelers must use a public conveyance of some kind but find conventional services (where available) too slow or inconvenient. Such shared-ride/paid driver services can also be cost competitive where parking fees exist.

9. Goods delivery and paratransit can be integrated. Urban area goods transportation accounts for a significant proportion of urban vehicle miles. Taxis currently transport small parcels in many urban areas and could substantially increase their business if the regulatory and pricing structure were changed. More gradations in service should be offered to provide more alternatives to shippers and carriers.

Transportation planners and policy makers realize that for financial, environmental, and social reasons we cannot afford to solve our urban transportation problems by massive construction of new facilities or through open-ended financing of ineffective transport services. During the next several years it will be necessary to improve the performance of existing highway and transit facilities as well as to make incremental improvements to the physical resource base. Paratransit can be instrumental in this task by building a bridge between private and public modes of transport. Paratransit has the potential for improving the performance of existing facilities by increasing automobile occupancy levels, increasing the amount and diversity of public transportation services available to the public, and increasing the effectiveness of existing conventional transit facilities. Whether these improvements can be realized will depend largely on the ability of professional transportation planners both to identify and analyze
potential improvements and to state their case clearly and cogently to the public leaders who face the risks inherent in transportation innovation.

REFERENCES