Management of Public Transportation Systems in the 1980s: The Emergence of Paraprivate Transportation

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Management of public transportation systems in the 1980s will be a major challenge for urban areas. Their operating scenarios, financial support, and general feasibility will be severely tested. The present heavy subsidy of transit is not expected to continue. Just as much of the U.S. industry has had to specialize its product offerings in a competitive market place, so will transit systems. This will mean the expansion of paratransit activities and the inclusion of paraprivate transportation options. This paper attempts to assist public transportation officials in thinking through their innovative alternatives and provide the rationale for the alternatives they adopt. How these newer, specialized forms of public transportation alternatives are integrated into existing traditional transit operations will be the major managerial and official focus for much of this decade. Those areas that are successful in broadening their concept of public transportation to include these innovations will breathe new life and vitality into their local transportation systems. Those who do not will continue to teeter from one financial crisis to another. Clearly, public transportation officials at all levels need to ask themselves, "What are we trying to do?", and restructure to accomplish these goals. We can no longer continue to use nineteenth-century work rules and early twentieth-century technology as we stumble toward the twenty-first century.

Public transportation systems underwent numerous changes in their ownership, financial support, and level of expectation during the 1970s. The majority of private urban transit systems was purchased with public money. Most are now heavily subsidized from public operating funds, and they are expected to be all things to all people. Public announcements are periodically made on how public transit can solve the energy crisis, reduce pollution, or improve urban mobility. Unfortunately, although the 1970s brought an influx of public funds to the transit industry, its competitive position to the private automobile has remained constant. Just as the 1950s and 1960s were the facilities-building era of the highway systems, the 1970s were the facilities-building years of publicly owned transit systems. The management of these combined facilities will be the major transportation challenge that faces officials in the 1980s. Thus, the purpose of this paper is (a) to develop the status quo of these combined facilities, (b) to demonstrate the need for a change in direction, and (c) to prescribe a management strategy for public transportation programs in the 1980s.

TRANSIT--THE PRESENT CASE

Although budgets for public transit greatly increased yearly in the 1970s, the expansion of local support taxes appears to have reached an end. Between 1969 and 1979, public transit deficits rose from a few thousand dollars to more than $3 billion (1). These deficits were financed through local tax levies and general funds. However, transit costs are increasing at an annual rate of two to three times that of local municipal budgets (1). The industrialized cities of the Northeast, which have eroding tax bases, appear to be hardest hit. The recessionary squeeze will restrict the total supply of transit services for the 1980s. Even through the expansive years of the 1970s, however, the actual supply of transit services (i.e., vehicle miles operated) remained relatively constant (1). With the slackening of local financial support, transit management will find it necessary to review service offerings for possible elimination.

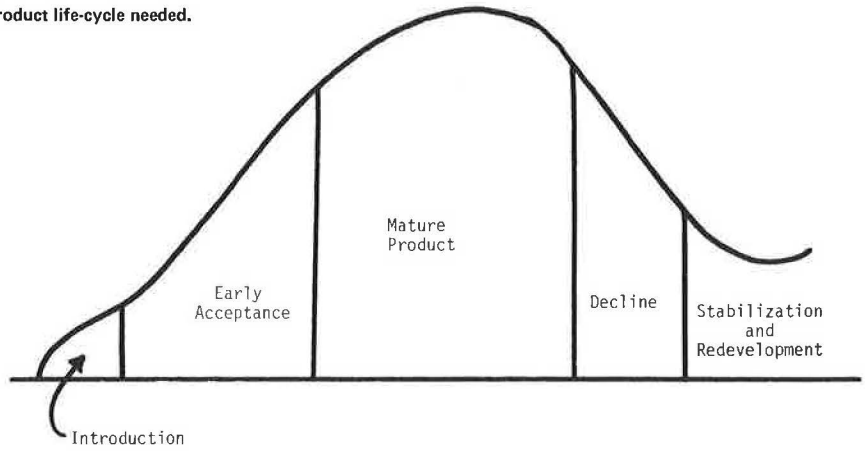
Some of this activity may prove healthy to the industry. Ironically, during the 1970s, although new vehicles and facilities were purchased with public money, minimal operational improvements were made by traditional transit systems. For nearly a century, transit management had geared its operations to serve the peak commuter markets. The major emphasis in route development, equipment design and use, and labor work rules was on efficient service for the peak commuter demand. With the advent of massive public support, a new mission and market were added to public transportation--the transportation disadvantaged. The transportation disadvantaged include not only the economically disadvantaged but also the physically disadvantaged. Unfortunately, the management of many public transit systems, burdened by the day-to-day operational problems of managing peak transit demand, underestimated this new responsibility and its implications. Their major efforts were consumed with the enormous task of gearing up for the peak-time commuter market with new vehicles, new garage facilities, and new rail systems.

Sadly, this continued preoccupation with ridership numbers was doomed for reasons beyond the control of mass transit management. The flight of people and jobs from the urban core and dense corridors to suburban industrial parks and residential areas continued and increased during the 1970s. Instead of work trips to a city center or a few major industrial sites, trips from lower-density dwelling units to other low-density areas were the norm. During the 1970s, suburb-to-suburb trips became the majority of all work trips and represented two-thirds of all work trips in urban areas (2). Due to the many origins and destinations created by such trip patterns, the attracting of this ridership to traditional mass transit became impossible, extraordinarily expensive, or both. Thus, although public treasuries pumped billions of dollars into local public transit systems (which by management decision were used to support the peak-time commuter trip), transit lost 40 percent or more of its market share. During the 1970s, transit's mode split of the peak-time commuter market decreased nationwide from 10 percent to 6 percent (2).

In marketing terms, the transit industry in the United States had been in a state of mature product decline (see Figure 1). Without massive federal, state, and local assistance, the transit industry would have gone out of business. However, fresh capital and operating funds gave transit a chance for stabilization and redevelopment of new product and service offerings that would appeal to the public in the remaining decades of the century. Unfortunately, this redevelopment has not taken place. Public support for transit may have sealed its fate and that of transit management by insisting on the public utility concept of viewing public transit as solely fixed-route, fixed-schedule services that blanket an urban area in either a grid or spoke-wheel network.

The concept of paratransit was begrudgingly introduced into transit, but this was only because traditional transit feared the loss of governmental support if it did not provide more specialized ser-

Figure 1. Product life-cycle needed.



vices in the form of demand-responsive scheduling and smaller vehicles for certain transportation-disadvantaged markets. Today such expenditures account for a relatively small amount of total transit expenditures. Thus, traditional services were mandated to be modified to make them accessible to some physically handicapped individuals--primarily individuals in wheelchairs. Now the same level of services that lost market share in the 1970s will be made available to the physically disadvantaged in the 1980s.

Ironically, traditional transit has been marketed during the 1970s to the tax-paying public as highly energy efficient. One constantly hears that a mass transit bus can remove 40 automobiles from the highway or that the train is energy efficient. Unfortunately, such claims are often exaggerated. It is true that transit theoretically can be highly energy efficient when traveling at capacity. However, due to deadheading, low density, and lightly used off-peak services, the average occupancy of a public bus per vehicle mile in the United States is only three persons, and the average occupancy per train mile is six. In reality, it is not what transit can do, but what it actually does, that determines the fuel efficiency of the mode.

A more formal work on the fuel and cost efficiencies of transit has been carried out by an Urban Mass Transportation Administration supported study conducted by System Design Concepts, Inc. (3). The report analyzes the specific energy used in three representative high-density corridors that serve Cincinnati, Ohio; Washington, D.C.; and Philadelphia, Pennsylvania. The results are shown in Table 1 (3). As shown, traditional transit, even in these dense corridors, conserved appreciably less fuel than did carpools and vanpools. Similar results were generalized for the nation as a whole in a recent Congressional Budget Office report (4). If one reviews the program cost savings estimated for travelers in these three corridors (see Table 1), the implications are obvious. The total travel savings are slight for conventional bus and even negative for rail service. As one does similar studies on lower-density corridors, the energy and cost savings will decrease substantially. Also, as the report states, the future will get even worse (3).

> Moreover, the energy benefits offered by many modes are derived from the difference between their consumption rates and those of automobiles. As automobile efficiency improves, there is a decrease in the energy savings potential of other modes. For example, if automobiles average 26.5 miles/gal (which is expected to be reached in 10 years), the average potential energy savings offered by conventional bus service is only about one-third as large as at present, if other factors remain constant.

Table 1. Energy and cost-effectiveness of urban transportation modes.

Mode	Program Energy[a] (BTUs/passenger-mile)	Program Cost Savings[b] ($/passenger-mile)
Carpool	4700	+0.15
Vanpool	7970	+0.23
Conventional bus	2890	+0.02
Express bus	2000	+0.04
Heavy rail, old	NA	NA
Heavy rail, new	730	-0.30
Light rail	890	-0.37

[a] Program energy represents the approximate average expected energy savings attributable to a mode in travel markets for which that mode is likely to be a serious candidate for implementation. Each mode's energy consumption in a market is compared with alternative modes that would otherwise be used in that market in order to obtain the estimated energy savings. Comparative judgments as to the energy savings of two or more travel modes in a particular travel corridor cannot be made with these numbers because they were computed with data from different travel markets.

[b] Program savings represent the approximate average expected cost savings attributable to a mode in travel markets for which that mode is likely to be a serious candidate for implementation. Each mode's costs in a market are compared with the costs of alternative modes that would otherwise be used in that market in order to obtain the estimated cost savings. Costs are given in 1977 dollars. Comparative judgments as to the cost savings of two or more travel modes in a particular travel corridor cannot be made with these numbers because they were computed with data from different travel markets.

Ironically, massive public assistance may have stimulated some of these inefficiencies. By providing public funds, many transit systems were compelled to provide some services to all of the political jurisdictions irrespective of density or demand for services. The rationale was that tax-paying subdivisions needed transit services the same as they needed police and fire protection. Indeed, many transit systems of the 1970s passed bond and taxing levies to expand their local systems into regional authorities. When one considers that the supply of transit (i.e., bus miles) has remained constant throughout the decade, the only conclusion is that the same supply is being spread over a larger geographical area and that service to the high-density corridors previously served has been decreased.

Clearly, there is a felt need for a change in direction. Continuance of the same managerial actions will mean that transit will lose the opportunity presented by its public infusion of funds in the 1970s. Public transit must position itself on a solid base for future rebuilding. Unfortunately, the demand for fuel-efficient, high-occupancy vehicles will accelerate in the 1980s. It is impera-

tive that appropriate legislative frameworks, management strategies, and the political sense to realize them be developed.

TRANSPORTATION DEMAND IN THE 1980s

The demand for transportation, in general, and commuter transportation, specifically, will increase greatly in the 1980s. The table below shows projections for automobile use in the future. Note that the term automobile excludes vans, light trucks, and campers.

Item	1975	1985	2000
Automobiles (000 000s)	95	118	148
Licensed drivers (000 000s)	120	151	177
Automobiles per licensed driver	0.73	0.78	0.84
Vehicle miles of travel (000 000 000 000s)	1.03	1.43	1.80
Vehicle miles of travel per licensed driver (000s)	7.9	9.5	10.2
Urban driving under congested conditions (%)	10	14	24
Transit ridership (000 000 000s)	5.6	6.5	6.5

According to a study prepared by the Office of Technology Assessment (5) concerning the future use of the automobile, the number of licensed drivers will increase from 120 million to 151 million by 1985 (see the table above). The number of automobiles will increase by 20 percent in the 10-year period from 1975 to 1985 (5). Many of these new licensees and automobiles will be driven by new female drivers as the proportion of women in the working commuter market increases. Given this increased demand and the limited ability to supply additional roadway and traditional mass transit options, it is little wonder that the report projects that 24 percent of all the urban miles driven by the year 2000 will be driven under highly congested conditions. Mass transit ridership is expected to increase by only 20 percent through 1985 and then not to increase at all between 1985 and 2000. Because of declining local funds and increasing transportation demand, public transportation officials face a critical dilemma of how to accommodate increases in demand with declining real dollars. Fortunately, there are ways to do this if one broadens the concept of public transportation to include the active management of all public transportation facilities and the vehicles that use them.

Broadening the Public Transportation Concept

For nearly a decade, the public utility approach to public mass transportation has tended to divide all transportation offerings into two groupings--private transportation and for-hire or regulated carriers. Regulated carriers were further defined as common, contract, and, in some cases (such as vehicles used for religious purposes), exempt carriage. Similar to other transport modes that have been heavily regulated as to entry, exit, fares, and service offering, mass transit initially flourished. But within the past three decades, mass transit has crumbled into financial ruin in the face of unregulated private competition in the form of private automobiles. Little could be done by the regulators to protect the mass transit markets so long as the private automobiles did not hold themselves out to carry others for a fare. Such jitney operations were banned in all but a few areas in the 1920s and 1930s. The effect of such ordinances is that even today it is illegal for one to receive compensation above a reasonable amount for shared expenses for the trip. In essence, a commuter can accept a fare for driving only if the total amount received does not exceed the cost of the trip (i.e., variable cost of gasoline, depreciation on the vehicle, and other related fixed costs).

Through stated public policy, a common-carrier public-utility concept of mass transit that makes it illegal for commuters to charge more than the proportional cost of the trip is being used. Thus, incentives for private transportation are held to a minimum. It is known that additional peak-time transit service is proportionally more expensive, in terms of public subsidy, to provide. But regulators insist on protecting this market from other sources that would need no subsidy.

In retrospect, the public policy of exercising no regulatory authority over the use of the private automobile may not be a prudent strategy. The cost of owning and operating several automobiles has become increasingly expensive to struggling families that are hard pressed by inflation and slow economic growth. The cost of foreign oil to fuel primarily automobiles now exceeds $80 billion/year. The annual carnage on the highways averages 50 000 fatalities/year to say nothing of injuries, hospital bills, human pain, and suffering. Through regulation, a gray area or subeconomy to public mass transportation has been created. For lack of a better name, this category could be referred to as paraprivate transportation.

Paraprivate Transportation

As shown in the table below, regulators have attempted to deal with transportation suppliers as either common or contract carriage or exempt private carriage.

Mode	Regulatory Classification
Traditional transit	Common carrier
Paratransit	
Dial-a-ride	Common carrier
Taxi	Common carrier
Limousine	Common carrier
Subscription bus	Contract carrier
Subscription van, for hire	Contract carrier
Paraprivate	
Carpool	Private, exempt
Vanpool	Private, exempt
Buspool	Private, contract carrier
Automobile	Private, nonregulated

The middle ground, that of private individuals who supply transportation services on a quasi-business basis (the paraprivate sector), has really had no convenient regulatory classification and thus, by definition, could not and should not exist, primarily because it blurs the distinction between nonregulated and regulated carriage. Only in the latter part of the 1970s did most states deregulate privately operated vanpools from their previous position as common carriers, and then only under the condition that they operate at no more than a break-even or share-the-cost basis. Mass transit management has naturally feared carpools and especially vanpools as threatening to remove riders from mass transit systems. Only recently have these highly fuel-efficient modes been given limited emphasis by public transportation officials. Clearly, the successful mass transportation strategy would be to use these newly developed paraprivate modes to assist in accomplishing the mass transportation objectives of reduced energy consumption and congestion as well as

cheaper, more-effective means of commuter transportation. For profit, exempt carpools, vanpools, and buspools could add enormous peak-time mass transportation capacity at little or no additional cost to the public.

PRESCRIPTION FOR IMPROVEMENT

If these paraprivate modes can be used to serve the growing peak demand and even some of the existing demand, transit management could then turn its efforts toward building a better off-peak base for transit development. Better services for nonwork trips such as medical, recreational, and social-service trips could be developed. Greater attention could be given to transit amenities such as benches, shelters, integration with community activities, and street signing systems that inform patrons how to use the system. Finally, with pressure relieved from having to expand the peak-time system, appropriate marketing of the systems could be undertaken. In many cities the local public transportation system is still a mystery to many.

Development of paraprivate transportation modes would bring about other major long-term benefits to transit. Initially it spreads the responsibility and cost of providing peak-time transportation to employment centers that, by their operational nature, cause the peak-time problem. In essence, the approach says, "You helped create the problem, now let's work together to solve it."

As government and private employers become actively involved in encouraging, administering, and assisting paraprivate modes such as carpooling, vanpooling, and even buspooling, major pressures for highway expansion can be relieved. Moreover, as more people share driving or riding in a vanpool or buspool, corridors of high-occupancy-vehicle use can and will develop. Research on these modes has shown that individuals who would not trade their singly driven automobile for transit might initially try carpooling. Over a period of time, some of these carpools will evolve into vanpools and later buspools. Such a phenomenon is labeled the "step-function approach to mass transportation" (see Figure 2). Such an approach recognizes that the personal private automobile is the preferred mode; but through conditioning of the marketplace over a period of time, some individuals can be coaxed away from this preferred mode. In essence, paraprivate modes can be used effectively over time to prepare a corridor or area for mass transit once sufficient volume is reached. Such a strategy used to its fullest could be used to develop future light rail corridors.

Highway and transportation officials can take actions to encourage paraprivate modes. High-occupancy-vehicle lanes can be the focus of new construction or use of present roadway capacity where more than two lanes per direction exist. The emphasis should be on occupied seat miles per gallon. This would give the same preference to a four-person, subcompact automobile carpool as it would to a full transit bus. Both would achieve 160 occupied seat-miles/gal of fuel. The bus, which averages 4 miles/gal, would carry 40 individuals, and the automobile, capable of achieving 40 miles/gal, would carry four passengers. Obviously, it is how the vehicle is used, not the vehicle itself, that is important.

Targeting efforts to the long-distance commuter should also be a major emphasis of the paraprivate approach for the 1980s. As shown in the table below (6), 27 percent of the workers who travel 11 miles or more are responsible for nearly 70 percent of the vehicle miles traveled.

One-Way Trip Length (miles)	Workers (%)	Home to Work Vehicles Miles of Travel (%)	Projected Travel Time (min)
≤5	52.1	13.9	≤15
6-10	20.9	17.8	16.25
≥11	27	68.3	≥16

Such targeting need not be difficult. These are real monetary benefits for the individual. As shown in Table 2, an individual can save as much as $246/month by carpooling and $266/month by vanpooling. Few government programs are able to demonstrate such returns on public dollar investment.

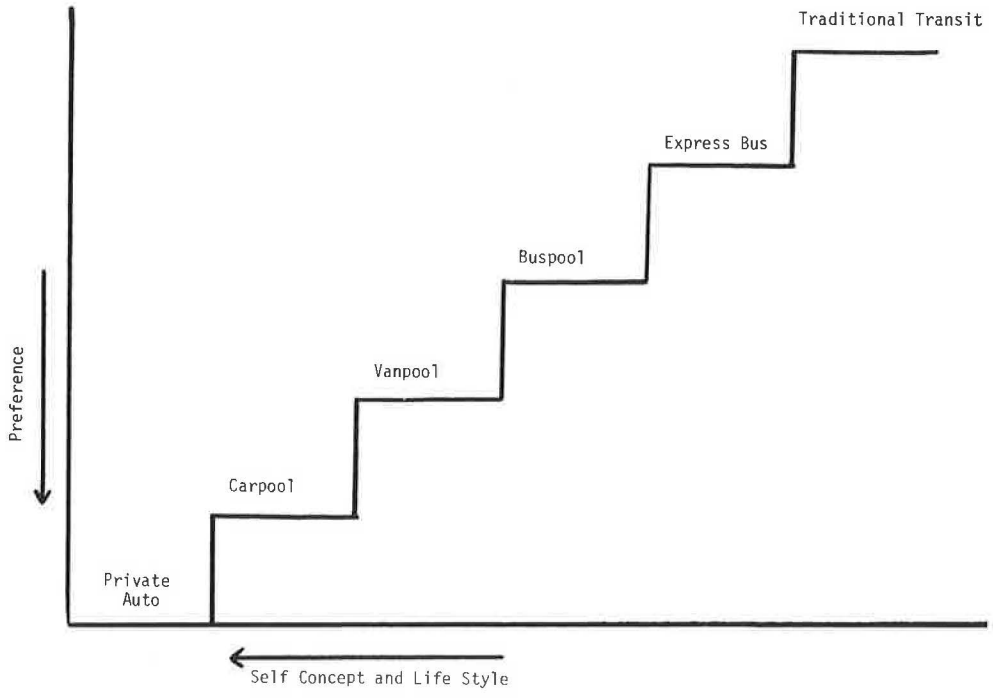


Figure 2. Public transportation step function.

Table 2. Estimated monthly cost for daily round trips.

Choice of Travel	Cost per Month ($)						
	10 Miles	20 Miles	30 Miles	40 Miles	50 Miles	60 Miles	70 Miles
Drive alone	45	90	135	180	225	270	315
Carpool of two persons	23	45	68	90	113	135	158
Carpool of four persons	11	23	34	45	56	68	79
Vanpool	37	41	44	48	52	55	59

Note: Table adapted from Federal Highway Administration statistics.

Even greater economies can be achieved if administration and financial support for these paraprivate options can be shifted in part (or in the case of large employers, totally) to the employment centers themselves. The nation's largest employer, the federal government, has already moved in this direction through Executive Order, Circular No. A118, which deals with federal employee parking facilities. In addition to mandating the collection of appropriate charges for federal employee parking, it also mandates the establishment of an employee transportation coordinator at every federal facility that employs more than 100 persons. In accordance with President Carter's memorandum of February 1, 1980, these employee transportation coordinators are to give priority parking to carpools and vanpools, to establish favorable van financing terms, to facilitate ridesharing matches, and to disseminate mass transit information. Many private firms have developed such programs as employee fringe benefits. Much more, however, is still needed. Nearly 65 percent of all workers drive alone to work. Many more could share the ride or become a member of a paraprivate transportation mode. Ironically, there would be an abundance of passenger seats, parking spaces, and roadway capacity if all vehicles, space, and highway networks were used efficiently. It is time to manage facilities far more productively than previously has been expected. Instead of planning and building for vehicles per hour per lane, concentration should be on persons per vehicle per hour per lane.

SUMMARY

The management of public transportation systems in the 1980s will be a challenge for transit and transportation officials. The concept of public transportation will expand to include paraprivate modes, just as it expanded to include paratransit modes in the 1970s. The broadening to include paraprivate modes, however, will bring a more fundamental change in the management strategy. Management will be forced to abandon the concept that only publicly owned and operated services comprise the public transportation system. In fact, management will be encouraged to do so by governmental authorities that are burdened by local tax pressures. Unlike traditional transit costs, costs of paraprivate options will be shared with employers as they are encouraged to set up and administer their own employee transportation programs. Such a change presents interesting challenges to state and local regulatory bodies. Resistance to these changes is natural; but in the end the rationale of these modes and their preference will prevail.

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Coordinating Transportation: The Logistics Solution

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One of the primary problems of the poor, handicapped, and elderly, especially if they live in rural and suburban areas, is transportation. More than 116 federal programs have been developed in an attempt to correct this transportation deficiency. However, due to the large number of programs, there have been charges of duplication of services. This has brought about calls for consolidation, even though consolidation is the least-efficient and least-effective form of coordination. The purpose of this paper is to emphasize that coordination of transportation service is totally different from the coordination of plans to build fixed facilities, organization to coordinate funding from many categorical grant programs, or organization to coordinate a well-defined production activity such as transportation. A second purpose is to emphasize that the large organizations that have been concerned with both the effectiveness of transportation as well as the efficiency of transportation are using the logistics approach to coordination whether they be government (military) or private (business). The third purpose of this paper is to emphasize some of the inherent weaknesses of consolidated transportation programs and to suggest some alternative approaches to coordination.