To the Graduate Council:

I am submitting herewith a dissertation written by Richard Thomas Symons entitled "An Analysis of the Regulating Environment of Selected Cities to Determine Impeding Factors for Para-Transit Forms." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Business Administration.

Joseph Frye, Major Professor

We have read this disseration
and recommend its acceptance:

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

AN ANALYSIS OF THE REGULATING ENVIRONMENT OF SELECTED CITIES TO DETERMINE IMPEDING FACTORS FOR PARA-TRANSIT FORMS

A Dissertation

Presented for the

Doctor of Business Administration

Degree

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ABSTRACT

Travel in urban areas is a problem faced daily by many. Numerous proposals have been made to alleviate all or part of this problem. One set of proposed answers advocates utilizing para-transit services. Para-transit services can be defined as services that are demand responsive and more flexible and personalized than conventional fixed-route bus service, available to the public on a regular and continuing basis, and operate over the existing street and highway system on a shared-ride basis.

Since transportation is a regulated industry subject to the interpretation of transit officials and given monoply status in most major cities, existing regulation in urban areas was analyzed in order to determine if para-transit is an option that can be studied. The analysis procedure used consisted of two parts: analyze existing regulatory ordinances and determine if local officials are aware of para-transit services.

This analysis required acquisition of city ordinances from cities where urban transit was governed by local ordinances. Next, a questionnaire was administered to local transit officials in an attempt to discover if the authority members were aware of the para-transit forms and demand situations where various forms of para-transit services might be successfully employed. The questionnaire was designed to examine the knowledge of the individuals concerning the existence and possible use of para-transit modes on their urban public transportation system.

It was found that transit authorities in states granting municipal control were more structured and, in contrast, that the powers given to independent transit districts were very broad. It was also discovered that in states which allowed both types of organization, independent transit districts were used more often than municipally controlled boards. Further analysis provided evidence that the transit officials responding to the survey had an understanding of the characteristics of para-transit modes as well as recognizing the needs of the different market segments depicted in the demand situations illustrated. A few of the market segments provoked differences of attitudes between transit officials and transit experts. The most notable was the favoring of regular bus and express bus operations in segments such as one-way low density demand areas and high density travel to diffuse areas. However, a comprehensive view of the analysis infers that the transit officials were in relative agreement with the transit experts.

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CHAPTER I

INTRODUCTION AND STATEMENT OF PROBLEM

I. INTRODUCTION

It was the application of mechanical power to production that made industrialism possible. Industrialism, in turn, required the aggregation of large groups of workers at plant sites. This created the need for transporting large groups of people within the urban environment.

At the outset of the industrial revolution, people used the only modes of transportation available (walk or horseback) to travel to and from work. Such transportation was relatively inexpensive and, for the most part, readily available. As technology advanced, a new mode of transportation emerged (i.e. streetcar) that allowed workers to reside farther from their employment.

The early urban public transportation industry (pre-1900) consisted of a group of distinct services. There was little coordination between various segments of the industry, and there were few or no regulatory constraints. The increased use of the streetcar (1900-1914) brought about a concentration of the urban transportation industry. It was impossible to ignore the practical demonstration of the electrical streetcar's inherent economies of scale.[1] The nature of the streetcar called for a single power source that provided energy to all vehicles in the system. Unifying all segments of streetcar services permitted energy

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[1] Smerk, George, "The Decline of Public Transportation," Readings in Urban Transportation, Indiana University Press, Bloomington, Indiana, 1967. p. 30.

to be distributed conveniently to peak usage areas and to be purchased at lower rates. The recognition of these facts, coupled with an increasing demand for service, prompted owners to merge in an attempt to take advantage of this potential monopoly.[2]

The potentially monopolistic position being apparent, the rail company was judged to be a utility. Accordingly, states and local governing bodies took steps to place the industry under regulation.

In developing regulation, four basic premises were assumed:[3]

1. The regulated industry was basically a monopoly with substantial economies of scale.
2. The regulated industry must meet the public's interest; consequently, service must be provided to all people in a non-prejudicial and non-discriminatory manner.
3. Since the regulatory agency had the authority to set service levels and prohibit prejudicial treatment, the public has an obligation to the carrier to insure that it receives an adequate rate of return under effective management. Consequently, rates were set on a rate of return basis, given that the carrier was providing the prescribed level of service and that management has not been found guilty of fraud or gross mismanagement.
4. Since the carrier was providing the service deemed necessary for the public and at a price deemed reasonable by the

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[2]Smerk, George, "Urban Mass Transport at the Ebb," Readings in Urban Transportation, Indiana University Press, Bloomington, Indiana, 1972.

[3]Davis, Frank, et al., "Intercity Bus Operations," Tennessee Department of Transportation, June 1974.

regulatory agency, the only effect of competition would be to increase the unit cost of the natural monopoly. Competing carriers could lower cost only by serving the profitable routes and not providing adequate service to the less profitable areas. Consequently, competitors should be prohibited from "taking only profitable business." Thus, new carriers could operate only where existing carriers were unable to meet the specific need.

Recognizing these four needs, the regulating bodies normally followed the precedent set forth in the Smyth versus Ames case,[4] which states that:

> A public utility may not fix its rates with a view solely to its own interests and ignore the rights of the public. The rights of the public would be ignored if the rates for the transportation of persons or property on a railroad were exacted without reference to the fair value of the property used for the public or of the services rendered, and simply in order that the corporation may meet operating expenses, pay the interest to its obligations and declare a dividend to stockholders.

Using the precedent set forth in this case, most legislative bodies enacted regulations to protect established utilities that adequately rendered services to the public. The regulations generally dealt with:[5]

1. Entry control
2. Fares and charges
3. Management and ownership; and
4. Service standards.

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[4]Smyth versus Ames, United States 169, U.S. 466, May 7, 1898.

[5]Hines, J.A. and Sloan, D.W., "Legal Analysis of Transportation Regulation and Innovation," USL TR-70-19, Cambridge, MA, 1971.

By regulating these four aspects, it was possible to control the structure of the urban public transportation industry. Thus, public policy--protecting the existing monopoly--excluded any competition (except from private auto) from the urban public transportation scene.[6]

This policy and the regulations that sustained it did not make provision for two elements which subsequently affected urban transportation: first, new technology; second, a decline of the transportation monopoly. By 1920, the decline of the streetcar monopoly was evident. Fifty or more electric rail companies had become bankrupt and private motor cars already had begun making significant inroads into commuter carriage. During this time period, regulation had the effect of dividing transit services, by giving existing public transit systems (usually streetcars) exclusive rights over established routes in regulated areas and by placing taxi operators under regulation which constrained their operations. New operators were prohibited from establishing service until granted permission by the regulating authorities; and this permission was often difficult to obtain since the applicant had to prove not only a need, but also that the needed service was not being provided by existing carriers. Using these precedents, initial competition from the automobile (1915-1930) in the form of jitney service was ruled illegal: it was felt that jitney operation was cutting into streetcar revenues by offering a low fare (e.g., five cents) for service over

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[6]Many examples of exclusion of taxi and jitney operations can be cited. See Rosenbloom, S., "Taxis, Jitneys, and Poverty," Transaction 7, 1968, pp. 47-54 for specific examples.

heavily traveled routes, but was offering no real increase in service, only a duplication of service.[7]

While streetcars now have essentially vanished and new vehicles, particularly buses, have taken their place, urban transportation in general is still governed by regulations designed for a monopolistic industry.

Currently, the public transportation rider is undergoing more changes from even more recent technological advances. High-speed rail systems[8] and advanced communications systems for routing and scheduling, e.g., the Bay Area Rapid Transit (BART) system,[9] are two experiments being conducted with the hope of being able to alter present systems to better meet the rider's needs. Research also is being performed to investigate the use of para-transit modes for urban mobility. (Para-transit is defined as: intra-urban passenger transportation which is available to the public but is distinct from conventional transit, e.g., scheduled bus and rail, though it operates over public highways and street systems.)[10]

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[7]Banks, R.L., "Study Evaluation of Urban Mass Transportation Regulation and Regulatory Bodies," National Technical Information Services, Springfield, Virginia, 1972.

[8]Vukan, R.V., "Light Rail Transit Systems," National Technical Information Service, October 1973.

[9]Lovelock, Christopher H., "Consumer Oriented Approaches to Marketing Urban Transit," Stanford University Press, Stanford University, Stanford, California, 1972.

[10]Kirby, Ronald, et al. "Para-transit: Neglected Options for Urban Mobility," Department of Transportation, Washington, DC, June 1974.

II. STATEMENT OF PROBLEM

Urban transportation still is a regulated industry subject to the interruption of transit officials and it is given monopoly status in most major cities; therefore, it is appropriate to analyze existing regulation to determine if such status is or has been a barrier to innovation in the transit industry. This will be done by:

1. Analyzing the regulatory ordinaces of selected cities to determine if existing regulation impedes the implementation of selected para-transit services.
2. Determine if local officials in these selected cities are aware of the para-transit forms selected (i.e., taxi, car/vanpools, and subscription bus).

III. SCOPE OF STUDY

This study investigates passenger movements in urban areas where state legislation enables metropolitan authorities to govern by local ordinances. Cities in states that give this right to local government were studied in order to analyze the specific urban area's regulation as well as the recognition by local regulatory authority members of the selected para-transit forms. In cases where the state retains the authority to regulate, the analysis stops at the state level and simply examines state laws. However, while members of the state transit authorities may be more aware of available alternatives, it should be noted that they may not recognize specific local problems and needs.

The regulation was analyzed and the authorities questioned concerning three general para-transit services.

1. Hire and Drive Services

   Rent-a-Car

2. Call Services

   Taxi, Dial-a-Ride, Jitney

3. Prearranged Ride Sharing Services

   Carpool, Subscription Bus, Buspools

These three para-transit services have received recognition as innovative procedures which may partially relieve certain urban public transportation problems.[11] For example, call service--the most studied and practiced para-transit operation--has been advocated by Rosenbloom,[12] Urbanek[13] and many others. Recently, prearranged ride sharing services have received national attention. In fact, H. Bain[14] and others feel that ride sharing "pools" may provide a vital service to the commuting public. Finally, the group that has received the least amount of attention as a para-transit form is hire and drive services (such as rent-a-car), which, as a series of articles by T. Bendixson[15] points out, may be a viable answer to many urban public transportation problems.

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[11] Kirby, Ronald, et al., "Para-transit: Neglected Options for Urban Mobility," Department of Transportation, Washington, DC, June 1974.

[12] Rosenbloom, S., "Characteristics of Taxicab Supply and Demand in Selected Metropolitan Areas," Systems Analysis of Urban Transportation, Vol. 4, Santa Barbara, California, 1968.

[13] Urbanek, T., "Dial-a-Ride Project in Ann Arbor," Highway Research Board, 1973.

[14] Bain, H., "The Boston Express Bus," Washington Center of Metropolitan Studies, Washington, DC, 1970.

[15] Bendixson, T., "Coin Operated Taxi," Transportation 1, 1972, pp. 100-101; "Self Drive Mini Hire Cars," Transportation 2, 1973, pp. 97-101; "A Japanese Self-Driven Urban Hire Car," Transportation 2, 1973, p. 102.

This study neither attempts to forecast the results of implementing para-transit forms, nor does it attempt to compare these para-transit forms with traditional services. This study is restricted to analysis of the legality of implementing para-transit systems and of the recognition by regulating authorities of the service characteristics of such systems.

IV. IMPORTANCE OF STUDY

The urban public transportation industry, using the traditional fixed-route, fixed-schedule services, has experienced a sharp decline in ridership. It has lost two-thirds of its total ridership over thirty years.[16] During this same thirty-year period, the total number of passenger trips has increased at an equally rapid rate.[17] Economists have indicated that the rise in disposable income and the decrease in the relative cost of private automobiles have caused an increase in auto ownership. Consequently, private automobiles have become a substitute for mass transportation services.[18] Geographers adhere to the hypothesis that the dispersion of families to the suburbs and away from the traditional transit routes have caused the problem.[19] Others feel that better highways and/or changes in the general attitude of the public have caused

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[16] American Public Transit Association, "Transit Fact Book," Washington, DC, 1975.

[17] Luna, Charles, "Handbook of Transportation in America," Popular Library Addition, New York, New York, 1971, pp. 18-20.

[18] Ibid., p. 22.

[19] Ibid,. p. 24.

the shift from mass transit to private transportation.[20] Indeed, there are also many other possible explanations for this situation.

Many of the explanations for public transit decline already have been the object of research efforts. These research efforts attempted to find methods that would alleviate the cause(s) of declining ridership.[21] George Hilton, reflecting on this, voices the opinion that although numerous research efforts have been made, too little action has been taken in actual transit operations.[22] While there are many possible reasons for lack of implementation of research findings, this study focuses on only two of them, legal implementation and knowledge of transit authorities, as possible reasons for the absence of implementation of selected para-transit techniques.

V. METHODOLOGY

Initially, this investigation developed the selected para-transit mode used in the study. (Research in the transportation field is cited in defense of the selected para-transit forms.) Next, the cities used in the analysis were selected. Only cities in states that enable the metropolitan areas to govern themselves with respect to public transportation were used. These states were chosen with the aid of an Urban Mass Transportation Administration sponsored project.[23] That study,

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[20]Hirsch, W.Z., "Urban Economic Analysis," McGraw-Hill Company New York, New York, 1973.

[21]Hilton, George W., "Federal Transit Subsidies," American Enterprise Institute for Public Policy Research, Washington, DC, June 1974.

[22]Ibid.

[23]Haines, R.L., Weibel, S.W., "State Enabling Acts," Purdue University, West Lafayette, Indiana, May 1974.

conducted at Purdue University, analyzed each state's ordinances regarding transportation and found that thirty states grant rights to independent transit authorities. From these thirty states, this study selected sixty cities--two from each state. These cities were chosen from as many different parts of the country as possible. Also, cities of different sizes were chosen. These two criteria, geographic location and size, were used to provide a true cross-section of urban areas, to illustrate varying transit demands.

Once the sample was selected, the ordinances that contain the transit regulations for each urban area were obtained. The regulations were analyzed to determine if the selected para-transit modes were permitted in the area. For example, one type of Call Service is jitney operation. A St. Louis, Missouri, ordinance, Section 307.080 of the revised code, specifically outlaws "the movement of taxi type vehicles (privately owned) over a fixed route with slight variation from that route." This ordinance effectively outlaws jitney service. This type of regulation, and more subtle methods of outlawing para-transit forms, were identified.

After the ordinances were analyzed, a questionnaire was administered to the members of each city's transit authority. This questionnaire attempted to discover if the authority members were aware of the para-transit forms that had been earmarked as possible solutions for selected problems in urban passenger transportation. The questionnaire contained questions that examined the knowledge of the individuals concerning the existence and possible use of para-transit modes in their urban public transportation systems.

The results of each phase of research are viewed in retrospect, and recommendations and conclusions are discussed.

CHAPTER II

PARA-TRANSIT

I. THE PROBLEM OF DEFINITION OF PARA-TRANSIT

The term "para-transit" is relatively new to the urban transportation scene. As recently as twelve years ago, the Urban Mass Transportation Act of 1964 did not recognize the term or the existence of the innovative transit practices now termed para-transit. This act described mass transit as "transportation by bus, or rail . . . serving the general public . . . and moving over prescribed routes."[1] Not until 1968 did government officials become interested in what was thought to be innovative techniques for urban mass transit. This interest was prompted by the appearance of the dial-a-ride concept and the need to find special services, particularly for the residents of low income, intercity communities.[2] This interest proved to be the catalyst for Congress to amend the definition of transit in 1968 to cover "general or special" and to substitute "on a regular and continuing basis" for "and moving over prescribed routes."[3] Finally, in 1972 the Urban Mass Transportation Administration applied the term "para-transit" to a group of urban passenger transportation modes that are more public

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[1]"Urban Mass Transportation Act of 1964," Public Law 88-365, 78 Stat. 302, 49, U.S. Department of Transportation.

[2]Altshuler, Alan, "The Federal Government and Para-Transit," Transportation Research Board Presentation, Williamsburg, Virginia, November 1975.

[3]"Amended Urban Mass Transportation Act (1968)," U.S. Department of Transportation, Washington, DC, 1974.

than the private auto, but more private than conventional scheduled transit services, e.g., fixed route, fixed schedule bus service. Modes of transit such as taxi; dial-a-ride; jitney services; daily and short-term vehicle rentals; subscription bus; and carpool or vanpool or bus-pools are considered para-transit modes (see Appendix A for definition of terms).

Since the term "para-transit" was coined, many authorities have attempted to be more precise in its definition. One such definition comes from Alan Altshuler at the Massachusetts Institute of Technology. It is:

> Para-transit may be defined as organized ride-sharing activities in a range between (but not including) pick-up carpools organized solely at the initiative of the individual members and fixed route bus service. Its unifying characteristics, then, are (a) some degree of formal organization and (b) flexible routing to serve specific rider origins and destinations rather than simply high-demand corridors.[4]

Another definition is by John Crain of Bigelow-Crain Associates:

> Para-transit services are those forms of intra-urban passenger transportation which are available to the public, are distinct from conventional transit (scheduled bus and rail) and can operate over the highway and street system.[5]

Finally, the Transportation Research Board's glossary of terms groups many of these definitions and defines "para-transit" as:

> Those forms of demand-responsive transportation services which are more flexible and personalized than conventional

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[4]Altshuler, Alan, "The Federal Government and Para-Transit," Transportation Research Board Presentation, Williamsburg, Virginia, November 1975.

[5]Crain, John, "The Role of Para-Transit in Serving the Needs of Special Groups," Resource Paper, Transportation Research Board, Williamsburg, Virginia, November 1975.

> fixed-route bus service, available to the public on a regular and continuing basis, and operate over the street and highway system on a shared-ride basis.[6]

As various definitions are viewed, it becomes evident that while the definitions are somewhat similar, no two are exactly alike. What also is readily discernible is that para-transit modes are differentiated from conventional transit generally by the nature of the service that is offered and/or by the organization of the transit service. For example, a bus that is usually used for fixed-route, fixed-schedule line haul services can be used for para-transit services simply by altering the operating arrangement. This bus could be driven by a designated person whose only remuneration is a free ride while commuting. The driver would pick up fellow workers with similar origins and deliver them to the common destination. Indeed, the organization of such a service may be as limited as a carpool matching service to assist potential riders in identifying one another. This informal organization structure would allow the routing to maintain maximum flexibility by scheduling stops at any point where a small number of riders will aggregate. On the other hand, this service could be structured through a formal organization such as transit systems that use a minimum path algorithm to route the vehicles. At the other end of the public-private spectrum, the automobile could function as a para-transit vehicle, taking the form of a rental car, jitney vehicle or dial-a-ride vehicle.

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[6]Glossary of Terms, Transportation Research Board, September 1975.

II. CHARACTERISTICS OF PARA-TRANSIT MODES

As previously mentioned, the critical features of para-transit services are (1) performance, i.e., what the vehicles do; and (2) circumstances, i.e., under what demand situation they operate--not the type of vehicle used.[7] Consequently, the characterization of para-transit is difficult because of the heterogeneous services that are offered. However, while definite characteristics that fit all para-transit modes may be difficult to specify, normally the following generalizations hold true:

1. Small groups with similar or identical origins and/or destinations are provided with a personalized service.
2. The vehicle operator is not constrained to a stringent route or schedule assignment that was created to please, as best possible, the desires of a large group of people.
3. The vehicles usually are small (fewer than 15 passengers), since small groups or segments of mass markets are served.
4. The organization which delivers para-transit is generally small and relatively informal with the decision makers close to the market place. This allows for immediate action on necessary decisions and adds to the service orientation of para-transit.

While these characteristics are true in general, there is considerable variation in the degree of applicability of each characteristic

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[7] Kirby, Ronald, et al., "Para-transit: Neglected Options for Urban Mobility," Department of Transportation, Washington, DC, June 1974.

to each of the different para-transit modes. Table II-I expands work done by Kirby, by adding relevant service characteristics to illustrate the applicability of ten specific service traits found in various para-transit modes.[8] These specific characteristics are:

1. Manner in which travel time is spent. This characteristic is especially important to people who do not mind traveling longer or paying extra money if they can do other things (such as reading) while traveling.
2. Geographic location of access and regress. Some modes offer door-to-door service while others offer only terminal type of service.
3. Degree of privacy. Some para-transit services offer complete privacy, or at least a choice of fellow passengers, while other modes require sharing the vehicle with many others.
4. Method of requesting service. Service may be requested by prearrangement, telephone request, obtaining vehicle at nearest terminal, or hailing a vehicle that is cruising.
5. Directness of route. Service may be provided on a direct route from origin to destination, a semi-direct route that makes only slight deviations for pickup and delivery, or an indirect route that allows considerable deviation at either end of the route.
6. Flexibility of route. The routes used may be completely flexible, as those of a taxi; relatively flexible, as those of a jitney; or fixed, as the route of a subscription bus.

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[8] Ibid. p. 39.

TABLE II-1

PARA-TRANSIT MODES

	Subscription Bus or Buspool	Vanpool or Carpool	Taxi	Jitney	Dial or Hail-a-Ride	Long-Term Rental	Short-Term Rental
How time is spent							
Driver (D)							
Passenger (P)	D/P	D/P	P	P	P	D	D
Enter and leaving vehicle							
Door to Door (D)							
Route Type (T)	T	D/T	D	D/T	D	D/T	D/T
Type Ride							
Personal (P)							
Shared (S)	S	S	P/S	S	S	P/S	P/S
Accessibility							
Pre-arrange (A)							
Phone (P)							
Hail (H)							
Used Descretion (U)	A	A	H/P	H	P	U	U
Route							
Direct (D)							
Semi-direct (S)	S	S	D/S	S	S	D	D
Route							
Flexible (F)							
Semi-flexible (S)							
Inflexible (I)	I/S	F/S	F	S	F	F	F
Schedule							
Flexible (F)							
Semi-flexible (S)							
Inflexible (I)	I	I	F	S	F	F	F
Organization							
Formal (F)							
Informal (I)	F	I/F	F	I/F	F	F	F
Remuneration of driver							
Free Ride (F)							
Salary (S)						not	not
Alternate Drivers (A)	S	F/A	S	S	S	applicable	applicable
Subsidies							
Direct (D)							
Indirect (I)							
Little or None (L)	I/D/L	D/I	U/L	U/L	U/D	U/L	U/L
User Subsidies							

7. Flexibility of Schedule. Para-transit services are characterized by flexible schedules which are demand-actuated by traveler request. The degree of flexibility ranges from compelte flexibility of taxi service to strict schedules of carpools.

8. Organization of para-transit modes. The organization of para-transit services can be very formal, such as those being administered by transit services. The organization can be small, informal department of a larger company, such as the 3-M vanpool operation.[9] The organization can be as informal as a group of neighbors banding together for a carpool.

9. Method of remuneration to driver. The payment of the driver of para-transit services varies greatly. Services such as a subscription bus may have a salaried unionized transit driver. Others, such as carpool drivers, receive only a free ride or alternate driving responsibilities while sharing operating expenses.

10. Subsidies to service. Most para-transit operators seldom receive direct subsidies. The consequences of the lack of direct subsidies are potentially far reaching. Particularly significant to para-transit services is the necessity of responding rapidly to shifting market conditions and the fact that the customers' fare (customer may include driver) must cover full cost. If subsidized, this fare may be

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[9] Fortune, W., "Vanpooling: An Energy Conservation Project," Continental Oil Company, Houston, Texas, 1975.

difficult to achieve since some noncompensatory services may be forced upon the para-transit provider.

III. BASIC PARA-TRANSIT GROUPS

Table II-I shows many similarities and differences in characteristics of the identified para-transit modes. By analyzing this table, the modes can be grouped into relatively few categories. These categories are described below.

1. Prearranged ride-sharing services. First, subscription bus service, and bus, van, and carpool service, seem to have similar characteristics. The only categories in which these modes do not share characteristics are remuneration and subsidies. The subsidy difference is potentially far reaching. A few subscription bus services receive subsidies, and selected pooling activities (i.e., Knoxville, Tennessee; Portland, Oregon; Seattle, Washington; and others) receive indirect subsidies. These indirect subsidies are used for the payment of management and coordination of pooling practices. Direct subsidies for bus type operations cover actual vehicle and/or operating costs. The major difference is that when a vehicle is publicly owned, political pressures may be exerted for the use of vehicles on noneconomical (below break-even) routes. Privately owned or leased vehicles with management services publicly supported may not receive the same amount of pressure.

   When discussing remuneration of the driver, it is convenient to distinguish between "pooling" and "subscription"

service. In a "pooling" situation, the riders usually share operating expenses and take turns driving. This relatively common situation has been accepted by insurance companies,[10] has been legalized by state laws in California, Virginia, and Connecticut, or has been exempted from regulation by policy exemptions as in Tennessee and other states. A hybrid of this operation is group purchase or lease of a vehicle (usually van); each rider pays his fair share of the total cost and the only driver remuneration is a free ride each day and use of the vehicle when the group is not using it. This pooling situation has not met with wide acceptance from insurance companies. In addition, the legality of this type of operation is questioned in some areas.

The final sub-category is subscription service. This service normally has a salaried driver; moreover, the vehicle condition, financial responsibility and sometimes the routes and fares must have approval of public utilities commissions. Also, all fares must meet appropriate tax laws. Since these modes are so closely aligned, they will be viewed together as "prearranged ridesharing services" for which users make arrangements to travel on a regular basis.

2. Phone or hail service arrangements. The second major group of para-transit modes is those whose services are obtained by hailing on the street, meeting at designated stands, or

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[10]Roger Gum, from interview conducted with author. Mr. Gum is an independent insurance broker handling insurance for the Knoxville Brokerage Project.

requesting by telephone. This group contains the following modes: taxi, jitney, dial or hail-a-ride. It is evident from Table II-I that few differences exist in the characteristics of these modes; however, difference in the policy of granting subsidies is again found. In general, only dial-a-ride type services have received funding (i.e., Haddonfield, New Jersey) while taxi and jitney services have not.[11] The question of funding is becoming a complex issue because taxi operators view themselves as coming under the Urban Mass Transportation Act of 1964 definition of mass transit "service on a regular and continuing basis." With increased use of this shared-ride philosophy, taxi operations meet the definition of a mass transit provider. On the other hand, if shared-ride service is a decision left to the patron after entering the taxi, some experts feel that taxis should not fall under this definition.

The outcome of the argument concerning the applicability of the term "mass transit" to taxi operations may change this specific characteristic of such services. An answer to this question also would change the applicability of the concept of personal or exclusive ride. For example, if taxi service becomes a totally shared-ride mode, as some think it may,[12]

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[11] Haddonfield, Dial-a-Ride, Final Report, Washington, DC, U.S. Department of Transportation, Urban Mass Transportation Administration, 1974.

[12] Beimborn, E.A., "Characteristics of Taxicab Usage," Highway Research Record 283, Highway Research Board, Washington, DC, 1969.

this characteristic will be uniform in these modes. The only other difference is found in routing. Taxi service offers direct routes, while the other two modes have a semi-direct route, caused by deviations to meet fellow passenger demand. If a taxi is engaged in a shared-ride practice, its route will also become semi-direct.

3. Rental service arrangements. The final group of para-transit modes is long- and short-term rentals. This formally organized mode is the most cohesive group to date. Although long- and short-term rentals show no difference in any category, the daily, or long-term, rentals have been most successful. Hertz, Avis, National and other agencies, for instance, have offered car rentals primarily on a daily basis to a growing market. Yet, the second type, short-term, or hourly, rental may eventually be even more successful since this form of rental car service requires high vehicle utilization with a minimum of reshuffling of vehicles between terminals.[13]

IV. FACTORS THAT ARE CONDUCIVE TO PARA-TRANSIT

Generally, para-transit seems to perform well in an environment where one or more of the following exist:

1. Some catalytic agent such as congestion or fuel shortage has prompted users to try para-transit modes.
2. Travel routes and/or schedule demands are widely varied.

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[13]University of Pennsylvania, "Minicar Transit System: A Final Feasibility Study," Philadelphia, Pennsylvania: University of California Press, Irvine, California, 1975.

3. The number of travelers with similar demand patterns is small, or a larger group is segmentable and can be served by custom designing a service to meet their specific demand.
4. Cost savings over the private auto or an increase in convenience is attainable.
5. Movement is within a densely populated area (such as a central business district) where transit is in demand.
6. Movement is from a sparsely populated area to a densely populated area with few parking facilities.
7. Travel is from a sparsely populated area to an aggregation point along a fixed line-haul route.

Four markets conducive to para-transit services can be identified. They would allow impact on passenger transportation. These potential markets are:[14]

1. High density home-to-work travel;
2. Low density travel demands;
3. Trips in order to gain access to line-haul transit; and
4. Travel within commercial districts.

1. High density home-to-work travel. Travel demands such as commuter needs in densely populated suburban areas or apartment complexes fit this category. This demand fits the characteristics of the prearranged para-transit services and seems to hold application in the near future with the immediate use of high occupancy para-transit modes. Para-transit service allows a personal control by users and allows for

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[14] Kirby, op. cit., p. 40.

tailoring services to specific needs. Individual control is important because most people who live in such areas (suburbs) have medium or high incomes and demand a personal, tailored service if they are to be lured away from private automobiles. Carpools, vanpools, and subscription bus services are particularly well suited for relatively long home-to-work trips where origins and destinations are in a small area, where schedules are compatible, and where some disincentives exist, such as lack of parking facilities.

This service has another attractive feature: implementation would not require the expense of purchasing new vehicles (with the possible exception of subscription bus service). Private owners could use their own vehicles. Indeed, the latest United States Department of Transportation figures show that 72 percent of all home-to-work trips are made in vehicles having only one occupant and the average number of riders on this type trip is only 1.4 persons a work trip.[15] These figures imply that a large potential supply of transit vehicles for prearranged "pooling" services exist.

Another type of para-transit, the jitney service, is attractive for relatively short home-to-work trips where demand is located on a semi-fixed route, and schedules of medium-sized groups are not compatible. The prospect of increasing a relatively inexpensive supply of transportation

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[15] U.S. Department of Transportation, "1975 National Transportation Report," U.S. Department of Transportation, Office of the Secretary; Government Printing Office, Washington, DC.

service at peak demand by having jitneys cruise major corridors pleases transportation economists but irritates many regulators and union members. However, the question of whether the jitneys would attract riders from transit or private automobiles is the true crux of the problem. Until an in-depth analysis of a new jitney service is performed, any answer to this problem will be hypothetical.

2. Low density travel demand. Low density travel demands exist in many low density suburban and small town areas. These demands are experienced in off-peak periods at places where traffic density is high at other times. At present, the ideal mode to meet this demand is the private auto. But transit authorities must consider groups who do not have access to an auto or potentially do not have access to an auto if the private auto becomes prohibitively expensive to operate. However, a variety of different para-transit services for low density travel demand may satisfy this demand. Some of these modes are: taxicab, part-time drivers in public or privately owned vehicles, specially equipped vehicles (van or bus) or dial-a-ride service. Utilization of these para-transit modes could provide service to many who are not presently served, as well as relieving existing traditional transit of unprofitable routes.

   One segment of society that fits into this low density travel demand pattern is the limited mobility group. This group is composed of people who cannot drive, those who do drive but do not have access to an automobile, and handicapped

persons. Because of their special needs, the severely or non-ambulatory handicapped are prohibited from most forms of transportation including standard para-transit vehicles. However, needs may be met by specially equipped taxis or dial-a-ride services or by health care agencies' vehicles. Systems such as the Yellow Cab in Phoenix, Arizona, and Haddonfield, New Jersey, have shown that para-transit services can successfully serve short trips by handicapped persons who need personal aid entering and egressing from vehicles. By having a few specially equipped para-transit vehicles, the cost to a system may be much less than the cost of specially equipping all traditional transit vehicles.

3. Access trips in order to gain line-haul transit. Carpools, subscription bus, taxi, and dial-a-ride services might all serve as feeders to line-haul transit systems. Where a feeder service exists there is a potential for more efficient service to existing and potential users. For example, joint inter-modal fares, well-designed transfer facilities, and information about coordianted routes would add to an integrated system. The use of feeder services is a vital portion of the total integrated program.

This type of coordinated program is practiced and has been very successful in some areas. For example, a well-coordinated para-transit and transit service has improved coverage and service levels of public transportation in Canada.[16] Hopefully,

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[16]"Strengths and Weaknesses of the Current Metropolitan Toronto Transportation System," Metropolitan Toronto Transportation Plan Review, Toronto, Ontario.

such integration will be considered in the United States as many major cities upgrade their transit systems.

The effectiveness of para-transit feeder services depends on proper coordination between transit and para-transit services. This coordination will probably entail a common dispatch area as well as such changes as an integrated fare structure that may pass some of the bus subsidies on to the para-transit providers. The transfer of subsidies, in turn, raises policy questions that have not as yet been answered.

4. Travel within commercial districts. The travel demands of a commercial district may be met by vehicles that operate along semi-fixed routes (jitney) or by services that can be hailed or phoned while cruising. Another possible para-transit service is the rental car. A rental car service would require a large system of vehicles and terminals. This rental car operation has been implemented experimentally in Amsterdam[17] but has not been attempted in this country.

V. SUMMARY

This chapter was designed to achieve three goals. They are:

1. to describe para-transit;
2. to categorize para-transit modes into groups by defining general and specific characteristics of para-transit services; and

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[17] Kirby, op. cit., p. 52.

3. to show environments where para-transit service is potentially helpful for meeting travel demand.

It was found that the transit act of 1964 neither mentioned para-transit nor described its function. Not until 1968 was the wording of the act changed to encompass this type of service; and, not until 1972 was the term para-transit coined. Since then, many attempts at defining "para-transit services" have been made. All attempts had as the underlying theme that para-transit operations are a type of service not an organization or vehicle and that no one definition could possibly fit all para-transit services.

The second section of this chapter introduced four general characteristics found independently or in combination in para-transit services. From these four general characteristics, ten specific service-oriented charactersitics were defined and applied in Table II-I, page 17, to seven para-transit modes. Analysis of Table II-I reinforced preliminary findings by noted authors that para-transit modes can be grouped into major categories:

1. prearranged ride;
2. phone or hail ride; and
3. rental rides.

Similarities and differences were found among modes in each group. Major differences concerning remuneration of drivers and the likelihood of subsidies appeared between modes in the prearranged ride category. However, in all remaining categories, characteristics were at least shared. Differences in the phone or hail ride category were found in the following characteristics: (a) likelihood of subsidies, and (b) routing. It was concluded that some policy changes concerning

shared-ride practices may eliminate these differences. Finally, rental rides were analyzed and no differences in the selected characteristics were found.

The final section looked at markets conducive to para-transit. By aligning the various para-transit service characteristics with the market demands they best satisfy, four demand environments were identified that potentially find para-transit services attractive. These demand environments are:

1. high density home-to-work travel demand;
2. low density travel demand;
3. access trips in order to gain line-haul transit; and
4. travel within commercial districts.

Figure 1 is a conceptualization of the contents of this chapter. At the top of the figure is the broad term "para-transit" and the underlying principal "service orientation." From this broad description, ten specific characteristics are stated and each is evaluated with the seven modes of para-transit listed. Next, this broad field is narrowed to three manageable groups of para-transit services. Finally, from the broad base of existing and potential para-transit users, four demand segments are identified and the para-transit groups that possess the appropriate characteristics are linked to the identified segments.

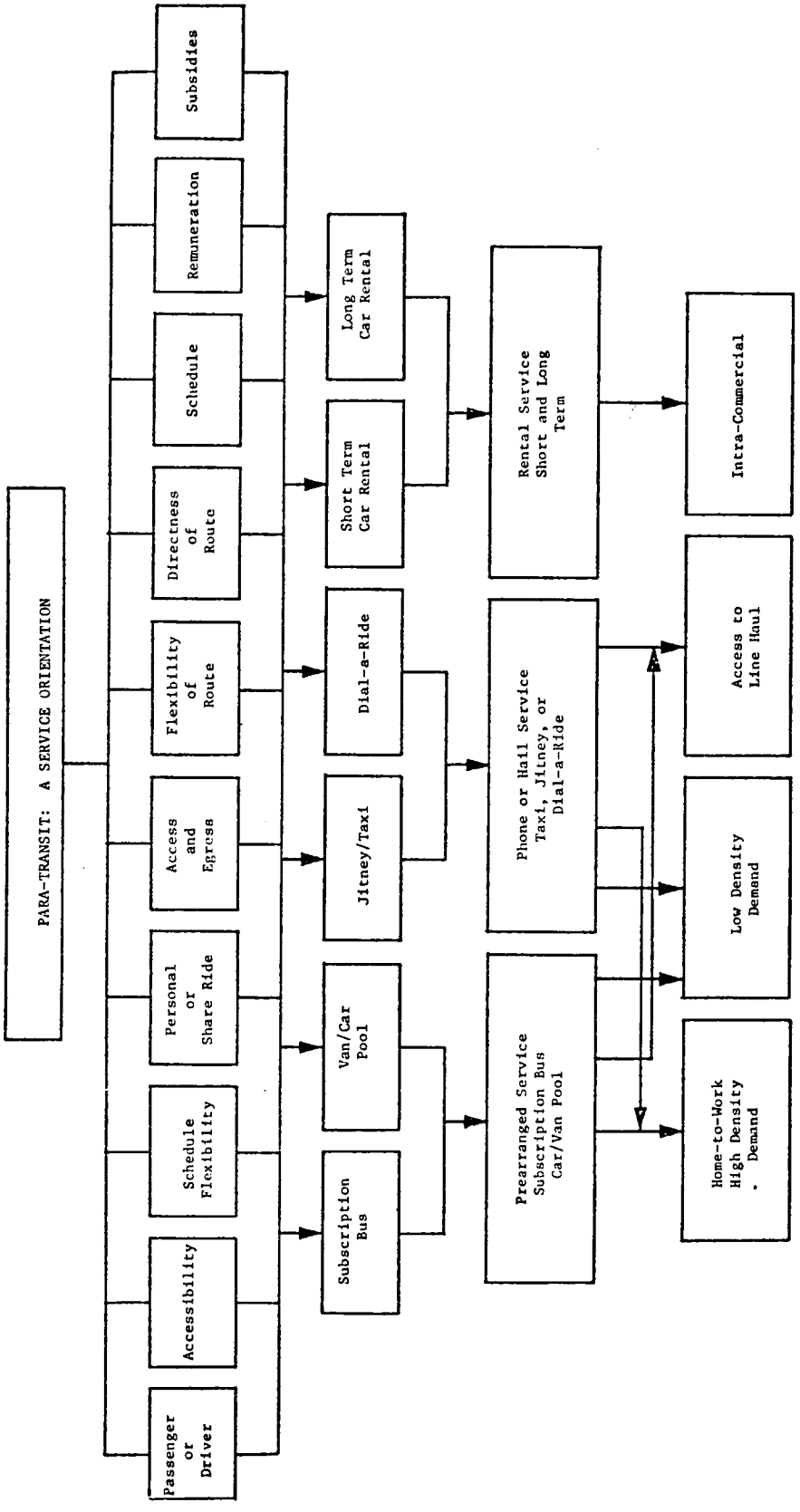


FIGURE 1

CHARACTERISTICS OF PARA-TRANSIT MODES AND EXISTING AND POTENTIAL PARA-TRANSIT USERS

CHAPTER III

SITE SELECTION AND QUESTIONNAIRE DEVELOPMENT

I. INTRODUCTION

This chapter deals with selection of the sample areas of study and with the questionnaire utilized to examine the extent to which transit officials realize the potential of para-transit.

II. SITE SELECTION

The selection process used in this study attempts to maintain a cross-section of the cities in the United States that have been granted the right, by state governments, of governing transit operations. Only municipal areas that have this right were considered. Secondly, consideration was given to cities meeting specific size and geographic criteria. Finally, cities were selected that were not planning major legislative changes in the foreseeable future.

The specific site selection process utilized a review of a recent research effort conducted at Purdue University, which dealt with the state legislation regulating urban transportation.[1] This research analyzed legislation in every state and was able to group the state legislation into three categories. The first, municipal transit systems, permitted transit to be operated by cities or counties as part of the normal range of municipal services. The public transit system was hence a division of a municipal department, a separate department, or a municipal

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[1] Haines, R.L., "State Enabling Legislation for Urban Mass Transit," Purdue University, West Lafayette, Indiana, 1974.

utility, and would be controlled directly by the city or county legislative body. The second broad category of legislation created independent transit authorities. The independent authorities or districts specify in detail the appropriate structure of the governing body and the scope of the mandate to provide transit service. A third category, supplemental assistance acts, was found to be issued always in conjunction with one of the other categories. These assistance acts took the form of specific exemptions from vehicle, road, and fuel taxes for public passenger carriers.

Thirty-two of the fifty states fall into one or more of these categories. The Office of the Governor of each of these states was questioned by letter (Appendix B) or by phone to make certain that the nature of their legislation had not changed. In most cases, the Governors' officers transferred the call or letter to the highway department or whatever department handled state transportation. However, thirteen offices dealt with the reply personally. This personal response seems to indicate that the issue of transportation regulation is a relatively important issue to those offices. Table III-I lists the thirty-two states and the type of state legislation found in each state. Twelve of the thirty-two states do allow either municipal or private operation of public transit.

The next step was selection of study cities from each of the thirty-two qualifying states. No attempt was made to draw a simple random sample. Rather, a representative sample was drawn, using size, location, and stability of present ordinances as stratification variables for the selection criteria.

Due to the nature of this study, a representative cross section of the states that pass legislative authority to the urban areas was of

TABLE III-I

STATES THAT GRANT URBAN PUBLIC TRANSPORTATION TO INDIVIDUAL CITIES AND THE TYPE OF AUTHORITY ALLOWED IN EACH STATE

State	Type of Act	
Alabama	M	T
Arizona	M	T
Arkansas		T
California		T
Colorado		T
Connecticut		T
Florida		T
Georgia	M	T
Hawaii	M	
Illinois		T
Indiana	M	T
Kansas	M	T
Kentucky	M	T
Massachusetts	M	T
Michigan	M	T
Minnesota		T
Mississippi	M	
Missouri	M	T
Nebraska		T
New Hampshire	M	T
New Jersey	M	
New York		T
North Carolina	M	T
Ohio	M	T
Oklahoma	M	
Oregon		T
Pennsylvania		T
Tennessee	M	T
Texas		T
Virginia		T
Washington	M	T
Wisconsin	M	T

M--Municipal Transit
T--Independent Transit

Source: Haines, R.L., "State Enabling Legislation for Urban Mass Transit," Purdue University, West Lafayette, Indiana, 1974.

utmost importance; thus, a stratified random sample negated the risk of choosing a sample of similar populations and/or geographic location. This stratified random sample was necessary because cities of differing size and location were thought to have different transit needs. For example, a larger city usually will have a higher concentration of trips to one area.[2] This concentration of trips creates a different demand situation from that of a small urban area, where trips may not be as concentrated. Also, cities with contiguous boundaries potentially will have different needs from cities with non-contiguous limits.

The initial site selection in each state considered the large urban areas. One of the five most populated urban areas for each was selected. An attempt was made to select an area that was not part of a linear configuration, since a linear configuration could stifle the use of para-transit services because of different regulations in one market area. This absence of a linear configuration was achieved in all cases with the exception of Hartford, Connecticut; Boston, Massachusetts; and possibly Chicago, Illinois. These three areas are very densely populated, and their city limits are contiguous with neighboring cities.

The second site selected for each state represents the small urban areas. This selection was more problematic because the city had to possess diversity of transit demand, yet be small enough to illustrate demand characteristics of small urban areas. To maintain representativeness, additional stratification variables were used.

Naturally, one necessary segment of the transit market supply was traditional transit service. Thus, the initial step in determining

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[2]Netzer, D., "Economics and Urban Problems," Basic Books, Inc., New York, New York, 1974.

the appropriate size of the city was to consult transit fact books to determine the population of small cities that support a traditional transit system. As Table III-2 illustrates, bus systems were found in essentially all size urban areas. However, when the total number of cities in each category was compared, it was evident that the percentage of cities having a population less than 100,000 plus a bus system is much smaller than the percentage of cities with greater than 100,000 population plus a bus system. This fact would indicate that the site selected to represent the smaller urban area should have a population of 100,000 or more, to enhance the probability of having a viable bus system.

It was also necessary that the selected cities have enough demand to support other modes of urban public transit (e.g., taxi, pooling). Sufficient diversity of demand was preferable since the presence of such modes would potentially familiarize transit officials with the practical economic characteristics of these forms of transit. Since little data is presently available on the size of urban areas that have these modes (with the possible exception of taxi service), business[3] and academic[4] personnel who work in the transit field were questioned concerning the size of urban areas that have sufficient diversity of demand to sustain multi-urban transit modes. All that were contacted concurred that an urban area of 100,000 to 200,000 persons should be able to sustain

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[3]Mr. P. Ringo, President of the American Public Transit Association, and Mr. Gallagher, President of International Taxicab Association, were interviewed.

[4]Dr. J. Carroll, Professor at Pennsylvania State University, who is presently conducting research concerning education of transit officials, was interviewed.

TABLE III-2

NUMBER OF BUS SYSTEMS FOUND IN
VARYING SIZED URBAN AREAS

Population of Urban Area	Bus System
500,000 or greater	373
250,000 to 500,000	55
100,000 to 250,000	116
50,000 to 100,000	73
Less than 50,000*	313

*Approximately 80 percent of the urban areas in the U.S. have less than 100,000 population.

"Transit Fact Book 74-75," American Transit Association, Washington, DC, 1975.

different modes of urban transit. They also pointed out that many smaller (less than 100,000) areas may have sufficient demand for one or more modes; however, a majority of these smaller areas would not support multi-mode urban public transit. Thus, in order to maintain a representative sample, cities with 100,000 to 200,000 persons were chosen.

Table III-3 shows the cities (and their population) that were selected for this research. A letter was sent to the mayor of each city. This letter explained the nature of the research and requested that the mayor send a copy of the ordinace that legislates all transit, public and private, in his city. Also, the mayor's office in each of the cities was asked to send the names of transit officials. Appendix C contains a copy of this letter. Approximately three weeks later a follow-up letter (Appendix D) was mailed to all cities that had not responded.

III. QUESTIONNAIRE DEVELOPMENT

In general, the questionnaire was designed to provide information for the evaluation of transit officials, and awareness of service characteristics of para-transit forms that have been earmarked as possible solutions to selected problems in urban passenger transportation. More specifically, this questionnaire had to discretely examine the knowledge of the officials concerning the characteristics of the various groups of para-transit services. Education and/or attitude questions were generally used to gain this type of information.[5] Attitude analysis questions were developed and used since research indicates that they produce a more valid measure of

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[5]Allport, G.W., "Attitudes," Handbook of Social Psychology, Clark University Press, 1967, 3-13.

TABLE III-3

CITIES SELECTED FOR ANALYSIS

State	Cities	Population
Alabama	Birmingham	301,000
	Mobile	190,000
Arizona	Phoenix	600,000
	Tucson	262,000
Arkansas	Little Rock	132,000
California	Sacramento	257,000
	San Francisco	750,000
Colorado	Denver	514,000
	Colorado Springs	140,000
Connecticut	Hartford	160,000
	New Haven	130,000
Florida	Jacksonville	530,000
	St. Petersburg	216,000
Georgia	Atlanta	500,000
	Columbus	160,000
Hawaii	Honolulu	315,000
Illinois	Chicago	3,500,000
	Peoria	130,000
Indiana	Indianapolis	750,000
	Fort Wayne	180,000
Kansas	Wichita	276,000
	Kansas City	166,000
Kentucky	Louisville	361,000
	Lexington	120,000
Massachusetts	Boston	641,000
	Worcester	176,000
Michigan	Detroit	1,513,000
	Grand Rapids	197,000

TABLE III-3 (continued)

State	Cities	Population
Minnesota	Duluth	104,000
	Minneapolis	465,000
Mississippi	Jackson	196,000
Missouri	St. Louis	622,000
	Springfield	120,000
Nebraska	Omaha	350,000
	Lincoln	150,000
New Hampshire	Manchester	109,000
New Jersey	Jersey City	260,000
	Newark	381,000
New York	Buffalo	462,768
	Albany-Syracuse	195,000
North Carolina	Charlotte	241,000
	Greensboro	150,000
Ohio	Columbus	356,000
	Cleveland	751,000
Oklahoma	Oklahoma City	368,000
	Tulsa	330,000
Oregon	Portland	380,000
Pennsylvania	Pittsburgh	600,000
	Erie	130,000
Tennessee	Memphis	623,000
	Knoxville	180,000
Texas	Houston	1,232,000
	Corpus Christi	204,000
Virginia	Norfolk	307,000
	Richmond	250,000
Washington	Seattle	530,000
	Spokane	170,000
Wisconsin	Milwaukee	717,000
	Madison	171,000

Source: Rand McNully Geographical Atlas, Chicago, Illinois, 1975.

the actual feeling of the respondent.[6] One problem found when attitude measures were employed was the measurement of the replies. It was necessary to decide on an appropriate scaling technique that would successfully measure response and allow for tests of the appropriate research hypotheses.[7]

Before selecting a scaling technique, a link between attitudinal research and educational research had to be clarified. Using an abstraction of work done by Kerlinger,[8] this link was made. He explains that two evaluative criteria of educational perception exist: (1) the respondent can be tested against some peer group to see if the group shares similar feelings about relevant situations; and (2) the responding groups' replies can be compared to a "well-informed" group which has expertise in the area. For the purpose of this research, both criteria were tested. First, the replies of the various transit officials were tested against one another. Second, if the group in general showed a propensity toward a certain attitude, this attitude was compared to the feelings of the "expert" group.

Since a mailed questionnaire was utilized, the length and simplicity of the questionnaire was of utmost importance if an adequate response were to be realized.[9] Consequently, it was desirable to use one

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[6]Fishbein, M., ed., "Readings in Attitude Theory and Measurement," Wiley, 1967.

[7]Crespi, I., "Use of a Scaling Technique in Surveys," Journal of Marketing, Vol. 25, 69-72, July 1961.

[8]Kerlinger, F.N., "Foundations of Behavioral Research," Holt, Rinehart, and Winston, 1965.

[9]Mendenhall, Ott, Schaeffer, "Elementary Survey Sampling," Duxburg Press, Belmont, California, 1972.

set of questions to test the two hypotheses (stated formally later) that would give insight into the answer of the two educational evaluation criteria previously mentioned. For this evaluation to be accomplished, a modified version of a semantic differential scale,[10] two forms of the chi-square test and a ranking technique were employed. The modification of the scale allows the use of one set of questions to test both criteria. This technique describes a demand situation where the characteristics of one, or possibly two, forms of transit or para-transit services meet the demand. Then, the respondent replies by using the given semantic differential scale to describe how he or she feels this mode will affect the described situation. The modification was that the demand situation described is one that has been agreed upon by authorities in the transit field as having one or more potential modes whose characteristics meet the demand.

Definition of the demand situations was the first task accomplished. Since research presented in Chapter II suggested areas that are conducive to para-transit, these four areas were used as demand situations:

1. high density home-to-work travel;
2. low density travel demand;
3. trips made for line-haul transit; and
4. travel within commercial districts.

A fifth situation where demands could be met by traditional bus service was also presented. One or more brief descriptions of these situations have been used in the questionnaire. These descriptions follow:

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[10] Downing, J.A., "Attitude Scaling," Publication 4 of the Market Research Society, Oakwood Press, 1960.

Demand Situations

1. Trips to work from a densely populated, medium to high income ($18,000 to $25,000) area where the residents work at different locations that are at least ten miles from the person's home.
2. Local trips (e.g., to grocery store) in a densely populated, medium to high income ($18,000 to $25,000) area.
3. Trips made by residents of a densely populated area (e.g., apartment complex) to an industrial park complex at least ten miles away.
4. Trips from a relatively densely populated area (e.g., housing subdivision) to an area with many work locations (e.g., downtown business district).
5. Trips to work from a sparsely populated, residential area to various work locations that are at least ten miles from the person's home.
6. Trips made from office to office in a congested downtown area during business hours.
7. Trips by handicapped or elderly persons from home to rehabilitation centers, meetings or shopping centers.
8. Trips from business establishments or homes to inter-city transportation facilities (e.g., airports).
9. Trips made from home to a congregation point (e.g., city parking lot) which is located along an existing regular bus route.

It should be noted that these descriptions were developed by questioning approximately fifty people who were not experts in the field

of transit. The initial set of descriptors was pre-tested and, after analyzing the comments by the pre-test group, the initial set of descriptors was revised and the present set developed. While the descriptors may seem over simplified to one who is familiar with urban public transportation, they were not viewed as over simplified by the test group questioned.

Next, the classification of transit modes used as categories of potential responses to the demand situation was selected using the research presented in Chapter II. Each of the groupings of para-transit services was represented together with a category for traditional, fixed-route, fixed-schedule bus service. These categories are:

1. pre-arranged ridesharing services;
2. hail or phone arranged services;
3. rental services; and
4. fixed-route/fixed-schedule service.

An example of each category was used so that the service could be placed in a context to which the respondent could relate. After discussing these categories with many individuals, the following examples were chosen:

1. carpooling services;
2. vanpooling services;
3. traditional taxi service;
4. car rental service (e.g., Avis, Hertz);
5. traditional bus service;
6. jitney service;
7. rail service; and
8. shared-ride taxi service

Next, the semantic differential scale was designed. Development of a scale of this nature poses four inherent problem areas.[11]

1. Whether the scale should be forced or non-forced choice variety;
2. Whether cues should be balanced or unbalanced;
3. Type of cue: numerical, graphic, verbal or some combination; and
4. Selection of antonyms.

Moreover, since the respondent may not be aware of the attitude object or the dimension of the object in the question, additional problems may arise. Studies by Hughes[12] suggest that when this situation occurs, forcing respondents to indicate an attitude compounds unawareness and indifference, which, in turn, distorts measures of central tendency and variance. Thus, the approach used in this research was non-forced choice scales, with the non-forced choice category dropped for the purpose of analysis, since inclusion of this variable would skew the results.

For example, the cues might be: better than--4; equal to--3; worse than--2; can't say--1; where the "can't say" is a non-choice cue.

The second decision concerning the scale was whether or not the scale should be balanced. A balanced scale has an equal number of cues on either side of the indifferent cue. Unbalanced scales are used when a researcher has reason to believe that subjects will respond with extreme values and produce a distribution of responses truncated by the end of

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[11]Shaw, M.E., "Scales for the Measurement of Attitudes," McGraw-Hill, 1976.

[12]Hughes, G.D., "Attitude Measurement for Marketing Strategies," Scott, Foresman and Company, London, 1971.

the scale, rather than the statistically desirable normal distribution around the mean attitude. If the researcher has reason to believe this situation might exist, an unbalanced scale would be used, thereby stretching the distribution of responses along the attitude dimension.[13] For example, cues might be as follows on an unbalanced scale:

1. enthusiastic;
2. extremely favorable;
3. very favorable;
4. favorable;
5. fair; and
6. poor.

Little or no evidence could be found that would indicate that transit officials would exhibit this "end piling" tendency. Thus, a balanced scale was used, with the no-choice cue, previously discussed.

The original semantic differential work exhibited a graphic[14] type of cue (e.g., friendly ___: ___: ___: ___: unfriendly). Since then numerical, verbal and combinations of the three have been developed. By combining the types of cues, it was possible to simplify coding and to aid respondents.

The selection of cues was critical to the success of the survey.[15] It was generally felt that selecting antonyms required, first, a knowledge of the salient attributes in order to select adjectives or statements

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[13] Hughes, G.D., "Attitude Measurement for Marketing Strategies," Scott, Foresman and Company, London, 1971, pp. 90-105.

[14] Osgood, et al., "Measurement of Meaning," University of Illinois Press, 1957.

[15] Hughes, C.D., "Selecting Scales to Measure Attitude Changes," Journal of Marketing Research, Volume 4, February 1967, pp. 75-87.

which were unambiguous and bipolar. If attitudes were not known from previous research, it was necessary to conduct preliminary investigation that would suggest antonyms.[16]

In order to gain insight into which antonyms people would recognize as related to transit services, the same groups that were questioned concerning the descriptors (description of demand situations) were asked to describe how certain modes affected transit demand. The replies to this question were anlayzed and the following cues were determined to be the most prevalent responses: helpful, no effect, retards, not helpful, adds to transit problem, extremely helpful, not related, hurts, might help, and don't know what it would do.

Using these antonyms as a base of knowledge, the following six antonyms were chosen for this research scale: extremely helpful, helpful, no effect, not helpful, adds to problem, and can't say.

Adding the numeric values, the scale became: extremely helpful--6; helpful--5; no effect--4; not helpful--3; adds to problem--2; and can't say--1.

This, as any such instrument, may yield information containing some bias because of instrument error. Since this questionnaire was designed to extract existing information, however, and not to perform in a pre-test, stimuli, post-test fashion, many of the common errors faced by field experimentors (i.e., Maturation, Statistical Regression toward the mean, Instrument Decay)[17] were not relevant. However, as in any such

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[16] DeSola, Pool, "Trends in Content Analysis," University of Illinois Press, 1959.

[17] Barnes, L.B., "Organizational Change and Field Experiment Methods," University of Pittsburgh Press, Pittsburgh, Pennsylvania, 1967.

field experiment, the potential for error, especially respondent error, is prevalent.

The design of this questionnaire attempts to incorporate checks for some of the more common errors. The first such error is referred to as "socially acceptable answers."[18] This term alludes to the representativeness and rate of response. For example, the effect of tax raises on low income categories cannot be measured by surveying upper income categories. Likewise, if the completion of surveys falls below a certain amount (30 to 35 percent), one runs the risk of not being able to generalize, as responses from persons who refuse to participate in surveys often differ from participants. Participants may be more talkative, more cooperative, or better educated.

Since the sample in the survey dealt with all transit officials in the study area and the thrust of this portion of the study regarded only transit officials, the problem of obtaining socially acceptable answers were minimized. The return rate could not be forecast. Thus, the degree of generalization that the survey allowed remained to be seen.

Another problem that potentially effected this survey was the problem of realizing a "halo effect."[19] This is the tendency of a response group to respond to various questions in the same way. This tendency can be caused by peer pressure, previous publicity on given subjects, or previous education. While this effect is difficult--if not impossible--to stop, the design of this questionnaire lent itself to the

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[18]Warruck, D.P., "Comparative Research Methods," Prentice-Hall, Englewoods Cliffs, New Jersey, 1973, pp. 39-75.

[19]Thorndike, E.L., "A Constant Error in Psychological Rating," Journal of Applied Psychology, Volume 4,]965, pp. 25-29.

testing of this effect. Since each demand situation described in the survey lent itself to a different mode, or at least, a different set of modes, any individual that marked one mode as being the most beneficial in all cases would be highly suspected of exhibiting the "halo effect." In order to evaluate the data for this effect, any response that exhibited similar answers to all demand situations was extracted from the data base. If this problem had seemed prevalent, the analysis would have continued with two sets of data: one set with all respondents and a second set with those respondents exhibiting the potential for "halo effect" removed. If the results of the two analyses differed significantly, the appropriate explanations would have been made.

Combining the descriptors, cues, and the ranking response, the final questionnaire is displayed in Appendix E.

Using this questionnaire and appropriate statistics, the education evaluation criteria were tested. The first criterion, that of comparing a shared attitude to that of an expert group, was examined first by testing if any one cue of a certain mode received a significantly different number of responses than would have been expected by chance. To examine this, the following hypothesis was tested for each mode for each descriptor.

$$H_o : P_o = P_i \qquad H_o : P_i = 1/5$$

or

$$H_a : P_o \neq H_a : P_i \neq 1/5 \quad \text{(when } i=1,5\text{)}$$

Verbally stated, this test examined if any one cue received a significantly different number of replies than would be expected by chance.[20] If one or more cues proved significant, the opinion inferred was compared to the "expert's" opinion. If the opinions agreed, it was concluded that the transit officials had a working knowledge that would enable intelligent evaluation of the different modes of transit. If, on the other hand, the opinions of the transit officials differed from the "experts" this difference would have indicated that the officials were ill-prepared to make decisions facilitating efficient use of the characteristics possessed by the various modes.

The second evaluative criteria stated that respondents should be tested to examine attitudes shared by the peer group. An examination of each demand situation was made independently to see if one or more cues contained a significantly different number of replies. This was tested by using a contingency chi-square test and testing the hypotheses:[21]

$$H_o : P_{ij} = (p_i)\ (p_j) \qquad i=1,5 \qquad j=1,5$$

$$H_a : P_{ij} \neq (p_i)\ (p_j) \qquad i=1,5 \qquad j=1,5$$

This hypothesis examined whether any one cell contained a greater number of replies than the row and column joint probability would have led one to expect. Thus, any high rate of replies would have indicated a propensity toward a shared attitude by participating transit officials. If one cell had a higher probability than the joint probability would suggest, it was also concluded that the opinion was shared by the transit

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[20] Siegel, S., "Nonparametric Statistics for the Behavioral Sciences," McGraw-Hill, New York, 1956.

[21] Conover, R., "Nonparametric Statistics," McGraw-Hill, New York, 1967.

official group. This common reply indicated that, either through an informal education process or through mutual transit experience, they had gained a shared opinion. However, the real value of the chi-square test was to check whether a predominant opinion existed among transit officials and then check whether this shared opinion was similar to the "expert" opinion. If the chi-square test was not significant, an interesting question was raised; that is, whether the officials knew from experience that a mode would not meet the demand situation, or whether they were answering from ignorance. The outcome of the independence test performed by the first research hypothesis aided in answering this question; however, no conclusive answer could be drawn.

In addition, the results of this test enabled the researcher to discern any agreement or disagreement of the transit officials with "experts" even if it seemed that a "halo effect" existed.

For example, if the research instrument showed a disproportionate number of officials indicating that all modes were extremely helpful to a given situation, then, the response would indicate a "halo effect," and the inference drawn from a one-way chi-square test would be questionable. However, since the contingency test compared the joint probability of row and column results and, in essence, considered the increased probability created by the large number of replies in one column or row, the evaluation examination of any one cell--given this increased probability--had significantly more replies than the others. In fact, if one cell did show a significant difference, it might be inferred that the difference did exemplify the attitude of the officials (even though a halo effect did exist) and the appropriate conclusions could be drawn.

The final question asked respondents to rank the modes in order of usefulness in various situations. This ranking was to enable the researcher to evaluate the mode on a relative basis. The information furnished a consistency check for the Lickert scale and enabled an examination of the evaluative service criteria by comparing the attitude of the transit official with "experts" in the para-transit field.

IV. SUMMARY

This chapter dealt with the development of a questionnaire and the selection of the study cities. The foremost thought in site selection was to maintain a representative sample. In order to achieve this, two cities (where possible) from each state that gave the right of urban public transit regulation to the cities were selected. These cities were chosen on two basic criteria. First, population was considered. The acceptance criterion was to select one of the five largest cities in the state. The second city was to be between 100,000 to 200,000 persons, or as close to this size as possible. Along with size, geographic location was considered in sample selection. A letter was then sent to the mayor of each city requesting the city ordinance that legislates public and private transit in the urban area and the names of the area transit officials.

The development of the questionnaire was also discussed in this chapter. An abstraction of a technique discussed by Kerlinger was used to draw a link between educational type research questions and attitudinal research. This technique was accomplished by a modified semantic differential technique that used one set of scales with appropriate descriptors

and cues to test two hypotheses that give insight into the educational evaluative criteria.

CHAPTER IV

ANALYSIS OF SELECTED CITY ORDINANCES

I. INTRODUCTION

The officials of thirty-one urban areas chose to participate in this study. All of these urban areas sent the names of their transit officials, as well as that portion of the urban ordinance that presents the transit regulation for the area.

Analysis of transit regulations from the participating urban areas is contained in this chapter. Each of the three categories of ordinances discussed in Chapter III (municipal, independent, combination) is presented independently. The analysis emphasizes any unique regulation found. The final portion of this chapter presents a micro view of regulation in the participating urban areas. This final section discusses the range of the transit regulatory power granted to the respective regulating authorities.

II. MUNICIPAL OPERATIONS

Municipal transit operations were service integrated with the normal range of municipal services in the areas surveyed. The public transit system (usually traditional fixed-route, fixed-schedule) was shown to be either a division of a municipal department, a separate department, or a municipal utility, which was controlled either directly by the city or county legislative body or by an appointed and directly accountable transit authority or commission. Relatively little special state authorization was required for municipal ownership in most states;

indeed, state authorization rarely dealt at length with the structure and powers of the transit governing unit. The structure of the authority therefore was determined by the individual urban area.[1]

Eight urban areas exhibiting municipal control chose to participate in the study. Of the eight city ordinances involved, five had a majority of their urban public transportation regulation rewritten in the seven years previous. The remaining three urban transit regulatory ordinances used existing legislation effectively by amendments to its legislation. Table IV-1 shows the cities analyzed in this section and the dates that their ordinances were drafted.

The range of the powers granted by the various ordinances varies greatly. These powers ranged from a very loose regulatory document, in Honolulu, Hawaii, which basically allowed for free entry and exit by private operators, to a very structured document found in Newark, New Jersey. The Newark ordinance, not relying on competition to stabilize the marketplace, regulated entry and exit stringently. While these two examples present a dichotomy, an overview of the entire spectrum of powers granted in the eight ordinances displays certain common characteristics, which will now be discussed.

1. Transit officials. Two basic types of transit-regulating bodies were created in the various ordinances. One was an appointed board such as that in Memphis, Tennessee; this usually is appointed by a mayor and approved by the city council. The largest group contained those cities whose transit officials

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[1]Haines, R.L. and Weibel, J.W., "State Enabling Legislation for Urban Mass Transit," Purdue University, West Lafayette, Indiana.

TABLE IV-1

CITIES WITH MUNICIPAL ORDINANCE REPORTED IN STUDY AND DATE OF DRAFTING OF ORDINANCE

City	Date
Memphis, Tennessee	1975
Tucson, Arizona	1974
Newark, New Jersey	New Ordinance being drafted
Greensboro, North Carolina	Old Ordinance with significant Amendments
Charlotte, North Carolina	Old Ordinance with significant Amendments
Jackson, Mississippi	1973
Honolulu, Hawaii	1969
Knoxville, Tennessee	1975 (Taxi Ordinance only)

were the city council itself. In most cases, this elected group reported directly to the mayor, who may or may not have been a member. A third group, a hybrid group, was an advisory board like that found in Newark, New Jersey. This group had power to suggest changes, but no power to implement them. Usually, regardless of whether a transit authority or an advisory group existed, the city council had overriding power concerning decisions by the official board even if the issue had already received approval by the mayor. The definition of this power is vague in most of the ordinances. However, the Knoxville, Tennessee, ordinance distinctly defined the council's authority since the city council had created the official board.

2. Bus. Most regulations in each study site dealt with fixed-route, fixed-schedule bus regulation. In fact, many officials felt that fixed-route, fixed-schedule bus was the only form of public transit. Indeed, three of the cities (Jackson, Mississippi; Memphis, Tennessee; and Charlotte, North Carolina) sent only the bus-related regulations when they were asked for documents concerning regulation of all public transportation.
3. Bus management. One section found in all ordinances (except that from Newark, New Jersey) was an agreement which places the operation of the public bus fleet under an independent management organization. Although various types of agreement were found, certain elements were common to each of the urban areas. For instance, each city remunerated the company by paying a certain percentage--which ranges from 4.5 percent to 8 percent--of the operating revenue. That the percentage

remains flexible was evidenced by the fact that many municipalities have altered this figure frequently since the adoption of their ordinances. Newark, New Jersey, the only urban area not placing the operation under independent management, had the capability of reviewing requests from individuals or corporations offering transportation service and granting them authority to operate under the direction of city council. The Honolulu ordinance allowed for both the use of the publicly owned transit operation under independent management and the right to negotiate contract service with private individuals through the City Department of Transportation.

4. Bus routes and schedules. Another section common to each ordinance was the setting of the routes and schedules for bus systems. All of the cities had traditional, fixed-route, fixed-schedule bus routes that have remained relatively inflexible. Many of the ordinances set up the exact routes, while others leave the designation of the routes to the transit board or city council in conjunction with the transit manager (if a transit manager existed). The flexibility of routes depended on the process used to alter routes. In all cases, the transit board, which sometimes is the city council, had to approve the route or schedule change. Many ordinances also required the compliance of the transit manager. In one city (Greensboro, North Carolina) a public hearing had to be held to change routes; but the Greensboro ordinance is unique, since just the council's agreement usually is required. Another interesting method for altering routes or schedules was found in Newark, New Jersey.

Here a transit supplier had to notify the police in writing and have alteration approved by the Police Department. Generally it was found that routes were set with designated stops and remained relatively inflexible. One practice that allows for more flexibility in routing was the use of express bus service.

5. Express bus. Five of the cities reporting in this section used express bus service of some form. In no case did an ordinance specifically mention express bus service. Technically, express bus route changes had to be cleared through the same procedures as any route change; however, express bus service was initiated and abandoned with relative ease as compared with traditional service.[2]

   A method used to alleviate many regulatory problems with express bus service was an amendment allowing for charter service. This amendment was found in two of the ordinances. The amendment essentially allowed express bus service to be used under a loose definition of express bus services.

6. Bus fares. Most of the ordinances discussed in this section were heavily concerned with the fare structure of the bus system. Many different methods were used, but the basic structure for fixed-route, fixed-schedule services were similar. The general procedure was to set a common fare within the urban area and charge a set amount for transfers. No ordinance designated the way in which rates were to be calculated, and

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[2]Discussion with transit managers in the selected cities.

none mentioned the procedure for setting express bus service fares.

7. Bus inspections, insurance and operations. Without exception, each ordinance contained a very detailed outline of the specific insurance and inspection requirements. Likewise, the method of operation required of all operators was spelled out in detail. The presence of detailed directions was especially true of the older ordinances. In no case did the requirements prohibit a potential supplier of service. For example, most insurance requirements were set at the level of state rates. These rates were obtainable since the state board of insurance normally sanctions state rates, thus, insurance companies must offer coverage at that specific rate.

8. Taxi. In addition to auto-bus operations, each ordinance also dealt with the operations of traditional taxi service in the urban areas. The scope of the ordinances ranged from a small degree of regulation exhibited by open entry/exit control to strong regulation shown by setting the actual number of taxis allowed in operation at one time.

9. Taxi fare. The exact fare structure in different cities varied greatly. Six of the eight city ordinances examined in this section required a meter fare system to be used. A few ordinances permitted special fares for unusual events (i.e., athletic contests), while others permitted zone structures if the taxi owner cared to use them. The city of Knoxville, Tennessee, allowed the drivers/owners of the taxis to set their own system of fare calculation, so long as it was

approved by the city taxi coordinator. In this city, as in most where transit authority was found, the taxis were not under control of the local transit authority. Another interesting method required a zone system, but did not set exact rates. This system, found in Honolulu, Hawaii, attempted to allow for relative ease of entry into the market to hold prices at a reasonable rate.

10. Taxi entry and exit. While this aspect of regulation was discussed in each ordinance, no consensus could be determined. A number of the cities, especially those where officials had not rewritten their ordinances recently, used a fixed number of cabs in operation at any one time to dictate entry and exit control. Others controlled entry and exit by holding transit official hearings and requiring proof of need by the party requesting the change. And one, Honolulu, had free entry and exit with the only restriction being insurance requirement and safety regulations.

11. Taxi insurance and safety. All of the ordinances were very specific on the insurance and safety requirements for the taxi operations. None had exactly the same requirements dealing with liability levels for insurance and driving standards for the driver. Generally, it was found that this section of the ordinance was very exacting and in-depth. In fact, in a few ordinances, this section actually made up three-fourths of the entire document.

12. Taxi method of operation. All of the ordinances allowed traditional taxi service to use phone service as one method

of rider contact. However, here the similarity ended. For example, Charlotte, North Carolina, while allowing limited staging for events that would overflow traditional bus service, allowed no cruising, but permitted taxis to wait at stands whose locations were designated by the city. Newark, New Jersey, on the other hand, did not allow stands, outlawed staging and permitted limited cruising. In general, the traditional taxi service (i.e., hail and ride, phone and ride) was legal in seven of the municipally governed areas. But methods such as staging, cruising, and stands differed from area to area. Another important method of operation significant to para-transit was the legality of shared rides. Four of the eight cities' ordinances forbid shared riding outright. Newark, New Jersey, did not have a specific section of the ordinance for regulation of shared riding, but it had a fare structure that made shared riding unattractive to taxi drivers. This fare structure stated that only one fare can be charged over a route regardless of the number in the cab. For example, if one passenger was traveling from A to B and a second person boarded at point A, destined to point C, the individual would only have to pay for the ride from B to C. This obviously was not conducive to shared riding. Also, those cities with meter fare calculations essentially prohibit shared rides because of the complexities of calculating the metered fare of more than one rider. The two ordinances most conducive to shared riding were found in Honolulu and Knoxville. Both allowed zone fare structures which were more conducive to

shared riding and neither had sections that specifically forbid a shared ride service.

13. Taxi jitneys. Some ordinances such as the one found in Newark outlaw jitney operation in a subtle manner. For instance, jitney service is made illegal by prohibiting the rental of cabs for use over a similar route on consecutive trips. Two cities--Honolulu, Hawaii, and Knoxville, Tennessee--did not outlaw jitney operations. Honolulu, essentially made no reference to this type of operation, while Knoxville, Tennessee, on the other hand, gave the city council the right to suspend the taxi operating as a jitney if it were in competition with the publicly owned transit company, even though the traditional taxi service might legally compete with the public bus service.

14. Pooling. No ordinance in this section specifically mentioned car- or vanpooling.

15. Ramifications for para-transit. Although the use of "innovative" para-transit services employing traditional transit vehicles (bus and taxi) have been recognized and dealt with in the urban areas' ordinances, their bus operations have been traditionally fixed-route, fixed-schedule; and municipal ordinances have been designed to maintain their traditional operations. As a rule, the ordinances were designed so that changing routes and/or schedules were very difficult, since the city council (and in one case a town meeting) had to approve all changes. However, it was still possible to implement a para-transit service by using a quasi-demand-responsive express bus system.

Most of the ordinances were not as strict with route and schedule regulation of express bus services, and councils had apparently accepted express bus procedures with little hostility.

Like bus operations, taxi operations seemed to be well defined in the selected ordinances. Many of the regulations for taxi operations were used basically to protect fixed-route, fixed-schedule service from the ruinous[3] competition that taxis at one time afforded. With this type of regulation found in six of the eight analyzed ordinances, the evaluation of taxis as a true full-service, para-transit mode was very difficult, especially since many of the ordinances effectively outlawed shared riding and jitney services even if they were not in competition with traditional transit (bus) operations. Also, entry and exit control potentially hamper para-transit implementation. With strict entry and exit control, the desired amount of service to meet demand might be delayed and consequently not reach the market when needed. Since strict control was contrived in most ordinances, para-transit modes may suffer. In addition, the complete neglect of pooling in the ordinances may have had serious effects on para-transit services. Since councils had no specific regulations to follow and since the range of their authority varies, indivi-vidual councils could handle the various modes differently. For example, the transit officials may use the number of

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[3]Pegruim, Dudley, "Transportation: Economics and Public Policy," Irwin-Dorsey Limited, Homewood, Illlinois, 1968.

passengers and the stability of the pool route to classify the service as a bus or a jitney service. In this case the service would fall under the bus or jitney regulations, which were not designed to allow maximum efficiency of a para-transit service. In cases where the ordinance did not specify regulation but where the scope of authority was wide, the council was more apt to use new regulation and procedures to meet the need (assuming the members understood the need). For example the Honolulu ordinance states:

> Every county shall have the power to provide transportation service with approval of Council whether directly, jointly, or under contract with private parties, without the county of private parties being subject to the jurisdiction and control of the public utilities commission in any manner.

Here the Council could contract for services whereas an ordinance such as the one found in Newark, New Jersey, did not give the advisory committee power to create alternative regulation allowing for advantageous implementation of contract service.

III. INDEPENDENT TRANSIT AUTHORITIES

The next group was comprised of those urban areas that granted independent transit authorities or districts the duty of regulating urban passenger transit. Table IV-2 contains the names of these urban areas. A primary difference between this group and the group exhibiting municipal operations was that decisions on administration and service policies were made in this group by the appointed "board of directors." This board had executive power over a transit system within a service district

TABLE IV-2

CITIES WITH INDEPENDENT TRANSIT AUTHORITIES PARTICIPATING AND EXHIBITING TRANSPORTATION DISTRICTS

City	State
Chicago	Illinois
Dallas	Texas
Denver	Colorado
Detroit	Michigan
Duluth	Minnesota
Hartford	Connecticut
Jacksonville	Florida
Lincoln	Nebraska
New Haven	Connecticut
Portland	Oregon
Richmond	Virginia
Syracuse	New York

that was jurisdictionally separate from other levels of governments. In general, these commissions had more flexibility since little, if any, regulation was clearly defined for them in state legislation and they did not report to another body.

The range of power found in these regulating bodies was broad. In fact, many authorities, having obtained power from the state level, were able to regulate all forms of urban transit. However, a telephone survey indicated that many authorities holding this inclusive power exercised regulatory powers only over bus operations.[4]

1. Range of power. The extent of power granted to the transit boards varied between urban areas. Richmond, Virginia, appeared to be the most restrictive in the range of the legislation that regulated the Greater Richmond Transit Company. The structure of the legislation was barely discernible from the more traditional municipal regulations. This ordinance gave power to the city council (which, in fact, created the ordinance) to set rates, to evaluate schedules, and to examine routes. The ordinance specified fixed-route, fixed-schedule service and required public hearings to determine need for altering existing schedules or routes. On the other side of the continuum, one found the legislation in Hartford and New Haven, Connecticut. This legislation was

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[4]Six of the areas that reported authority over all transportation services were contacted. The individuals and the system were:
A.L. Handman, Director, Hartford, Connecticut;
E.A. Mueller, Executive Director, Jacksonville, Florida;
D. Westlake, Director, Denver, Colorado;
E.J. McLean, First Deputy Commissioner, Chicago, Illinois; and
R.M. Storto, Commissioner, Syracuse, New York.

developed by the state so that both urban areas operated under the same ordinance. The scope of this legislation can best be exemplified with a quote from the ordinance itself:

> The Board of Directors has full control over the transit system which means street-railway motor bus, mini-bus, for-hire auto, rapid transit, and any other land transportation for the movement of persons or goods locations within and between participating municipalities.[5]

As was evident, the board of directors had complete power over all land transportation (excluding the private auto). However, after a discussion with the Director of the Greater Hartford Transit District, it was found that the only power actually exercised was authority over bus operations. This seemed to be the case in all of the urban areas studied. Of the remaining ten reporting cities, the range of power granted and the actual power used fell somewhere between the Connecticut and Richmond, Virginia, examples. The degree to which the power was exercised was normally limited to bus fleet operations. The one exception was Jacksonville, Florida, where the regulatory power over all forms of transit had been granted and was being exercised by the Transit Authority members.

2. Diversity of regulatory power. As has been mentioned, all of the authorities had the power to regulate bus operations and many also had the authority to regulate taxi operations. Concomitant with these powers, the various districts had other

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[5]State Statute, State of Connecticut, Chapter 103a, "Transit Districts," Section 7-273b.

regulatory authority; for example, many districts had the authority to own and operate parking facilities. In fact, one authority (Hartford) kept the power usually reserved for state public service commissions and assumed all powers related to transportation. However, most authorities' regulatory powers were limited to route, rate, schedule, and, at times, to parking regulation.

3. Regulatory boards. The regulatory boards varied in size, from five members in Detroit to twenty-three members in Chicago. They also varied in appointment procedure. In Richmond, Virginia, for example, the populace elected the board members (i.e., the city council), whereas in Jacksonville, Florida, the governor appointed half of the members of the transit board while the other members were elected; and in Portland, Oregon, the governor appointed the entire board of seven members. In general, transit boards were appointed by mayors and approved by city councils. If the district encompassed more than one urban area, a formula usually existed for distributing the number of transit board members in a representative fashion to insure equal representation. A few areas, however, had unique composition of their boards. In Detroit, Michigan, for instance, the transit board actually made the rules, but it had to operate in conjunction with an advisory committee of citizens appointed by the mayor and the transit board.

4. Financing. In every case, the districts received partial funding from the municipalities that made up the authority. In addition, many different types and combinations of types

of financing were found. One frequent procedure was the ability of the authority to issue bonds. As Table IV-3 illustrates, seven of the reporting areas were able to issue interest-paying bonds. In all but two cases, the authorities could issue bonds on their own accord. In Hartford and New Haven, however, a public hearing had to rule in favor of the issuance of a new bond before sales could begin.

Another procedure was the issuance of term notes. This practice was found in only four of the reporting cities, all of which also issued bonds. The obvious practice in these areas was to sell bonds for long-term needs and to use short-term notes for immediate assistance.

Finally, three of the urban areas had the authority to administer and levy taxes on the citizens of their district. The method and the type of taxes levied vary in different areas. Two of these areas, Detroit and Portland, used a percentage of real estate value as the base while Denver used an income tax.

Because of the financial problems of recent years, many of the urban areas were using a combination of methods of financing. Two other methods used for obtaining funds were common in all ordinances. The first was simply the operating revenue from the bus runs; and second was the ability of the authority to accept grants and/or loans from agencies such as the state or federal governement.

5. Operation management. In all of the reporting urban areas, with exception of Lincoln, Nebraska, the selection of the

TABLE IV-3

METHOD OF FINANCING

City and State	City Funds	Bonds	Notes	Tax
Chicago, Illinois	X	X		
Dallas, Texas	X			
Denver, Colorado	X	X	X	X
Detroit, Michigan	X			X
Duluth, Minnesota	X			
Hartford, Connecticut	X	X	X	
Jacksonville, Florida	X	X	X	
Lincoln, Nebraska	X			
New Haven, Connecticut	X	X	X	
Portland, Oregon	X	X		X
Richmond, Virginia	X			
Syracuse, New York	X	X		

general transit manager was made by the transit authority board. In Lincoln, however, the Mayor of the city retained the right to select the manager. None of the ordinances were precise in the guidelines for selection of the manager. Indeed, only minimum level of experience and training was required in most cities. The Denver ordinance, for example, required five years experience in transit management or related work. Other than the selection of the general manager, the ordinances did not specify any criteria for the organization.

The authority of the manager was generally limited to the public bus fleet and its supporting facilities. However, in Detroit, the manager also had the authority to grant licenses for operation of public transportation to any private individual or corporation capable of proving an existing need and willingness to abide by the regulation and rules of the urban area.

6. Routes, schedules and fares. The creation, abandonment, and/or changes in rates, routes, and schedules were initiated by the general manager in each city. A few of the districts (Denver, Syracuse, Portland) issued the power to the manager to alter, at least temporarily, schedules, routes and rates without approval of the transit board. In Denver, the evaluation of routes, schedules and rates was viewed as the operations department's task. To perform this task, the operations department periodically evaluated bus routes for economic and service viability. If the route, schedule, or fare was not viable, they had the power to alter or eliminate it. They

also had the power to subsidize unprofitable routes if these routes were providing a needed service. This power was also found in the Connecticut authorities, but the specific subsidy had to be approved by the transit board. One city, Richmond, Virginia, gave the final authority for all route, schedule, and rate changes to the Mayor, who was advised by the city council, which was also the transit board. Lincoln, Nebraska, had an additional procedure for changes in route and scheduling. In addition to the usual procedure, the transit board's changing rates, schedules, or routes, a private individual could demand a public hearing to request alterations in route and/or schedule. An interesting situation was found in Chicago, Illinois, where the authority had the right to contract for or to create joint and/or through fares with any carrier that passed through the jurisdictional area.

7. Express bus and charter bus services. In none of the reporting ordinances was express bus and/or charter bus service declared illegal. Only five of the twelve ordinances analyzed either failed to mention or to make provisions for express service. The directors of two of these five transit systems assumed express bus service was part of their jurisdiction and consequently were promoting the service.

Denver's district ordinance was the clearest concerning express services. It stated that services which meet group demand on a regular or semi-regular basis, especially in peak time periods could be initiated. Upon speaking with the

director of the Denver Regional Transit District,[6] it was learned that this power was exercised fully because of the economic benefits concomitant with express bus service. Many express operations were sanctioned by charter clauses, especially in authorities where the transit board had to pass on all fixed-route changes and routing for express service.

The difference, as generally defined in the ordinances, between charter and express services was that charter service rented the entire bus for one fee, whereas the express service rented the bus by seat. A unique method of regulation and implementation of express bus service was found in the Connecticut systems. There, the urban authority had to approve the express service, but the actual contract was held by the state and not the urban authority.

Recent regulation passed by the Urban Mass Transportation Administration (UMTA) forbids urban public transportation authorities that receive UMTA funding to use their vehicles (buses) as charter vehicles outside their urban areas in competition with private charter operations unless they charge a fare that will cover the full cost of the operation.[7] If the authorities desire to enter the charter market, the authorities must: (1) set rates that take into account the actual cost--both direct and indirect--of operating charter

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[6]Telephone interview with Mr. D. Westlake, Director of Denver Regional Transit District.

[7]Charter Bus Operations, Part 604, Federal Register, Volume 41, No. 64; April 1, 1976.

service, without regard to capital or operating assistance funding; and (2) give notice of proposed service and file written comments that prove to the public and UMTA that the service is not in competition with private carriage.

This new regulation also deals with school bus operators and prohibits school bus operations by federally funded operators unless such operations are not in competition with private school bus operations.

In general, the flavor of the entire regulation is to protect the private charter carrier. This may cause disruption of express service in urban areas that operate express service under charter service regulation. The effect remains to be seen since most areas that use this practice are transit authority type operations and have the ability to alter, with relative ease to meet the new requirements, the regulation they operate under.

8. Taxis. As has been mentioned, taxi regulation was not being governed by the transit authorities even though some technically had the power. To obtain the taxi regulation, the individual cities of the transit districts were contacted and the regulating ordinances were obtained. Since these ordinances were really municipal regulations, they were similar to the municipal taxi regulation explained above. In fact, no unique regulations were found that could potentially affect para-transit. Traditional fare structures were found: (1) meter fares were the most prevalent and where they were found, it would be difficult for shared riding

to exist; and (2) zone structures are also found, in which case, shared rides are possible.

In every ordinance, jitney service was outlawed either by a direct statement or by describing a jitney operation and then outlawing the service. While some of the transit authorities had the power to provide and/or regulate jitney service, to date, this power had not been exercised. In a few areas such as New Haven and Hartford the taxis were regulated by the state. This state regulation was very traditional and was of little consequence to the research.

9. Pooling. No ordinance mentioned pooling specifically (car or van). However, active pooling campaigns were being waged at the time in at least two of the selected areas (Portland and Denver).

10. Ramifications of ordinances on para-transit. In general, the independent district was favorable to the implementation of para-transit services. While most of these districts were primarily concerned with bus operations, it was clear that the capability existed for realizing their power to expand the regulation to include all modes of para-transit as well as traditional fixed-route, fixed-schedule systems. The transit board essentially created the regulation under which the urban transit system operated. Because of the selection of the regulating board was normally made by the mayor and city council, or by the governor, the ability to dictate the urban area's capability to utilize regulation that lends itself to

the possible use of para-transit modes was, indirectly, a political responsibility.

Existing legislation in the transit districts contained very few restrictions that would hamper the use of para-transit. A few of the authorities, such as Portland's and Denver's, had board members who seemed to recognize the existence of para-transit. However, most of the transit boards and the directors of the transit districts generally believed public transit was synonomous with bus transit. This point was supported by these significant findings: first, when the request for the regulation governing all urban transportation (public and private) was made, the only information returned was regulation concerning bus fleets; second, was the hesitation of the various transit authorities to exercise their power over taxi operation; and third, was the total neglect of regulation concerning pooling of any form.

IV. MIXED REGULATORY CAPABILITIES

Several of the states that passed regulatory legislation giving control of transit in urban areas to the local regions had chosen to allow either municipal or independent transit districts to have control of the transportation in that district. Table IV-4 shows the selected urban areas of this type that chose to participate in this study and the type of authority that exists in each jurisdiction.

As Table IV-4 illustrates, only one of the twelve reporting areas chose municipal control. While reasons for this choice varied, the

TABLE IV-4

CITIES AND TYPE OF TRANSIT CONTROL SELECTED

City and State	Type of Authority
Birmingham, Alabama	Transit District
Cincinnati, Ohio	Municipal
Cleveland, Ohio	Transit District
Fort Wayne, Indiana	Transit District
Kansas City, Kansas	Transit District
Lexington, Kentucky	Transit District
Madison, Wisconsin	Transit District
Manchester, New Hampshire	Transit District
Mobile, Alabama	Transit District
St. Louis, Missouri	Transit District
Wichita, Kansas	Transit District
Worcester, Massachusetts	Transit District

most prevalent explanation[8] was that most federal and state grants were geared toward the publicly owned transit system that served an entire area, not a single city. The system receiving grants was usually one that encompassed an entire community, regardless of legal boundaries, and was thus better able to serve the total welfare of an entire urban area. This fact guided those who were drafting the urban legislation toward the transit district concept, because a district, through common consent of participating communities, can cross municipal jurisdiction and boundaries. A few other reasons were also suggested:

1. transit district jurisdiction was more successful;
2. city government did not need more departments; and
3. city councils felt that since future annexation of the smaller suburban areas by the larger community could occur, forming a transit district now would avoid confusion later.

One rather candid gentleman indicated that the two prime reasons for adoption of the transit district was to stifle competition for any inter-municipality routes and to increase the probability of getting "that easy federal money." Regardless of the reasoning for the choices, urban areas, when given a choice, clearly tended to select independent transit districts rather than traditional municipal control over regulation and operations of public and private forms or urban transportation.

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[8]The following persons were interviewed concerning the reasons for choosing the type of legislation found in their areas:

R.E. Ojala, Administrator, Worcester Regional Transit Authority, Worcester, MA.

E. Karstensen, Executive Assistant to Mayor, Wichita, KS.

W.O. Somerfeld, Director of Transportation, Madison, WI.

L. Ronis, General Manager, Regional Transit Authority, Cleveland, OH.

Stephen Ulis, Administrative Assistant to Mayor, St. Louis, MO.

Jackson Bailey, City Clerk, Birmingham, AL.

The analysis of the specific ordinances will be handled somewhat differently for this section. Since the general ordinances, municipal or independent transit district, have already been discussed, only unique regulations or methods of regulation will be reported.

1. Municipal regulation. Cincinnati was the only municipally urban area reporting in this section. Cincinnati had a relatively unique regulatory system since it operated in two states (Ohio and Kentucky). This interstate travel required a special permit from the Interstate Commerce Commission (I.C.C.).[9] The basic regulation was similar to most other municipal regulation, with the exception of a greater degree of power being placed in the hands of the city manager and city safety director. The city also had to maintain certain agreements with the contiguous Kentucky counties that benefited from Cincinnati bus and taxi operations. Cincinnati, like most of the other municipally regulated areas, had a traditional fixed-route, fixed-schedule bus system with limited express service. Routes, schedules and rates were under the direct control of the city manager, but the city council had the power to override his decision. The taxis operated on either a zone or a meter fare structure, and entry control was supervised by the city manager and the city safety director. The number of cabs allowed to operate was set by city council under guidelines set by the I.C.C. for interestate transport.

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[9]Interstate Commerce Contact Carriage Permit, Section 409-1 and 404-2, 1974.

Fixed-route or semi-fixed route operation by taxis was specifically outlawed, thus forbidding jitney operations. Pooling was not mentioned in the ordinance.

2. Transit district authority. As was seen in the previous section (dealing exclusively with transit district authority), the powers realized by the transit district boards were very broad, and, in most cases, they could encompass all forms of for-hire urban land transportation. A few unique regulations were found in these urban ordinances. The Fort Wayne, Indiana, ordinance, for example, was the only ordinance analyzed in this study which specifically mentioned demand-responsive transit. While the ordinance was specifically describing dial-a-bus operations, the definition was sufficiently general to encompass essentially all forms of demand-responsive transit.

The Worcester Regional Transit Authority added a new dimension to its regulation. It allowed the contracting of its services to districts where it did not have jurisdiction. Naturally, their own geographic region was served first, but to defray expenses, the authority could contract out service, which necessitated approval from the Public Service Commission. Such approval had been obtained, and Mr. Ojala (Administrator of the Authority) indicated that the practice had been financially beneficial to the system.

Kansas City, Kansas, also added a new dimension to supplying urban transportation. The city had no public transportation (bus); it technically did not participate as an operating member of any regional transit district. Rather, the city

contracted with a near-by company for specific routes and subsequently used the fares collected from those routes to pay partial expenses; the remaining costs were subsidized. The city had maintained control over taxi service, however, and handled it in a traditional fashion.

Finally, Madison, Wisconsin's transit ordinance is unique because it employs two transit boards for regulation. The first was composed of members appointed by county officials and members elected by the populace. The second board had members from various city and county planning groups, as well as technical people with specific training in transportation and related fields. The second group acted as an advisory board to the first. While the appointed and elected board actually advocated or vetoed specific programs, the technical group served as consultants and helped evaluate the feasibility and forecastable results of specific changes. While this practice may exist elsewhere, the Madison ordinance was the only one to establish a specific plan for such an activity.

3. Ramifications for para-transit. The ramifications for para-transit that can be expected from these ordinances are similar to those ramifications that have been explained in relation to the independent analysis of the municipal and transit authority regulatory ordinances. It is obvious from the previous sections that the municipal type legislation seemed prohibitive to the implementation of para-transit forms in the urban area. Thus, the tendency of the urban areas to choose this type of regulation was significant for the

possible future use of para-transit modes as an alternative to urban transportation.

A few additional unique regulatory structures and regulations were found in this group. Of these unique regulations the most noticeable was the recognition of the demand-responsive methods by the Fort Wayne Indiana ordinance; but, perhaps the most far-reaching innovation was the regulatory board structure of the Madison, Wisconsin's transit board and advisory board. Theoretically, the elected board would represent the needs and desires of their constituents, and the technical board could advise them on the most viable alternative to offering the service needed.

The districts not mentioned exhibited regulations similar to the previously discussed districts. While these did not add new elements to the analysis, they did reinforce the previous analysis which dealt with independent transit districts.

V. MACRO-VIEW OF PARTICIPATING AREAS

The analysis of the thirty-one urban areas that chose to participate in the study shows that they possessed a wide range of transit regulations and demonstrated varying amounts of regulatory power. It was observed that the power of some city councils was actually very limited because of restrictive methods and procedures. On the other hand, most transit district boards essentially had complete power with only a few guidelines to limit their regulatory authority. The continuum in Table IV-5 lists the participating cities and the degree of flexibility

TABLE IV-5

CONTINUUM OF FLEXIBILITY OF REGULATING POWER OVER URBAN TRANSPORTATION OF PARTICIPATING CITIES

Complete Power Over Urban Transportation and Related Areas	Partial Power Over Urban Transportation and Related Areas	Interpretation Flexibility Over Urban Transportation Related Areas	Inflexible Following of Existing Regulation
Syracuse, NY*	Portland, OR	Lincoln, NE	Newark, NJ
Detroit, MI*	Chicago, IL	Richmond, VA	Greensboro, NC
Hartford, CT*	Duluth, MI	Cincinnati, OH	Jackson, MS
New Haven, CT*	Dallas, TX	Fort Wayne, IN	Charlotte, NC
Jacksonville, FL*	Denver, CO	Memphis, TN	Kansas City, KA
Wichita, KS*	Birmingham, AL	Knoxville, TN	
Lexington, KY	Cleveland, OH	Tucson, AZ	
Madison, WI	Mobile, AL	St. Louis, MO	
	Worcester, MA		
	Honolulu, HI		

*Have complete power but do not exercise it.

possessed by the regulating board. The left column of the continuum lists those areas that gave their transit boards complete control over all urban land passenger transit (with the exception of the private auto) with only guidelines to follow. The right column lists urban areas that had very specific regulations and allowed little room for interruption by council or board members.

As one might expect, all the areas listed in the left column were of the "district type" rather than municipally regulated. In fact, all members (except Honolulu, Hawaii) of the first two columns were independent transit districts. This finding indicated that, when the transit board had the power to create its own regulations and the appropriate demand for para-transit existed, implementation of para-transit could be accomplished with little or no delay resulting from regulation.

While many transit authorities had the power to regulate all forms of urban transit, five areas did not exercise this power over taxis, and not one mentioned such techniques as pooling in the regulatory documents. Several transit boards (see list in footnote 8) were questioned about this absence and the replies indicated that the boards had not contemplated the implementation of pooling as a part of their jurisdiction and/or they were not familiar with the characteristics of the method. This topic will be addressed in greater detail after the analysis of the recognition of transit officials has been presented in Chapter IV.

Cities in the right column had the greatest restraints upon their regulatory authority, consequently implementation could take place only if the city ordinance was amended. These cities would have the greatest difficulty in the implementation of para-transit services. Amending is possible; however, it would depend on the attitude of the

city council members. Cities in the column second from the right could possibly implement certain experimental para-transit services, but would probably need temporary legislation to legalize the experiment.

This analysis indicated that municipally regulated transit authorities generally had greater institutional and regulatory barriers then the independent transit districts. However, exceptions, such as the Honolulu, Hawaii ordinance, did exist. What this analysis also points out is the possibility of implementing para-transit in many regions if the regions' regulatory agencies have favorable attitudes and dispositions toward these services.

A prime example of this favorable disposition was seen in Knoxville, Tennessee, where a project being conducted by the Transportation Center at The University of Tennessee required the Knoxville Transit Authority's consent to use pooling techniques within the Authority's area of jurisdiction. Although the particular technique to be used was illegal under existing local regulation, the transit authority (a municipally regulated agency) agreed to temporary legislation that enabled the experiment to be performed. This type of cooperation was necessary if the experiment was to be made and could lead to regulatory amendments if para-transit service proves desirable.

VI. SUMMARY

This chapter has presented an in-depth analysis of the ordinances of thirty-one urban areas. The ordinances were grouped by state enabling legislation. The three groups are:

1. states granting municipal control;
2. states with independent transit districts; and

3. states that allow both municipal control and private, independent districts.

It was found that transit authorities in states granting municipal control were more structured and, in contrast, that the powers given to independent transit districts were very broad. It was also discovered that in states which allowed both types of organization, independent transit districts were used more often than municipally controlled boards. Finally, a continuum was presented to illustrate the relative level of regulations' flexibility found in each city. This was used for a macro-view of the ordinances regulating transit in the participating urban areas.

CHAPTER V

ANALYSIS OF TRANSIT OFFICIALS RECOGNITION OF CHARACTERISTICS OF PARA-TRANSIT MODES

While urban public transit municipal ordinances were the foundation of urban regulation, the functional regulation came from the interpretation of these ordinances by the local transit officials. In addition to the flexibility afforded by interpretation, these officials had the right to amend any section of the ordinance or to rewrite the entire city ordinance governing transit. Thus, the attitudes of the transit officials ultimately set the tone of urban regulation. The contents of this chapter present the results of the study questionnaire (see Chapter III) and compare these attitudes with attitudes many transit experts have toward para-transit (see Chapter II). The first section of this chapter contains an overview of the data obtained from the previously mentioned study questionnaire. This section is followed by an analysis that includes summary by simple statistics and analysis by hypothesis testing of the research hypothesis.

I. INTRODUCTION

It is imperative in any research that utilizes primary data to understand thoroughly the returns used in the analysis. However, much can be learned from the data before formal analysis begins. In this research the representativeness of the sample (see Chapter III) and the characteristic problems of psychological scaling questions (see Chapter III) deserve special attention. Representativeness is important because the object of this sample was not to obtain a simple random

sample, but to obtain a stratified, random sample from large and small urban areas distributed in many regions of the country. The scale overview was necessary to check for discrepancies, such as a halo effect, that would invalidate results.

1. Representativeness. As discussed in Chapter IV, thirty-one cities whose locations were found in all sections of the country consented to participate in this project. Of these 31 cities, 83 percent returned questionnaires. Of the 206 officials contacted, 131 (63 percent) felt that this study was important enough to return the completed questionnaire. This relatively large percentage of returned forms would, in itself, indicate transit officials' concern with the area of study and would also infer an interest in the use of para-transit as a potential solution for a portion of their cities' transit demand.

2. Criteria. Three important criteria concerning representativeness of the sample were: (1) location; (2) size of area; and (3) type of ordinance. A dispersion across each of these categories was important if the results were to be used for a generalized comparison with accepting para-transit characteristics. Table V-1 lists those cities whose transit officials returned surveys. This table shows the relative size of the urban area (see Chapter III for exact size), the area of the country, the type of authority, and the number of surveys returned. As evident, neither large nor small urban areas dominated the study. Small urban areas composed 57 percent of the sample, and large areas composed 43 percent of the

TABLE V-1

SELECTED INFORMATION CONCERNING CITIES PARTICIPATING IN RESEARCH

City and State	Relative Size	Area	Type of Authority	Number of Returned Surveys
Birmingham, Alabama	L	SE	T	4
Charlotte, North Carolina	S	SE	M	2
Chicago, Illinois	L	MW	T	2
Cleveland, Ohio	S	M@	M	2
Colorado Springs, Colorado	S	SW	T	4
Denver, Colorado	L	SW	T	8
Duluth, Minnesota	S	MW	T	4
Fort Wayne, Indiana	S	MW	T	5
Grand Rapids, Michigan	S	MW	T	4
Jacksonville, Florida	L	SE	T	8
Kansas City, Kansas	S	SW	T	10
Knoxville, Tennessee	S	SE	M	4
Lincoln, Nebraska	S	MW	T	4
Madison, Wisconsin	S	MW	T	2
Manchester, New Hampshire	S	NE	T	2
Memphis, Tennessee	L	SE	T	2
Milwaukee, Wisconsin	L	MW	T	9
Newark, New Jersey	L	NE	M	14
Portland, Oregon	L	NW	T	2
Richmond, Virginia	S	SE	T	4
Seattle, Washington	L	NW	T	6
Spokane, Washington	S	NW	T	2
Springfield, Missouri	S	MW	T	2
St. Petersburg, Florida	S	SE	T	4
Tulsa, Oklahoma	L	SW	M	2
Wichata, Kansas	L	SW	T	2
Miscellaneous				8

S = Small T = Private Transit Authority
L = Large M = Municipal Authority

MW = Midwest NW = Northwest SE = Southeast
NW = Northwest SW = Southwest

sample. This mix was desirable since the purpose of the study design was to gain a sample representative of urban areas of all sizes. The location of the cities was equally important, since ordinances tend to be patterned after others in a given geographic area.[1] Once again, the sample was comparatively well distributed. Nine midwestern, seven south-eastern, two north-eastern, five south-western, and three north-western cities were represented. This distribution aligns with the distribution of the participating areas and was sufficiently dispersed to illustrate the attitudes of many locations, and therefore was not unduly influenced by any one area. Transit authority response rate, as compared with municipal authority, seemed to dominate the cities that returned questionnaires. Eighty percent of the represented cities exhibited transit authority rule. While this large percentage potentially detracts from the representativeness of the sample, a review of Table III-1 shows that 79 percent of all thirty-two states had the capability of exhibiting transit authority rule. Thus, this distribution was not proportionately non-representative.

3. Scales. An initial compilation of data produced a listing of the raw data and a frequency distribution for each question. This preliminary output indicated that where scaling techniques were used, the respondents seemed to understand the

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[1]Haines, R.L. and Weibel, S.W., "State Enabling Legislation," Purdue University, West Lafayette, Indiana, May 1974.

instructions and marked the scales appropriately. Likewise, where the relative ratings were requested, the respondents filled our the questionnaire properly in all but four cases. This response indicates that the respondents understood the instructions, but it does not verify that they understood the questions; however, this comprehension may be inferred since individuals tend to complete questions they feel they can answer correctly.[2]

4. "Halo Effect." Since these checks do not give any concrete indication of the respondents' understanding of the subject (only the instructions), other methods were used to achieve some indication of the validity of the responses. The initial method employed sorted out any questionnaire containing responses that were all favorable or all unfavorable. Next, several checks were made in an effort to detect a tendency toward a "halo effect." The first check employed the fact that the scale's midpoint was a no-effect choice. The check reported if any respondent had chosen only favorable responses (replies five or six) or only unfavorable responses (replies two or three) on any one question. It was found that this situation had not occurred on any of the questionnaire returns. Continuing efforts to detect a "halo effect" were made to see if five of the six possible replies to each demand situation were only favorable or unfavorable replies. Two responses exhibited such a pattern. Since the questions were designed

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[2]Mendenhall, W., et al., "Elementary Survey Sampling," Duxbury Press, Belmont, California, 1973.

so that three of the six possible replies were potentially useful, any question that had two, three, or four responses in either categories five or six (a favorable response) or categories two or three (an unfavorable response) was acceptable. A total of eight individual questions was suspected of exhibiting a "halo effect" because they did not meet these criteria. By eliminating these questions, the concern about the "halo effect" ("halo effect" is discussed in Chapter III) skewing the data, and consequently the results were alleviated.

5. Internal validity. The next check concerned internal validity and was suggested in a work by Allen L. Edwards.[3] This check uses the semantic differential scaling technique and the relative rating of the different modes simultaneously in order to check compatability of responses. For example, if a respondent rates a certain response as the best alternative, then one would expect this response to be rated on the differential scale at least as favorable as any other potential response, and the next response on the rating scale equal to or less than the first response on the differential scale, and so forth. This type examination was performed on each individual survey; the check showed that thirteen surveys contained questions which did not meet this criteria. Eight of these were the variables suspect of a "halo effect."

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[3]Edwards, A.L., "Techniques in Attitude Scale Construction," Appleton-Century-Crofts, Inc., New York, New York, 1957.

6. Check for range of responses. A final check was designed to insure that a respondent did not exhibit the same attitude in every situation. The method was to select two demand situations that possessed different characteristics and to review the responses concerning the favorability of one mode in the differing situations. This check was performed by reviewing question one, which was a high density home-to-work situation, and question seven, which was a low density travel demand situation dealing with limited mobility groups. The modes that were common to both questions were: regular bus, rent-a-car, regular taxi, carpool, and shared-ride taxi. Review of the individual responses showed only three responses that demonstrated similar modes benefiting different situations. While the results were questionable, none were serious enough to eliminate the questionnaire from the sample. An aggregated view of the responses verifies that emphasis was placed on different modes in each situation.

II. OVERVIEW OF DATA

The method of analysis employed in this section uses the statistical tests described in Chapter III to analyze the semantic differential scales. Two chi-square tests were used to compare the observed results of: (1) expected independent results (by chance) in order to determine a propensity toward a given mode in a given situation and (2) expected joint results given the replies of the entire group. If these tests prove statistically significant (using the alpha level equal

to .05), the results can be compared to the results that would be suggested from the research presented in Chapter II concerning the appropriate modes for the illustrated market segments (demand situations).

It can be noted that each chi-square test performed on each mode in each demand situation was statistically significant at an alpha level of .05; thus, when results are explained throughout this chapter, one may assume significant differences are statistically significant unless otherwise informed.

1. High-density home to work. Table V-2 contains results of the semantic differential scales for questions one and four from the instrument administered to the transit officials of the participating urban areas. These questions were grouped together because they represent the market segment referred to as high-density home to work travel described in Chapter II as a potential para-transit market. As Table V-2 indicates, certain modes received a very high percentage of favorable responses. For example, the responses to question one indicated that the transit officials felt para-transit modes of carpool and express bus could be helpful in meeting the needs of this demand situation. In fact, 85 percent of the officials reported that carpooling was at least helpful in this situation while 48 percent of the officials said it was extremely helpful. This result is statistically significant from a chance result (see Appendix F for all results of the chi-square statistical tests performed). This indicates that the officials declared a distinct preference toward this mode in this specific demand situation. Since the characteristics

TABLE V-2

REPLIES BY TRANSIT AUTHORITY MEMBERS TO THE SEMANTIC DIFFERENTIAL QUESTIONS CONCERNING HIGH DENSITY HOME TO WORK TRIPS

Question 1: Trips to work from a densely populated medium to high income area ($18,000 to $25,000) where the residents work at different locations that are at least ten miles from their homes.

Question 4: Trips from a relatively densely populated area (i.e., housing subdivision) to an area with many work locations (i.e., downtown business district).

Number of Responses / Percentage

Question 1	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problem	No Response
Regular taxi	2/2	26/22	32/27	28/23	14/11	2
Shared-ride taxi	2/2	61/52	20/17	24/20	2/2	5
Regular bus	24/20	56/48	12/10	18/15	2/2	2
Carpool	56/48	44/37	12/10	0/0	2/2	0
Rent-a-car	2/2	6/5	30/25	44/7	16/14	6
Express bus	50/42	48/41	4/3	8/7	2/2	2
						n=114
Question 4						
Vanpool	50/42	58/49	2/2	0/0	2/2	2
Shared-ride taxi	6/5	72/61	26/22	6/5	2/2	2
Regular bus	68/57	44/37	2/2	0/0	0/0	0
Rail	42/36	36/31	8/7	8/7	8/7	0
Rent-a-car	2/2	4/3	26/22	44/37	20/17	16
Regular taxi	4/3	16/14	34/29	34/29	18/15	0
						n=114

of this mode compliment the needs of this demand situation, it can be inferred that the officials agreed with the experts in the para-transit field. In general, the responses of the officials tended to agree with the inherent advantages of para-transit services as described in Chapter II. The exception to this general agreement was the degree of benefit attributed to regular bus service (while not a para-transit mode, it is a viable alternative) in this demand situation. Since these passengers were traveling to various work locations, it seemed that regular bus service could not satisfy their service demands. Certainly if the destinations were on a linear route, this service could be helpful; but, 68 percent (which is the percentage of respondents who feel it is helpful) of the time this specified linear route was unlikely to occur. Yet, 68 percent of transit officials felt this service could be helpful in this demand situation. Another interesting finding was that 54 percent of the respondents indicated that shared-ride taxi service could be at least helpful in this situation. Apparently there was recognition that the characteristics of this service did meet the needs of a portion of this market segment. Since shared-riding has been stifled in many urban areas throughout the nation,[4] this response was unexpected.

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[4]Heathington, K.W. et al., "An Organizational and Environmental Review of Two Privately Owned, Shared-Ride Taxi Systems," Transportation Center, University of Tennessee, Knoxville, Tennessee, 1974.

The second education criteria, peer group recognition of modes, was tested by contingency chi-square. The results were significant (see Appendix G) which infer that, as a group, transit officials shared certain evaluations concerning the benefit of given modes in this demand situation. Comparison of the expected and observed values of the chi-square table shows, as one might expect from previous analysis, that the major contributors to the calculated chi-square value were found in the favorable ratings for carpooling, express bus, and regular bus service. Also, considerable variation was observed in the non-favorable rating for rent-a-car service. This variation would tend to agree with the characteristics of rent-a-car service and would, consequently, strengthen the agreement between transit officials and noted authorities in the transit field.

Table V-3 contains the results of the relative rating of the modes for demand situations one and four. The method of ranking assuming a continuous scale calculated the exact median position. All ratings ranged from one to six. The area from one to two, two to three, and so forth, was subdivided into as many divisions as respondence to the response in that rating category. The distance along the number line could be calculated from the beginning of the interval (whole number) to the actual median score. For example, assume a 50-person sample were distributed in this fashion:

Rating	1	2	3	4	5	6
Number of Responses	5	10	15	5	5	5

TABLE V-3

REPLIES BY TRANSIT AUTHORITY MEMBERS INDICATING TO THE RELATIVE RATING OF SERVICE CHARACTERISTICS OF VARIOUS MODES IN HIGH DENSITY HOME TO WORK TRIPS SITUATIONS

Question 1: Trips to work from a densely populated medium to high income area ($18,000 to $25,000) where the residents work at different locations that are at least ten miles from their homes.

Question 4: Trips from a relatively densely populated area (i.e., housing subdivision) to an area with many work locations (i.e., downtown business district).

	Rank	Median Value	Mode
Question 1	1	1.1	Carpool
	2	1.3	Express bus
	3	2.3	Regular bus
	4	3.0	Shared-ride taxi
	5	4.3	Regular taxi
	6	5.2	Rent-a-car
Question 4	1	1.3	Regular bus
	2	1.5	Vanpool
	3	2.2	Rail
	4	3.1	Shared-ride taxi
	5	4.5	Regular taxi
	6	5.1	Rent-a-car

1 = Most Desirable 6 = Least Desirable

The median score would be the 25th score; thus, the median value would be 3.67 since the 25th score aligned with rating 3 plus 10/15 or .67 of the distance from 3 to 4.

The ratings of question one could be expected after analyzing the responses of the semantic differential scale for the same question. The ratings show that officials consider carpooling the best form of transit, followed closely by express busing, with regular bus service third. Once again--with the possible exception of attitudes toward shared-ride taxi and regular bus service--this rating matches the attitudes expressed by the research on para-transit characteristics as reported in Chapter II.

Question four also exhibited a demand situation that was developed to represent a high-density home-to-work market segment. The major differences from question one were that no income range was specified and the destinations were not in differing areas. This situation would seem advantageous to regular bus service. Transit officials apparently recognized this advantage since they indicated regular bus serivce as the most desirable. Also, as Table V-2 reveals, 93 percent advocated carpooling service as being helpful or very helpful for providing service for this market segment. This demand, however, also fits the characteristics of vanpool services. Apparently, the transit officials agree, since 91 percent reported that vanpools were favorable in this situation. The transit officials also indicated that rail (67 percent) and shared-ride taxi (66 percent) service would be at least

helpful in this situation. The characteristics of shared-ride taxi service seem conducive for meeting the demand in this segment. This was especially true if the trip was relatively short (e.g., two to three miles), or if the schedules of the residents were not compatible. Most transit officials believe that characteristics of rail were not conducive to this demand situation. Likewise, regular taxi service was viewed by the transit officials as not helpful (29 percent) or at best as having no effect (27 percent). The attitude toward regular taxi service was a major point of difference between the officials and the "experts". If the trips were relatively long (e.g., ten miles) and/or a personalized service was not demanded, then there would be no disagreement. However, if a personalized service was required and, even more importantly, if the trips were relatively short (two to three miles), the taxi service characteristics would be compatible with this demand. Since the explanation of the question does not give these criteria precisely, no conclusive judgment can be made. Yet, there seems to be a discrepancy between recognition of benefits of taxi services and the actual benefits. Only 17 percent of the officials conceded any benefit to taxi service. This seems low compared to the potential for service taxi operations exhibit (see Chapter II).

Again, the test of peer evaluation shows that certain modes exhibited significantly different responses than could

be expected, given the total number of responses at that level of benefit. The major contribution to the calculated statistic came from a large number of favorable responses for regular bus, rail, and vanpool service. Another major contribution came from the unexpectedly large number of unfavorable responses to rent-a-car services. These findings support the previous analysis and generally agree with the feelings of the experts in the field cited in Chapter II.

2. Low density travel demands. The next potential market for para-transit analyzed was low density travel demands. While this segment's needs were not as visible as high density commuter needs, it was recognized as perhaps the most productive area for instituting a wide range of para-transit services. For this reason, this market was broken into four areas and each area was devoted a question in the questionnaire. The four areas are:[5]

   A. low density home-to-work trips;

   B. low density one-way trips;

   C. low mobility transportation needs; and

   D. off-peak travel in what was high-density area.

A. Home-to-work. Question five dealt with low density work trips (see Table V-4). Experts think that this market can best be served by pre-arranged ride-sharing modes. The

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[5]Kirby, Ronald, et al., "Para-transit: Neglected Options for Urban Mobility," Department of Transportation, Washington, DC, June 1974.

TABLE V-4

RESULTS OF QUESTION PERTAINING TO LOW DENSITY TRAVEL DEMANDS IN A HOME TO WORK DEMAND SITUATION

Question 5: Trips to work from a sparsely populated residential area to various work locations that are at least ten miles from the person's home.

Semantic Differential Results

Number of Responses / Percentage

Mode	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	No Response
Regular bus	26/22	52/44	10/8	20/16	4/3	5
Rail	12/10	24/20	14/11	34/28	16/13	16
Vanpool	60/50	48/41	0/0	8/7	0/0	0
Regular taxi	2/2	22/18	38/32	30/25	16/13	8
Carpool	58/49	54/45	4/3	0/0	0/0	1
Shared-ride taxi	6/5	64/54	16/13	18/15	4/6	5

n=98

Relative Rating Results

Rank	Median	Mode
1	1.2	Carpool
2	1.3	Vanpool
3	3.0	Regular bus
4	3.2	Shared-ride taxi
5	5.0	Rail
6	5.5	Regular taxi

1 = Most Desirable 6 = Least Desirable

results from the survey indicate that the transit officials agree. Table V-4 contains the semantic differential scaling results and the relative (and medium) value of the modes from question five. Carpool and vanpool services were rated one and two, relative to all other modes with 94 percent and 91 percent (respectively) of the responses. This indicates that these modes were favorable in this demand situation. Once again the majority (66 percent) of the transit officials indicated that regular bus service was at least helpful in this area. However, only 22 percent felt it would be extremely helpful. The characteristics of regular bus service were not conducive to this market segment since it would be difficult to strategically locate pick-up points convenient for passengers. Shared-ride taxi service, viewed favorably by 59 percent of the officials was far greater than the 20 percent who felt that regular taxi service would be helpful. However, shared-ride taxi service ranks fourth among the modes for offering service. This ranking was compatible with the feelings of those experienced with para-transit services because the distance was greater than ten miles.

The peer group analysis of question five substantiates the analysis of the same question. The contingency chi-square test was significant with the major contributions to the statistic coming from high numbers of favorable responses for vanpooling and carpooling.

B. One-way low density demand. Table V-5 contains data from question eight which represents one-way low density travel demand. The example used concerned trips to an inter-city passenger facility, such as an airport. This segment of the low-density market demand services seemed best satisfied by the hail-or-phone modes, such as regular taxi service or rental-car service. Again, a definite preference was shown by the transit authority members. They ranked express bus service first and viewed it favorably 83 percent of the time. This choice did not agree with the transit authorities referred to in Chapter II, since the diverse origins of the trip were conducive to a more flexible mode. The next two rankings, a regular taxi service and shared-ride taxi service, and their respective percentage of favorable votes, would tend to agree with the transit experts. However, the poor showing of rental-car service in this situation did not corroborate the match of rental car characteristics with this market segment demand.

C. Handicapped and limited mobility. The third segment of the low density demand market includes handicapped and/or limited mobility groups. This group was perhaps one of the most difficult transit groups to deal with since many need specialized equipment. However, those groups who do not need the special equipment have found the para-transit modes have potential for answering portions of their transportation problems. Question seven was designed to gain transit

TABLE V-5

RESULTS OF QUESTION PERTAINING TO LOW DENSITY TRAVEL DEMANDS IN A ONE-WAY DEMAND SITUATION

Question 8: Trips from business establishments or home to inter-city transportation facilities (e.g., airports).

Semantic Differential Results

Number of Responses / Percentage

Mode	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	No Response
Carpool	10/8	24/20	26/22	40/34	6/5	9
Rent-a-car	8/6	40/33	16/14	30/25	8/6	14
Regular bus	20/17	62/52	18/15	10/8	0/0	8
Regular taxi	48/40	56/48	2/2	4/6	2/2	0
Shared-ride taxi	44/37	54/45	6/5	2/2	2/2	7
Express bus	66/56	39/25	6/5	10/8	0/0	4

n=98

Relative Rating Results

Rank	Median	Mode
1	2.3	Express bus
2	2.9	Regular bus
3	3.1	Shared-ride taxi
4	4.3	Regular bus
5	5.5	Rent-a-car
6	5.6	Carpool

1 = Most Desirable 6 = Least Desirable

officials' views concerning the applicability of para-transit modes to the limited mobility group's transportation needs. As Table V-6 indicates, para-transit services--especially pre-arranged services such as vanpool (85 percent) and shared-ride taxi (85 percent)--were the choices of the transit officials. These modes were followed by regular taxi-service which had 79 percent favorable responses. This outcome was substantiated by the relative rating of the various modes (Table V-6): vanpooling first, shared-ride taxi second, and regular taxi third. However, the outcome of the peer group analysis was not as clear as had been the case in previous tests. The contradiction in the analysis arises because while the test was significant, the major contribution to the chi-square statistic did not come from the variables receiving an unexpectedly (greater than chance) high percentage of favorable responses when analyzed independently. Rather, the 58 percent of the total variability represented in the rental car responses was due primarily to the strong feeling against the usefulness of this mode in this demand situation. This did not verify the former analysis and raises some question about the significance of the recognition of peer acceptance of certain modes to meet the demand of this market segment. Consequently, it is with reserve that one might observe that within the responding group of transit officials (relative peer evaluation), the modes of shared-ride taxi, vanpool, and regular taxi illustrated an unexpectedly high number of

TABLE V-6

RESULTS OF QUESTION PERTAINING TO HANDICAPPED
OR LIMITED MOBILITY GROUPS

Question 7: Trips by handicapped or elderly persons from home to rehabilitation centers, meetings or shopping centers.

Semantic Differential Results

Number of Responses / Percentage

Mode	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	No Response
Regular bus	10/8	60/51	8/7	30/25	8/7	7
Vanpool	52/44	48/41	2/2	10/8	0/0	1
Rent-a-car	0/0	4/6	24/20	58/49	24/20	1
Regular taxi	32/27	62/52	6/5	8/7	6/5	0
Carpool	12/10	58/49	12/10	24/20	8/7	0
Shared-ride taxi	44/37	56/48	6/5	2/2	4/3	1

n=96

Relative Rating Results

Rank	Median	Mode
1	0.0	Vanpool
2	1.8	Shared-ride taxi
3	2.3	Regular taxi
4	3.2	Carpool
5	3.5	Regular bus
6	5.4	Rent-a-car

1 = Most Desirable 6 = Least Desirable

favorable responses when compared to the general distribution of replies. Whereas, it could be stated without reserve that definite opinions were exhibited on the semantic differential scale and that these opinions tended to agree with the information compiled from experts in the para-transit field.

D. Low-density off peak. The fourth segment of the low density travel market analyzed was off-peak travel in an urban area that, during peak times, was a high-density travel demand area (question two). The transportation experts felt that regular or shared-ride taxi service and carpool service provide the service characteristics that meet this demand (see Chapter II). Table V-7 contains the results of question two. The transit officials' replies to this question indicated that while they recognized the advantages of modes such as taxis and carpools, they felt that regular bus service was the best mode to meet this demand; consequently, they rated it as the most desirable in this situation with 86 percent indicating that regulated bus service could have a favorable effect on the expected travel demand of this market. Regular taxi service was next in the relative ratings, with 70 percent of the officials believing it would meet the demands of this segment. Aside from the confidence in regular bus service in this situation, the officials agreed with the transit experts in their evaluation of the effectiveness of the other modes. While the peer group anlaysis was significant, the major contribution to the calculated value came from the

TABLE V-7

RESULTS OF QUESTION PERTAINING TO LOW DENSITY TRAVEL DEMANDS IN A LOW DENSITY OFF PEAK DEMAND SITUATION

Question 2: Local trips (e.g., to grocery store) in densely populated medium to high income area ($18,000 to $25,000).

Semantic Differential Results

Number of Responses / Percentage

Mode	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	No Problem
Regular taxi	22/19	60/51	16/14	10/8	4/3	8
Shared-ride taxi	16/14	48/41	26/22	16/14	4/3	9
Regular bus	32/27	70/59	4/6	4/6	4/3	2
Carpool	18/15	46/39	24/20	22/19	0/0	0
Rent-a-car	0/0	8/7	32/27	50/42	12/10	17
Express bus	8/7	14/11	24/20	54/46	8/7	2

n=103

Relative Rating Results

Rank	Median	Mode
1	2.3	Regular bus
2	3.0	Regular taxi
3	3.3	Carpool
4	3.4	Shared-ride taxi
5	4.4	Express bus
6	5.9	Rent-a-car

1 = Most Desirable 6 = Least Desirable

dissatisfaction with rent-a-car and express bus service rather than from satisfaction with any particular mode. As in the analysis of question seven, this discrepency does not detract from analysis of the semantic difference scale and rating scale--especially since the unfavorable attitude toward the benefit of these modes was compatible with the ability of the service characteristics of these modes to meet the demands found with this situation.

In three of the four segments of this group of low-density travel demand markets, the results of transit officials agreed with the attitudes of the para-transit authorities cited in Chapter II. This agreement infers that in these demand situations the transit officials exhibited a comparatively substantial knowledge of the characteristics of the various modes as well as an understanding of the needs of the various demand situations. The one exception to the consenses of opinion was the one-way low density travel demand. This might be explained by an unfamiliarity with the situation.

3. Access to line haul demand. A third area that potentially exhibits demand for para-transit services was access to line-haul transit routes. Carpools, subscription bus, taxi and dial-a-ride services might serve as feeders to line-haul transit systems. Question nine was designed to gain the transit officials' attitudes toward the use of para-transit as a feeder to line-haul services. Table V-8 contains the results of question nine. The relative ratings of the six

TABLE V-8

RESULTS TO QUESTION PERTAINING TO AN ACCESS TO LINE HAUL DEMAND SITUATION

Question 9: Trips made from home to congregation point (e.g., city parking lot) which is located along an existing regular bus route.

Semantic Differential Results

Number of Responses / Percentage

Mode	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	No Response
Rent-a-car	0/0	8/7	16/14	64/54	16/14	6
Carpool	64/58	36/30	6/5	2/2	0/0	0
Regular taxi	4/3	66/56	18/15	12/10	10/8	3
Vanpool	60/51	44/37	6/5	0/0	0/0	2
Rail	2/2	16/14	26/22	42/36	10/8	16
Jitney	42/36	46/39	14/12	0/0	0/0	8

n=95

Relative Rating Results

Rank	Median	Mode
1	2.2	Carpool
2	2.7	Vanpool
3	3.3	Jitney
4	4.3	Regular taxi
5	5.7	Rail
6	5.8	Rent-a-car

1 = Most Desirable 6 = Least Desirable

alternative modes ranked the three para-transit modes one, two, three with carpooling first, vanpooling second, and jitney service third. This ranking was compatible with the suggested attitudes of the transit experts. Likewise, the semantic difference scale shows that 88 percent of the transit officials thought that carpooling or vanpooling would be advantageous in this situation, while 75 percent believed that a jitney operation would be beneficial. On the other hand, essentially all respondents agreed that a rail or rent-a-car service would, at best, have no effect on the situation. The contingency chi-square test verified these independent tests. The peer group analysis also proved significant, and the contribution to the calculated statistic was attributable to a large number of favorable responses in the para-transit modes and few responses in the remaining modes.

This analysis of line-haul para-transit potential indicates that the transit officials had an understanding of the service characteristics that were needed to satisfy such a demand and the modes that can provide such characteristics.

4. Intra-urban travel. Finally, today's congested business districts provide a final potential market for para-transit services. The travel demands of a commercial district may be met by vehicles that operate along semi-fixed routes (jitney) or by services that can be hailed or phoned while cruising. Another possible alternative for these demands was rental car; however, because the large system of vehicles

and terminals required for such a service did not exist, it is highly unlikely that this mode would be recognized as beneficial. Table V-9 contains the results of question six, which was designed to obtain information concerning transit officials' attitudes toward the benefit of various modes in commercial transit demand situations. Once again, the transit officials generally agreed with noted authorities in the transit field. For example, 74 percent felt that taxi service would be of some assistance and 69 percent felt that a jitney operation would be at least helpful in meeting this demand. The positive attitude toward jitney service was especially interesting since jitney operations were not legal in many of the urban areas analyzed. The relative rating of the modes revealed that jitney service was ranked first, followed by regular taxi service. This order compares quite favorably with the ranking that would be obtained by matching the service characteristics of the alternative modes with the needs of this demand situation. The transit officials also indicated a strongly favorable attitude toward regular bus service as a very helpful mode of transit in this situation. In fact, 84 percent of the respondents indicated that this service would be helpful; but, it was ranked third among the six alternatives given as potential modes to meet this demand.

The peer group analysis verifies the independent trends observed and tested. The contingency test was significant

TABLE V-9

RESULTS OF QUESTION PERTAINING TO
INTRA-URBAN DEMAND SITUATIONS

Question 6: Trips made from office to office in congested downtown area during business hours.

Semantic Differential Results

Number of Responses / Percentage

Mode	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	No Response
Regular taxi	42/35	58/49	2/2	2/2	10/8	3
Carpool	0/0	12/10	24/20	65/54	10/8	7
Shared-ride taxi	12/10	48/40	18/15	24/20	10/8	6
Regular bus	42/36	68/58	4/3	2/2	0/0	0
Jitney	56/47	26/22	12/10	10/8	2/2	10
Rent-a-car	2/2	10/8	10/8	46/38	34/28	5

N=99

Relative Rating Results

Rank	Median	Mode
1	1.5	Jitney
2	1.8	Regular taxi
3	3.4	Regular bus
4	4.3	Shared-ride taxi
5	5.5	Carpool
6	6.2	Rent-a-car

1 = Most Desirable 6 = Least Desirable

with the major contribution of the sums of squares coming from the cells that proved significant using the independence tests.

5. Fixed-route, fixed-schedule demand. The final question (number three) dealt with a situation where transit demands were primarily suitable for regular bus service or express bus service. While vanpools might be acceptable, the transit demands of this situation were best met by one of the bus services. Table V-10 indicates that regular bus service, express bus service, and vanpool service were rated extremely helpful 23 percent, 85 percent, and 54 percent of the time (respectively). The relative ratings verified these results by selecting express bus service first, vanpooling service second, with regular bus service third. The peer group analysis supported the previous findings with the major contributions to the calculated statistic coming from favorable responses to the express bus and unfavorable responses to rent-a-car. These results agreed with the transit experts' opinions as reported in Chapter II, with the possible exception of the ranking of regular bus service in third place and vanpool service in second. This result leads to an interesting speculation concerning the reasons for such a result. This will be discussed in Chapter VI with the conclusions from that analysis.

QUESTION V-10

RESULTS TO QUESTION PERTAINING TO FIXED-ROUTE, FIXED-SCHEDULE DEMAND SITUATIONS

Question 3: Trips made by residents of a densely populated area (e.g., apartment complex) to an industrial park complex at least ten miles away.

Semantic Differential Results

Number of Responses / Percentage

Mode	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	No Response
Regular taxi	2/2	18/15	30/25	42/36	18/15	6
Vanpool	64/54	42/36	2/2	0/0	4/6	2
Regular bus	28/23	74/62	4/6	8/7	0/0	0
Express bus	100/85	12/10	2/2	2/2	0/0	1
Rent-a-car	2/2	4/3	32/27	34/28	22/19	11
Jitney	24/20	62/52	4/6	8/7	2/2	13

n=100

Relative Rating Results

Rank	Median	Mode
1	1.8	Express bus
2	2.6	Vanpool
3	3.6	Regular bus
4	3.9	Jitney
5	5.4	Regular taxi
6	5.8	Rent-a-car

1 = Most Desirable 6 = Least Desirable

III. SUMMARY

The analysis provided in this chapter yields evidence that the transit officials responding to the survey had an understanding of the characteristics of para-transit modes as well as recognizing the needs of the different market segments depicted in the nine demand situations. A few of the market segments provoked differences of attitudes between transit officials and transit experts. The most notable was the favoring of regular bus and express bus operations in segments such as one-way low density demand areas and high density travel to diffuse areas. However, a comprehensive view of the analysis presented in this chapter infers that the transit officials were in relative agreement with the transit experts.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

I. INTRODUCTION

The intent of this research effort has been to:

1. analyze the regulatory ordinances of selected cities to determine if existing regulation impeded the implementation of selected para-transit services; and
2. determine if local officials in these selected cities are aware of the selected para-transit services such as taxi, car/vanpool and dial-a-ride service.

The results of this study have several important implications which concern the legal framework of urban transit regulations: the knowledge of the urban transit regulators concerning the service characteristics of various para-transit modes and the needs of potential para-transit markets. Conclusions are drawn concerning the legal restraints found in the various city ordinances and the recognition of local urban transit officials concerning para-transit services. Also, recommendations concerning further research and possible new approaches for solving related problems of implementation of para-transit modes as a viable alternative in the spectrum of transportation services offered in an urban area are presented.

II. CONCLUSIONS

The ordinances, coupled with personal interviews and the research questionnaire, uncovered many obstacles to implementing para-transit as

well as revealing other information that led to the following conclusions:

1. Independent transit authorities were granted much broader, less-structured regulatory powers over urban transit than municipal transit authorities. Generally, the private transit authorities were given guidelines concerning regulation of all urban passenger transit. Municipal authorities, on the other hand, were granted much stricter regulatory control and usually did not cover the complete range of transit services available to the public transportation market. Thus, the private transit authorities were better able to implement para-transit services because they were in a position that enabled variation in interpretation of regulatory guidelines, whereas municipal authorities' regulatory powers were spelled out precisely, thereby permitting only limited variation in interpretation. This structured authority, in turn, required amending the ordinances to allow implementation of new services. This process rendered the rapid compliance to market demand practically impossible.
2. While independent transit authorities had the power to regulate all types of public transit in their jurisdictional area, very few exercised power over any service other than traditional bus and sometimes express bus service. This fact was emphasized when most authorities sent only traditional bus regulations upon request for legislation governing all public transportation in their urban area. This leads to one of two conclusions: (A) transit authority members did

not realize the advantages of other forms of service; or (B) they did not feel that services offered by modes such as car/vanpooling were presently a significant portion of urban transportation supply of service. The first alternative was dispelled by the transit officials' replies to the questionnaire discussed in Chapter V. This leaves the second alternative, which was verified by discussions with various transit officials. These officials indicated that para-transit services had use in the future, but most saw little use for them at the present time.

3. The operation of urban public transit was generally placed under the control of an independent management company. This private control could adversely affect the implementation of para-transit service because public transit was viewed only as regular bus operations; consequently, the manager of such a service would do all in his power to not permit the existance of a competing service. Since the usual method of remuneration for the operating companies is to pay 4 to 8 percent of the operating revenue to the management company, the manager could be protecting his company's interest, thus neglecting para-transit. Naturally this is an incentive to increase the operating revenue rather than provide increased service at a similar cost by evaluating needs of the potential transit users or by decreasing costs through cutting service in non-profitable areas.

Where independent operations were granted to transit authorities, many different methods of financing were

discovered. Some used property and/or real estate taxes, while others issued bonds; but all depended on fare box collection and state and federal grants. Different methods of financing exert different pressures on the operation of a transit system. For instance, if the system depended heavily on grants, it had to adhere to the fund granting agencies' criteria of operations; however, these may or may not meet the needs of the particular urban area. In contrast, if the system depends on taxes as its major source of income, it will--in all probability--attempt to satisfy the perceived needs of the area that pays the largest portion of the taxes. Once again, this may not place the service where it is most needed, especially if a large captive ridership was found and represents low-income categories. Finally, if the transit service operated on funds primarily from fare box collection, it was most apt to meet the ever fluctuating demands of the transit market. This last type of funding operations was the most conducive to prompting the experimentation of implementation of para-transit services since para-transit modes demand matching of mode characteristics with service characteristics demanded in the market place. This responsiveness would allow for yielding different types and levels of service to meet differing demands. Theoretically, this would yield maximum revenues and minimum costs for meeting the transportation demands of all those interested in using public transportation with a mode that does not offer excess

seating capacity (i.e., meeting low-density demands by traditional fixed-route, fixed-schedule service).

4. Schedules, routes, and fares were fixed by most of the ordinances and by design were relatively inflexible. This legal situation presently impedes implementation of para-transit services, such as express bus and van/carpools. For example, if a schedule cannot be altered to meet changing demand patterns, the service will lose its ability to meet the demands of the transit market place. Likewise, if the schedule can be altered, but if the process requires a great deal of time, the service is once again not meeting the immediate needs of the transit market. As mentioned in Chapter IV, a few of the urban areas reporting in this study, realizing the need for this flexibility, were using express bus or charter bus operations to overcome the inflexible, time-consuming procedures that were presently mandated by the existing ordinances.

The need for greater flexibility of routes, fares, and schedules was recognized by a few urban areas that exhibit independent transit authority control. These urban transit authorities allowed the operations departments of their authority to offer temporary alterations on an experimental basis with subsequent approval of the transit board necessary if the change were to be permanent. From the para-transit service point of view, this procedure is advantageous because it allows for immediate route and schedule alterations

dictated by changes in the market place. The procedure also was attractive from the legislators' point of view since it allows for stability in transit service, which was essential as long as transit was viewed as a public service. This procedure was promising because it met demands of the captive and non-captive transit rider. While recognition of this need was commendable and the idea of using express buses to side-step the issue was enlightening, the problem of cumbersome, inflexible schedules, route and fare alterations still hampers the implementation of para-transit service in many areas' studies.

5. All but two of the municipally regulated transit systems essentially prohibit shared-ride taxi service. Four outlaw it specifically. Of the four remaining municipally regulated transit systems, two require a meter system for calculation of taxi fares. This type of fare calculation procedure was not conducive to para-transit service offered by shared-ride taxi operations. With a meter system, multiple meters were necessary for fair calculations if shared rides occurred since the riders normally did not have the same origin and/or destination. Since other fare calculation procedures exist (i.e., zone calculation system) that have been satisfactorily used in many taxi operations, the multiple meter system was an unneccessary obstacle to the implementation of shared-ride taxi service.

6. No transit ordinance mentioned carpooling, vanpooling or buspooling. The transit managers in the urban areas indicated that pooling caused little or no problems; however, potential difficulties were numerous. The varying types of pooling arrangements could fall into categories of other services. For example, vanpools with twelve or more passengers were technically classified as traditional bus operations and therefore would require certificates of need to be legal. This requirement would stifle the flexibility of the mode's service and consequently detract from the advantages it has to offer. Likewise, carpool service can potentially be viewed as shared-ride taxi service, which was illegal in many urban areas. This would suggest regulations that were designed for protection and/or promotion of one mode would be used on a different mode with different characteristics. Consequently, as long as no legislation existed to regulate these pooling services, the potential legal elimination or, at best, severe restriction of this type of service was possible. It was interesting to note that while no ordinance specifically mentioned pooling, at least two of the urban areas that had private transit authorities had actively promoted and supported a carpool program. This would lead one to conclude that the private transit authorities, who generally had a wide scope of legislative power, feel that pooling is under their jurisdiction and were in support of it. These two urban areas (Denver, Colorado and Portland, Oregon) had

not, as yet, amended their ordinances to grant statutory regulatory power over pooling. This omission leaves the service vulnerable to restrictive legislation in the future if members of a future transit board view pooling differently.

7. Jitney service was illegal in all but two of the participating urban areas exhibiting municipal control. Obviously, this is an obstacle to implementing para-transit service since jitney operations were viewed as a para-transit service. Many of the demands jitney service could theoretically serve (low density demand or commercial district transit demands) were areas that presently burden traditional transit services. By allowing for experimentation of jitney service, non-profitable routes presently being sustained by traditional transit might be eliminated without eliminating service to low density demand areas. The urban areas having private transit authorities had essentially ignored the regulation of jitneys. The officials in these urban areas viewed the jitney service as predatory on the traditional bus operations, and they did not feel this service was needed.

8. In all but one of the urban areas that could make a choice between municipal and independent transit authorities, the urban government(s) chose the independent transit authorities. Since this regulatory form presents the fewest obstacles to implementation of para-transit service, it would seem that this choice would open the way for para-transit operations. However, the main reason for selecting this type of governing

form (according to the transit officials questioned) was that independent authorities were most successful at attracting governmental grants. The move toward independent authorities can be detrimental to implementing para-transit services if the agencies do not desire the use of para-transit modes and obstruct implementation of the service. Consequently, the outcome of this trend remains to be seen.

9. In general, it was evident that transit officials and experts in the transit field shared similar attitudes concerning para-transit services ability to meet the demand segment of high density home-to-work trips. This market segment was important, since it was the segment that caused most of the peak hour problems. Consequently, knowledge of appropriate modes for satisfying this segment could aid in many of the urban transit market areas. One interesting result of this section of the questionnaire was the acknowledgement of shared-ride taxi service as a potential supplier in this segment. The shared-ride service meets the demand if the distance was not long (e.g., two or three miles). The officials realized the attributes of this service and suggested that it was one of the three best modes to meet this demand.

10. Low density demand markets were divided into four segments. Only one of these segments, one-way trips, exhibited responses that disagreed with the authorities cited. This demand segment was designed to analyze the transit official's perception of demand created by facilities such as airports or

train stations. Also, it enabled analysis of the perception of the modes which could best serve the demand. The officials indicated that express bus services could best meet the demand. This was true only if origins could be consolidated and schedules matched. In the general case, services offered by taxi or rent-a-car were most helpful. One explanation of this discrepancy might be that transit officials had a lack of experience with this type of demand since many of the areas in the study did not have comparable demand situations (one-way trips--i.e., airport service).

11. In six of the eight demand situations that offered regular bus service as an option, regular bus service was ranked at least third. This indicates that transit officials adhere to the idea that overall, regular bus operations were capable of offering services to meet a wide range of demand. Another possible explanation for this was that the funding structure[1] of the governmental agencies was designed to foster transit as it has been historically described (fixed-route, fixed-schedule services).

12. Regulations concerning shared-ride taxi service and jitney service do not conform to the attitudes of a majority of the transit officials reporting in this study. These services were available in only a few of the areas studied because of statutory law or fare structures. Yet, the

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[1]Hilton, George, "Federal Transit Subsidies," American Enterprise Institute for Public Policy Research, Washington, DC; June 1974.

transit officials recognized the need for services exhibited by these modes.

13. Transit officials indicated a preference toward personalized transit operations rather than traditional, inflexible services. The officials selected express bus operations and vanpool operations ahead of traditional bus service. These services (express bus and vanpool) exhibit all of the characteristics required to meet the demand plus flexibility in route and schedules, which were gained in para-transit modes. This selection infers that transit officials feel these characteristics were desirable in meeting a demand situation that technically could be met by a less service-oriented mode (i.e., regular bus). This was especially interesting since the transit officials rated regular bus service in relatively the same position in demand situations whose needs do not match the service characteristics possessed by traditional bus operations. This ranking along with the results of question nine (intra-urban demands), which gave regular bus service a very high percentage of favorable responses but ranked it third, indicates that transit officials feel regular bus service was advantageous in a wide range of situations. However, when it was compared with modes exhibiting similar characteristics, it was not the most desirable for meeting the needs of the demand situation.

III. RECOMMENDATIONS

This section of Chapter VI uses the information presented in the conclusions to make recommendations concerning possible amendments to existing ordinances and concerning the educational needs of transit officials.

1. Research should be performed that will aid in the creation of exemplatory legislation concerning pooling activities. It is impossible to state, without investigation for specific areas, the form of these regulations. However, it can be suggested that demand characteristics of the prevailing market segments be surveyed and that legislation be created that allows experimentation of pooling service to be used in conjunction with other transit services. This legislation is a necessary addition to the municipal transit ordinances that presently neglect pooling service arrangements.
2. If municipally regulated transit services continue having private companies operate their transit fleet, concentrated research must be focused on remuneration methods. Since the payment by percentage of fare box contains many dis-incentives to the use of para-transit, more advantageous methods to enhance the service offered by the transit operations should be investigated. Some methods of remuneration may include incentive payments for: (a) increased ridership; and (b) decreased cost.

3. Research should be undertaken concerning procedures for altering routes, fares, and schedules for traditional and para-transit modes. Transit service is available for the public use and certain riders are compelled to use public transit operation. The transit service consequently must have a certain degree of stability to insure rides for captive passengers. On the other hand, demand patterns and needs are constantly changing; thus, the routes, schedules, and fares of transit systems must be able to reflect the demands of the current transit market place. It also would be beneficial if a general procedure for fare calculations could be developed. This procedure would need to be flexible enough to fit many urban areas, but precise enough to alert legislators to the criteria and needs of an equitable fare structure.
4. The benefits of jitney operations should be applied to the needs and potential needs of many urban markets. If it seems that jitney service might be advantageous to the market and can be used in conjunction with the other transit services in the market place, then investigation concerning appropriate steps for implementation of jitney service is necessary.
5. Since transit officials realize the advantages of services offered by modes such as jitney and shared-ride taxi operations, it is recommended that methods of amending ordinances to legalize these operations be suggested to the transit regulating bodies in areas where such services are illegal.

In areas where the service is legal or not mentioned in the legislation, research is needed that will investigate the educational process which will prompt the use of such services.

6. Research should be initiated to investigate the power that funding of transit services has exerted on the formulation and integration of the various services available for public transportation.

7. The potential value of integrating transit services should be explained to the public officials who interpret regulation to form transportation policy. It is clear that transit officials have an understanding of the service characteristics of the various forms of transit and the markets they can serve. However, little--if any--work has been done that would clarify the expected results of using different modes to satisfy different demands.

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APPENDICES

APPENDIX A

GLOSSARY OF TERMS*

Bus service (express): A service offered by a 45 to 50 passenger vehicle that operates from a few pick-up points to one destination without intermediate stops, usually sharing premium fares.

Bus service (traditional): A service offered by a 45 to 50 passenger vehicle that operates over a fixed route on a fixed schedule.

Carpool service: A service where a group of people share their automobile transportation to designated destination. They may share driving or have one driver and share expenses.

Jitney service: A service provided by a loosely regulated roadway transit system where small vehicles operate similar to taxis except passengers do not command exclusive use of the vehicles and vehicles follow a semi-fixed route but are not scheduled.

Rental service: A service where an individual can rent the desired vehicle and return it to designated area at prearranged time.

Taxi service: A service offered by an automobile (one to five passengers) or van (twelve to fifteen passengers) offering demand responsive public passenger vehicle for hire on a shared or nonshared ride basis.

*Terms and definitions were taken from "Urban Public Transportation Terms for Planners and Operators," Transportation Research Board, September 1975.

Transportation Center
Research/Service

The University of Tennessee
Knoxville, Tennessee 37916
Phone (615) 974-5255

APPENDIX B

November 3, 1975

Office of the Governor
State of _____
_____

Your Honor:

The University of Tennessee under Urban Mass Transportation Administration funding is performing research concerning the legal framework of urban transit. Your state has been chosen as one of our study areas.

This research will cost your office no money. The only request that we make is that your office send us a copy of your State Legislation that regulates urban transit. If any duplication fees are incurred, please feel free to bill us.

Sincerely,

Richard T. Symons
Research Assistant

RTS:dc

Transportation Center
Research/Service

The University of Tennessee
Knoxville, Tennessee 37916
Phone (615) 974-5255

APPENDIX C

January 9, 1976

Honorable Mayor of _____
City Hall

Dear Mayor:

Your city has been selected as a study city for a research effort that is being performed by The University of Tennessee in conjunction with the Federal Urban Mass Transportation Administration.

The time and effort that is expected of your staff is essentially zero. All that we are requesting is a copy of the ordinance(s) that governs your city's transit system, public and private, and the names of the members of your Transit Authority or Transit Board.

If any charges are incurred for duplication, please feel free to bill the Transportation Center at The University of Tennessee. If you have any questions, please contact me at the above address or call collect (615) 974-6666.

Your prompt cooperation is essential since data collection will terminate on February 25, 1976.

Best personal regards,

Richard T. Symons
Research Assistant

RTS:dlc

Transportation Center The University of Tennessee
Knoxville, Tennessee 37916
Research/Service Phone (615) 974-5255

APPENDIX D

February 1, 1976

Honorable Mayor of _____
City Hall

Dear Mayor:

On January 9 you were sent a letter requesting the ordinance(s) that regulates public and private transportation in your city and the names of the members of your local transit officials.

To date we have not received a reply. Since data collection will be terminated on February 25, your immediate response is necessary.

If any duplication charges are incurred, please bill us.

If you have already mailed the requested information, please disregard this letter.

Sincerely,

R.T. Symons
Research Assistant

RTS:dlc

Transportation Center The University of Tennessee
Knoxville, Tennessee 37916
Research/Service Phone (615) 974-5255

APPENDIX E

April 14, 1976

Dear Transit Official:

Your state and city officials are participating in a research effort being performed by The University of Tennessee in conjunction with the Urban Mass Transportation Administration. This research is designed to evaluate your attitudes concerning the potential of various modes of urban mass transportation in different urban demand situations. Since you and your colleagues work closely with urban transportation, your ideas are vital to this research.

In order to minimize the time you must spend relating your ideas, a short questionnaire has been developed. This brief questionnaire is designed to allow you to share with us your ideas on the propensity of various modes of urban transit to serve certain demand situations.

If this research is to be beneficial, your cooperation is necessary. Your responses will be handled with utmost discretion to insure privacy of your opinions.

When you have completed the questionnaire, please return it in the self-addressed envelope as soon as possible for data collection will terminate on May 15.

Sincerely,

R.T. Symons
Research Assistant

RTS:dlc

Enclosures

QUESTIONNAIRE

This questionnaire contains nine situations where different modes (i.e., services) could be used to meet transportation needs. Under each of the situations, six alternative services and a range of possible effects of each alternative are listed. Please check the effect you feel each service will have on each demand situation. Also, you are requested to rank the services for each situation.

EXAMPLE (Demand situation): A rural area that is sparsely populated and located a relatively long distance from work locations.

(Check how effective you feel each of the following services would be for satisfying the transportation demand found in the above situation.)

Service	Rating					
	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	Can't Say
	6	5	4	3	2	1
Carpool	X					
Vanpool		X				
Regular bus					X	
Express bus				X		
Rent-a-car			X			
Regular taxi		X				

This would indicate that you feel carpooling would be extremely helpful; vanpooling would be helpful; regular bus service would add to problem; etc.

(Please rank in order of how beneficial you feel each of the services is for meeting the transportation demand found in the above situation.)

Carpool	1	Express bus	4
Vanpool	2	Rent-a-car	6
Regular bus	5	Regular taxi	3

This ranking would indicate that you feel carpooling best answers the needs of the above situation and rent-a-car service would be the least effective.

DEMAND SITUATIONS

1. Trips to work from a densely populated medium to high income ($18,000 to $25,000) area where the residents work at different locations that are at least ten miles from their homes.

Service	Rating					
	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	Can't Say
	6	5	4	3	2	1
Regular taxi	_____	_____	_____	_____	_____	_____
Shared-ride	_____	_____	_____	_____	_____	_____
Taxi	_____	_____	_____	_____	_____	_____
Regular bus	_____	_____	_____	_____	_____	_____
Carpool	_____	_____	_____	_____	_____	_____
Rent-a-car	_____	_____	_____	_____	_____	_____
Express bus	_____	_____	_____	_____	_____	_____

Regular taxi _____ Carpool _____
Shared-ride taxi _____ Rent-a-car _____
Regular bus _____ Express bus _____

2. Local trips (i.e., to grocery store) in a densely populated medium to high income ($18,000 to $25,000) area.

Service	Rating					
	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	Can't Say
	6	5	4	3	2	1
Regular taxi	_____	_____	_____	_____	_____	_____
Shared-ride	_____	_____	_____	_____	_____	_____
Taxi	_____	_____	_____	_____	_____	_____
Regular bus	_____	_____	_____	_____	_____	_____
Carpool	_____	_____	_____	_____	_____	_____
Rent-a-car	_____	_____	_____	_____	_____	_____
Express bus	_____	_____	_____	_____	_____	_____

Regular taxi _____ Carpool _____
Shared-ride taxi _____ Rent-a-car _____
Regular bus _____ Express bus _____

3. Trips made by residents of a densely populated area (i.e., apartment complex) to an industrial park complex at least ten miles away.

Service	Rating					
	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	Can't Say
	6	5	4	3	2	1
Regular taxi	_____	_____	_____	_____	_____	_____
Vanpool	_____	_____	_____	_____	_____	_____
Regular bus	_____	_____	_____	_____	_____	_____
Express bus	_____	_____	_____	_____	_____	_____
Rent-a-car	_____	_____	_____	_____	_____	_____
Jitney	_____	_____	_____	_____	_____	_____

Regular taxi _____ Express bus _____
Vanpool _____ Rent-a-car _____
Regular bus _____ Jitney _____

4. Trips from a relatively densely populated area (i.e., housing subdivision) to an area with many work locations (i.e., downtown business district).

Service	Rating					
	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	Can't Say
	6	5	4	3	2	1
Vanpool	_____	_____	_____	_____	_____	_____
Shared-ride	_____	_____	_____	_____	_____	_____
Taxi	_____	_____	_____	_____	_____	_____
Regular bus	_____	_____	_____	_____	_____	_____
Rail	_____	_____	_____	_____	_____	_____
Rent-a-car	_____	_____	_____	_____	_____	_____
Regular taxi	_____	_____	_____	_____	_____	_____

Vanpool _____ Rail _____
Shared-ride taxi _____ Rent-a-car _____
Regular bus _____ Regular taxi ___

5. Trips to work from a sparsely populated residential area to various work locations that are at least ten miles from the person's home.

Service	Rating					
	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	Can't Say
	6	5	4	3	2	1
Regular bus	_____	_____	_____	_____	_____	_____
Rail	_____	_____	_____	_____	_____	_____
Vanpool	_____	_____	_____	_____	_____	_____
Regular taxi	_____	_____	_____	_____	_____	_____
Carpool	_____	_____	_____	_____	_____	_____
Shared-ride	_____	_____	_____	_____	_____	_____
Taxi	_____	_____	_____	_____	_____	_____

Regular bus ____
Rail _____
Vanpool _____

Regular taxi ___
Carpool _____
Shared-ride taxi _____

6. Trips made from office to office in a congested downtown area during business hours.

Service	Rating					
	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	Can't Say
	6	5	4	3	2	1
Regular taxi	_____	_____	_____	_____	_____	_____
Carpool	_____	_____	_____	_____	_____	_____
Shared-ride	_____	_____	_____	_____	_____	_____
Taxi	_____	_____	_____	_____	_____	_____
Regular bus	_____	_____	_____	_____	_____	_____
Jitney	_____	_____	_____	_____	_____	_____
Rent-a-car	_____	_____	_____	_____	_____	_____

Regular taxi _____
Carpool _____
Shared-ride taxi _____

Regular bus ____
Jitney _____
Rent-a-car _____

7. Trips by handicapped or elderly persons from home to rehabilitation centers, meetings or shopping centers.

Service	Rating					
	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	Can't Say
	6	5	4	3	2	1
Regular bus	_____	_____	_____	_____	_____	_____
Vanpool	_____	_____	_____	_____	_____	_____
Rent-a-car	_____	_____	_____	_____	_____	_____
Regular taxi	_____	_____	_____	_____	_____	_____
Carpool	_____	_____	_____	_____	_____	_____
Shared-ride	_____	_____	_____	_____	_____	_____
Taxi	_____	_____	_____	_____	_____	_____

Regular bus ____ Regular taxi _____
Vanpool _____ Carpool _____
Rent-a-car _____ Shared-ride taxi _____

8. Trips from business establishments or homes to intercity transportation facilities (i.e., airports).

Service	Rating					
	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	Can't Say
	6	5	4	3	2	1
Carpool	_____	_____	_____	_____	_____	_____
Rent-a-car	_____	_____	_____	_____	_____	_____
Regular bus	_____	_____	_____	_____	_____	_____
Regular taxi	_____	_____	_____	_____	_____	_____
Shared-ride taxi	_____	_____	_____	_____	_____	_____
Express bus	_____	_____	_____	_____	_____	_____

Carpool _____ Regular taxi _____
Rent-a-car _____ Shared-ride taxi _____
Regular bus ____ Express bus _____

9. Trips made from home to a congregation point (i.e., city parking lot) which is located along an existing regular bus route.

Service	Rating					
	Extremely Helpful	Helpful	No Effect	Not Helpful	Adds to Problems	Can't Say
	6	5	4	3	2	1
Rent-a-car	_____	_____	_____	_____	_____	_____
Carpool	_____	_____	_____	_____	_____	_____
Regular taxi	_____	_____	_____	_____	_____	_____
Vanpool	_____	_____	_____	_____	_____	_____
Rail	_____	_____	_____	_____	_____	_____
Jitney	_____	_____	_____	_____	_____	_____

Rent-a-car _____
Carpool _____
Regular taxi ___
Vanpool _____
Rail _____
Jitney _____

APPENDIX F

This appendix contains the calculated test statistic for the chi-square tests of independence that were performed on the replies to each potential mode of transportation for all nine demand situations presented in the questionnaire administered to the transit authorities. The hypothesis tested was:

$$H_o : p_o = 1/5$$

$$H_a : p_o \neq 1/5 \qquad i = 1, 5$$

The critical chi-square value with alpha equals .05 and four degrees of freedoms equal 9.49. The calculated values that follow all exceeded the critical values, thus all tests were significant. The calculated values follow:

Demand Situation 1

Trips to work from a densely populated medium to high income ($18,000 to $25,000) area where the residents work at different locations that are at least ten miles from their homes.

Mode	Calculated Chi-square
Regular taxi	14.78
Shared-ride taxi	54.72
Regular bus	37.39
Carpool	57.48
Rent-a-car	30.90
Express bus	53.11

Demand Situation 2

Local trips (i.e., to grocery store) in a densely populated, medium to high income ($18,000 to $25,000) area.

Mode	Calculated Chi-square
Regular taxi	43.46
Shared-ride taxi	24.72
Regular bus	73.97
Carpool	24.54
Rent-a-car	40.47
Express bus	34.33

Demand Situation 3

Trips made by residents of a densely populated area (i.e., apartment complex) to an industrial park complex at least ten miles away.

Mode	Calculated Chi-square
Regular taxi	20.35
Vanpool	75.26
Regular bus	82.03
Express bus	160.80
Rent-a-car	24.38
Jitney	62.60

Demand Situation 4

Trips from a relatively densely populated area (i.e., housing subdivision) to an area with many work locations (i.e., downtown business district).

Mode	Calculated Chi-square
Vanpool	75.07
Shared-ride taxi	76.49
Regular bus	86.95
Rail	28.71
Rent-a-car	30.96
Regular taxi	15.58

Demand Situation 5

Trips to work from a sparsely populated residential area to various work locations that are at least ten miles from the person's home.

Mode	Calculated Chi-square
Regular bus	28.90
Rail	16.40
Vanpool	74.80
Regular taxi	34.96
Carpool	43.48
Shared-ride taxi	10.88

Demand Situation 6

Trips made from office to office in a congested downtown area during business hours.

Mode	Calculated Chi-square
Regular taxi	57.82
Carpool	56.72
Shared-ride taxi	20.92
Regular bus	80.11
Jitney	42.75
Rent-a-car	34.19

Demand Situation 7

Trips by handicapped or elderly persons from home to rehabilitation centers, meetings or shopping centers.

Mode	Calculated Chi-square
Regular bus	43.91
Vanpool	58.11
Rent-a-car	47.99
Regular taxi	52.74
Carpool	37.12
Shared-ride taxi	58.46

Demand Situation 8

Trips from business establishments or homes to intercity transportation facilities (i.e., airports).

Mode	Calculated Chi-square
Carpool	17.47
Rent-a-car	19.69
Regular bus	51.08
Regular taxi	65.97
Shared-ride taxi	59.32
Express bus	64.35

Demand Situation 9

Trips made from home to a congregation point (i.e., city parking lot) which is located along an existing regular bus route.

Mode	Calculated Chi-square
Rent-a-car	60.30
Carpool	77.03
Regular taxi	57.26
Vanpool	71.62
Rail	24.91
Jitney	45.76

VITA

Richard Thomas Symons was born in Kingston, Tennesse on February 2, 1949. He attended public school at Toronto Public School, Toronto, Ohio, and was graduated in 1967. At that time, he entered West Virginia University and studied Economics. He graduated with a Bachelor of Science degree in Economics in 1971. He then entered the Master of Science curriculum with a major in in Statistics and minors in Computer Science and Business at West Virginia University and graduated in 1973. During this time he worked as a research assistant at the Appalachian Center at West Virginia University and contributed in the research of numerous social science research efforts. In 1973 he entered the Doctoral Program of the Business School at The University of Tennessee. During the next three years he was employed as a research assistant at the Transportation Center and worked on the research team for many urban transportation studies. In 1976, upon completion of all classroom requirements, he accepted a position at National Steel Corporation as Assistant Transit Manager. He is presently working there.