PUBLIC TRANSPORTATION FOR SMALL URBAN AREAS

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Public transportation systems in small urban areas have been experiencing economic difficulties for quite some time. The requirements for transit planning for small urban areas may be somewhat different from those of large urban areas. The priorities for public transportation in small urban areas will normally be different from those established for the larger metropolitan areas. This study of an urban area with a population of more than 100,000 was performed to establish the priorities for public transportation. As a result of the priority analysis, 14 alternative systems were evaluated. A very close cooperation was maintained with the political structure through the entire study. This led to an effective utilization of the transit planning proposals.

• MANY public transit operations today are in serious trouble. Numerous factors have led to the decline of public transit, and the end result has been deterioration of service. As revenue from the fare box declined and costs of providing service increased, service was cut back through increased headways and reductions in route coverage. Rolling stock was not maintained properly and renewed when it should have been. The result of the reduced level of service was further reductions in patronage; in many small urban areas, the final result was a minimal level of service. The system uses old equipment to serve mainly, and perhaps exclusively, the well-known public transit captive riders—the old, the young, the poor, and the handicapped—who have no alternative method of transportation available to them.

Many privately owned transit properties have ceased operations and gone out of business, with the result that the community is left with no public transit service. The probability of reinstating a public transit system once it has ceased operation is extremely low. With this in mind, it is essential that communities that might wish to provide transit service not let the existing service (regardless of how poor) stop. In many areas, the community has recognized the need and has assumed the provision of public transit service.

In small urban areas public awareness of the need for public transit service many times is not so prevalent as it is in large metropolitan areas. In large metropolitan areas, many persons must be moved into and out of the central business district (CBD) and other concentrated areas of human activity each day. These large numbers of persons cannot be accommodated during the peak hours by the private automobile alone, and public transit is a necessity. However, this is not the situation in small urban areas. The requirements for, and justification of, public transit are quite different in small urban areas. Persons desiring to drive their private automobiles into the CBD of a small urban area can usually be accommodated on the street system, although with some congestion during certain times of the day. However, the length of the congestion period is relatively brief and can be tolerated.

In providing public transportation in small urban areas, one should not expect to "convert" large numbers of automobile drivers. The reduction in automobile use would not generally be such that the reduction in congestion or pollution would be significant.

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It would be helpful in building a case for public transportation if one could cite examples of large payoffs resulting from decreased automobile use, but this has not been the case in smaller urban areas.

In small urban areas, as in large ones, there are always persons who, because of age or economic status, do not have access to an automobile. These persons are dependent on public transportation. By providing public transit in the small urban area, we can meet the transportation needs of persons not having access to automobiles. As an added benefit, if the level of transit service is high enough, perhaps some automobile users could be induced to use the service. The result may be that the number of spaces required for on- and off-street parking in the CBD and at other locations in the city may be reduced.

In large metropolitan areas, a high level of transit service can be provided because of the large number of riders. In these areas, automobile level of service is low relative to that found in small urban areas. Thus, the level-of-service ratio for large urban areas can be quite good. It is not uncommon to find 3- to 5-minute headways for subway and bus service. However, in small urban areas these same headways cannot be economically attained; there are simply not enough riders.

Generally, there is a high level of service for the automobile in small urban areas. The travel time for automobiles is low, and parking is quite good relative to that found in large urban areas. By using traditional transit systems, one cannot provide a level-of-service ratio in small urban areas that will favorably compare with a level-of-service ratio for large metropolitan areas. Thus, using traditional bus transit systems, one finds it difficult to compete with the automobile in small urban areas. In these small urban areas, something other than the traditional fixed-route, fixed-schedule system will have to be employed if one hopes to attract the general public. Such concepts as demand-actuated systems (dial-a-bus) will have to be implemented to provide a level of service high enough to perhaps attract some automobile users to public transportation.

Much of the funding from the Urban Mass Transportation Administration (UMTA) has been oriented toward improving traditional transit systems, i.e., solving large urban area system problems. This is especially true for the funding under the capital grants program. The research and development program under UMTA has permitted some work in demand-actuated systems. However, these demonstration programs have not been as successful as desired. If there are going to be improvements in public transportation in small urban areas, local citizens will have to be permitted to solve their own problems using solutions peculiar to their area. The use of capital grant funds to depart from traditional transit systems for small urban areas would be a step in the right direction to overcome the problems of providing a high level of service. The restriction of capital grant funds to traditional transit systems for small urban areas simply places public transportation at a great disadvantage. A high level of service with traditional means can never be economically provided in small urban areas. There is a need for innovative transit planning for small urban areas; traditional methods will not suffice.

The following case study of public transit planning in Lafayette, Indiana, provides an illustration of the type of planning that can and should be done for small urban areas (1).

CASE STUDY

The privately owned bus system operating in the Greater Lafayette Area (GLA) decided to discontinue service in the spring of 1970. The cities of Lafayette and West Lafayette purchased the franchise and assets of the company and agreed to operate the bus service for approximately 1 year. At the time of the take-over by the two cities, a request was made to Purdue University to perform a bus transit study.

Because this study was to be performed for the local community, it provided a good opportunity for implementing many planning concepts for transit in small urban areas. As will be seen later, many of the planning concepts that have applications for small urban areas were implemented. A different approach to transit planning was attempted, and, from the results obtained and the public and political acceptance of the recommen-

dations, it is felt that this approach has been highly successful for at least one small urban community.

Greater Lafayette Area

The GLA is a small urban community composed of two core cities, Lafayette (founded in 1825) and West Lafayette (founded in 1845). The surrounding developing area is in Tippecanoe County, which was established in 1826. The GLA is located on Interstate 65 a third of the way from Indianapolis to Chicago.

The population of the Lafayette Standard Metropolitan Statistical Area (which includes all of Tippecanoe County) was 109,378 in 1970 and is projected to reach 150,000 by 1990 (2). It has been a rapidly growing area since 1940. Although this growth has been partly the result of the continuing expansion of Purdue University, which once was the dominant employer, most of the new and projected growth is, or will be, the result of continued and accelerating growth in industry and commerce.

About 42,000 people are employed in the area, 9,300 of them in local industry. In addition to being a market center for a rich agricultural hinterland, the GLA is becoming an important regional banking and financial center. Commercial areas and shopping centers are representative of those found in small midwestern communities.

History of Public Transportation in the Greater Lafayette Area

Public transportation has played a role in the development of the GLA for more than 100 years (3). The dawn of public transportation in the area came shortly after the Civil War, in 1869, with a system consisting of a mule-drawn railway known as the Ball Street Railway. The first "bus" was an omnibus, a horse-drawn Herdy Coach seating 12 passengers.

Planning and construction of the first really extensive public transportation system began in 1883, and the actual operation began in 1884.

Buses took over the entire public transportation service on May 12, 1940. The bus system continued to operate under various owners until July 1970. At that time the bus system came under public ownership.

One can see that public transportation has had a long history of operation in the GLA. As new technology and innovations came into being, they were incorporated into the public transportation system. At various times the system took on new dimensions both in technology and in areas served. Only in recent years had the owners used the profits for investment in other unrelated activities outside the GLA. This outside investment gradually led to the discontinuation of private ownership of the bus transit system.

Objectives of the Study

The general objective of the bus transit study was to evaluate the intra-urban bus transportation system within the GLA and make recommendations concerning public transportation in the GLA. The study specifically addressed itself to the following:

1. Transportation in perspective,
2. Existing system characteristics and performance,
3. General attitudes toward public transportation,
4. User attitudes toward public transportation,
5. Employee attitudes toward public transportation,
6. Political attitudes toward public transportation,
7. Guidelines for managerial operations for public transportation,
8. Guidelines for maintenance operations for public transportation,
9. Alternative systems for providing public transportation, and
10. Sources of financing public transportation.

By addressing the study to these 10 items, one could utilize some planning techniques that would have application to smaller urban areas and to small transit properties.

Transportation in Perspective

Public transportation is only one part of the overall transportation system, even in a small urban area. The airlines, railroads, trucks, buses, taxis, automobiles, and all other possible means of transportation in the area must be considered part of the total transportation system. The efficient coordination of all elements of this system, even in small urban areas, should be the ultimate concern of those responsible for planning and providing transportation. No element of transportation stands by itself. Each part of the transportation system provides certain functions that are difficult to duplicate by the other parts. A coordinated transportation system provides the balance necessary for efficient movement of goods and people within a small urban area as well as among urban areas. Each transportation subsystem should complement the other subsystems to promote effective utilization of resources. Unbalanced transportation systems can, at times, create problems for other activities within the urban area. One should have an understanding of the relation among the various urban systems in order to view transportation in a proper perspective.

This approach was used with regard to transportation in the GLA to present an argument to the power structure for the linkages that existed among all of the subsystems in the GLA. The discussion of the linkages involved in this area and portrayed in the study was intended to illustrate that transportation facilities in the GLA could not be viewed as a closed system. There are simply too many interrelations with various other subsystems to treat public or private transportation as a separate entity. It was strongly argued that viewing transportation as a closed system and making decisions on that premise would not lead to effective planning or utilization of resources of the GLA.

These linkages were discussed and presented to the decision-makers in a very elementary manner such that they could be easily understood by all. Some subsystems would be affected very little if bus service was discontinued. Other subsystems would be affected quite substantially.

Existing System Characteristics and Performance

Like any other transit study, this one was concerned with the system characteristics and performance of existing bus operations. An examination was made of the present bus system hardware, routes, schedules, fares, income, and expenses. An origin-destination survey of bus users was also conducted. Although this data collection is a traditional portion of a large transit study, it is also important for the study of small urban areas. System data must be collected and displayed in a format that is acceptable to the political structure. Even in small urban areas, it has been found that individuals in political office have little knowledge of how the system really operates. This is particularly true if the system has formerly been privately owned.

If the system has been under private ownership, it is often found, particularly in small transit properties, that no data have been collected relative to system characteristics and performance. In fact, in many smaller urban areas, there will be a total lack of information on which to base any decision regarding transit service. Frequently, the only data that are available are the total revenue. The revenue data may not even be available by routes. Frequently, as in the case of this particular study, one finds the system to be far more decrepit than is believed by the general public.

The bus system was found to be in a decrepit condition. The equipment had completely deteriorated and could not be rebuilt. The average age of the buses was more than 20 years. The bus system was barely able to maintain any semblance of operation and apparently had caused many of the riders to become discontented with the existing level of service. Ridership had steadily declined over the past few years. There had apparently been no effort on the part of management to promote public transportation in the GLA. Profits were invested in other unrelated activities. There was some question as to the potential of public transportation in the GLA.

Because of the poor condition of public transportation, for the past several years there had not been a viable alternative to the automobile. As a result of this (accompanied by continual ridership decline), there had been a change in trip-making charac-

terisitcs. Those persons no longer using the bus system were now making their trips by automobile. Most of the ridership was composed of captive riders. The riders really had no other alternative means of transportation for their trip-making. The majority of the riders were either elderly or very young. The largest group of riders was women, representing some 73.5 percent. A large portion of the ridership did not have drivers' licenses (62.3 percent), and a substantial number of the riders did not have a family automobile (37.5 percent). A large percentage of households (60.7 percent) had only one automobile. Very few, if any, of the riders used public transportation in the GLA because they desired to; they simply had no other means.

There were about 1,500 trips per day being made by bus transportation. There were less than 1,000 persons per day using the system.

The largest percentage of trips by purpose was for the work trip (42.8 percent). The largest group of riders was full-time employees. The CBD of Lafayette was the largest passenger-trip generator; Purdue University was the second major generator.

There were only two routes out of a total of four that had a reasonable amount of patronage. These two routes were also the only routes that had reasonable headways of 30 minutes. The bus system provided only limited area coverage. It did not provide bus transportation to some of the newer low-income housing units or to a substantial number of commercial activities. The level of service and area coverage had been greatly reduced over the years. In general, the bus system provided a very minimal level of transportation.

General Attitudes Toward Public Transportation

When examining any type of public service in small urban areas. We must keep in mind the importance of the attitudes of the general public. One might argue that in a small urban community the attitudes of the general public may have more influence on the political structure than in large urban areas. In small urban areas it is easy for an individual to have access to any portion of the political structure. To obtain an appointment with the local mayor, or any of the councilmen, is relatively easy. Most of the political forces are quite concerned about the attitudes of the general public, and many of them devote a substantial amount of their time to listening to suggestions from the general public.

Also, in small urban areas the news media have a strong influence on the community. The news media, whether newspapers, television, radio, or other, have a direct impact. Generally, the particular viewpoints of any given news medium reach a large percentage of the population of the area. This percentage is probably larger than could be reached by any one single news source in a large urban area. Thus, one can begin to see that in small urban areas public pressure can be great and can be exerted by various pressure groups. It will also be found that the political structure may be far more responsive to the desires of the general public in a small urban area than in the large cities.

One finds that, when a particular public service is needed in a small urban area, the citizens requiring the service may be few in number; however, on a per capita basis, they may represent a significant percentage of the population. One might argue that, on a per capita basis, the number of bus riders in the GLA would be equal to that of many other communities having a much larger population. Again, however, the absolute number of the riders is not large. Thus, when one begins to perform a planning study for public transportation in a smaller urban area, one must be well aware of the general public's attitudes and of whether this type of activity will be supported by the general public.

It is with the foregoing thoughts in mind that the attitudes of the general public were evaluated. To determine the attitudes toward bus transportation in the GLA, we administered an attitudinal survey as part of the Greater Lafayette Area Transportation and Development Study's origin and destination home-interview survey. Two questionnaires were administered to a total of 1,453 area residents. A total of 750 residents responded to the first questionnaire and 703 residents to the second questionnaire.

One of the objectives of this portion of the study was to determine the priority of a public bus system relative to other areas needing tax moneys in the GLA. The other

areas considered were public housing, streets and roads, public parks, pollution control, downtown railroad crossings, public welfare, police protection, and public schools. Another objective of the study was to determine the priorities of bus system characteristics that could exist in the GLA. Some of these characteristics were the assurance of getting a seat; longer hours of available service; more frequent service; more protection from weather at public bus stops; lower fare for passengers; shorter times spent traveling in bus; shorter walking distance to bus stops; and making a trip without changing buses.

Another objective of the study was to evaluate the present quality of bus service as viewed by the general public in the GLA. The respondents were asked to express an opinion on several statements, as follows: Bus stops are adequately marked; bus schedules are easy to find; buses are comfortable and pleasant to ride in; the insides of buses are clean, neat, and in good repair; there are enough shelters at bus stops; bus drivers are neat in appearance; bus drivers are often helpful and courteous; it is not too much trouble to transfer; buses go where I need to go; it is easy to find out which bus to take; buses make too many stops along the routes; buses are usually on schedule; and the bus hardly ever breaks down.

Another objective of the study was to develop a ranking of potential bus operators for the GLA. There were three options given: Lafayette, West Lafayette, and Tippecanoe County jointly; the cities of Lafayette and West Lafayette jointly; and a private bus company.

Another objective was to determine a fare structure that would be desirable to residents of the GLA. This included a determination of the amount that the fare should be as well as whether the fare should be based on distance traveled or one fixed fare regardless of distance. Various types of service such as a fixed-route, fixed-schedule system and door-to-door service were evaluated as to fare structure.

Another objective was to determine acceptable sources for financial support for a bus service in the GLA. Three choices were presented to the respondents: Bus service should pay for itself from fares charged users; bus service should be supported in part from fares and part from local taxes; and bus service should be free with the entire cost paid from local taxes.

Two psychological scaling techniques were used in the analysis of this portion of the study. The method of paired comparisons was used to develop relative rankings, and the semantic differential scaling technique was used to develop absolute rankings (4, 5).

The general attitude toward public transportation in the GLA was not a favorable one and at the most was one of indifference. When ranking public transportation relative to other areas that could compete for tax moneys, public transportation ranked very low.

Figure 1 shows the relative ranking by the general public of areas needing tax moneys. The method of paired comparisons was used to develop the ranking. It is seen from Figure 1 that bus service in the GLA had a very low priority relative to the other items. Figure 2 shows the relative ranking by the general public of bus system characteristics. More frequent service held the top priority relative to the other listed characteristics. The availability of seats on a bus transit system held the lowest priority.

Although the GLA residents had a low priority for public transportation, they were not opposed to continuing or expanding the service. They were generally in favor of the cities of Lafayette and West Lafayette operating a system. They slightly preferred this type of operation over that of a private firm. They preferred that the system be fully supported out of the fare box but would consider partially supporting the system from taxes. They were definitely opposed to free bus service.

From this portion of the study it was learned that, if one was to operate a bus transit service in the GLA and support any part of the system from tax moneys, a good public information program would be required. Considering the indifference toward public transportation in the GLA, one would have to be extremely careful in working out any proposed system. A misunderstanding by the public in general through the reception of insufficient or misleading information could have permanent harmful effects on public transportation in the GLA. However, if proper procedures are employed in developing a bus system, the public attitude may change to one of appreciation and understanding

for public transportation. This information was extremely helpful in the formulation of strategies to be utilized in the transit planning activities.

User Attitudes Toward Public Transportation

User attitudes toward public transportation were also evaluated in this case study. The data were taken during 1 day, Thursday, in November 1970 from the beginning of bus operation at 5:45 a.m. until the end of operation at 11:10 p.m. During the more than 17 hours of operation, more than 90 percent of the riders were surveyed aboard the buses. In addition, a mail-in questionnaire was given to each rider. A total of 913 mail-in questionnaires were given to bus riders. Of these questionnaires, 459 (approximately 51 percent) were completed and returned. The mail-in questionnaire was necessary because of interviewing time limitations on the bus and the need to obtain attitudes of users toward present and proposed bus systems. As with the general community, the users were asked to rank the same 9 community services competing for tax moneys as was done in the home-interview survey discussed previously. The method of evaluation was somewhat different because of the fact that the questionnaire had to be a self-administered one. The same 13 statements on the quality of the present bus service were also evaluated in the mail-in questionnaire. The bus users were asked who should operate the bus system in the GLA. They were asked to rank the fare structure, both for door-to-door service and for fixed-route, fixed-schedule service. They were also asked to indicate their preferences for financial support.

As one would expect, the user is quite concerned about the continuation of public transportation in the GLA. As can be seen from Table 1, the users place a high priority on continuing the bus system. In other respects it is interesting to note that their philosophy toward other aspects of bus service is very similar to that of the general public. The bus users also desire that the bus system be supported from the fare box. They are also in agreement that the bus system should be operated by the cities of Lafayette and West Lafayette. Both the users and the general public would seem to be receptive to a bus service that would provide door-to-door service for an additional fare. With the exception of priorities placed on continuing bus service, there was very little difference between users' attitudes and the general public's attitudes toward public transportation in the GLA.

Employee Attitudes Toward Public Transportation

In implementing a new system with new innovations, one will find that employee attitudes and cooperation will have a tremendous impact on the success of a small transit property. Thus, it was desirable to learn of any difficulties that might result from the introduction of innovations in the bus system in the GLA. The Clinical Psychology Department of Purdue University agreed to undertake this portion of the study. Employees were all brought together for a group discussion, and the session was conducted by a department faculty member. After the group session, the results were analyzed and reported.

It was found that employee attitudes toward what would promote public transportation in the GLA were generally in disagreement with those of professional planners. A need for education and training of these employees in the concepts of public transportation was shown to exist. Many of the attitudes that the employees had were not compatible with good operations. However, there appeared to be few undesirable conditions existing that could not be overcome through proper training and education.

Political Attitudes Toward Public Transportation

This case study evaluated alternative plans to provide, operate, and maintain a viable, coordinated bus transportation system responsive to the needs of the inhabitants of the GLA. As part of the evaluation process, the study identified social, political, economic, and physical factors that needed consideration. A basic consideration in the planning of any type of public system for a community is the determination of the goals and objectives of the area as viewed by the political structure. The determination

Figure 1. Community priorities for allocating tax moneys in the GLA.

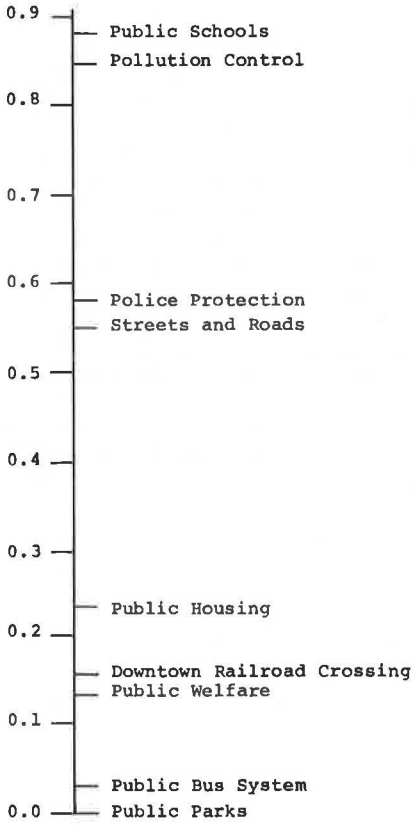

Figure 2. Relative ranking of bus system characteristics by residents of the GLA.

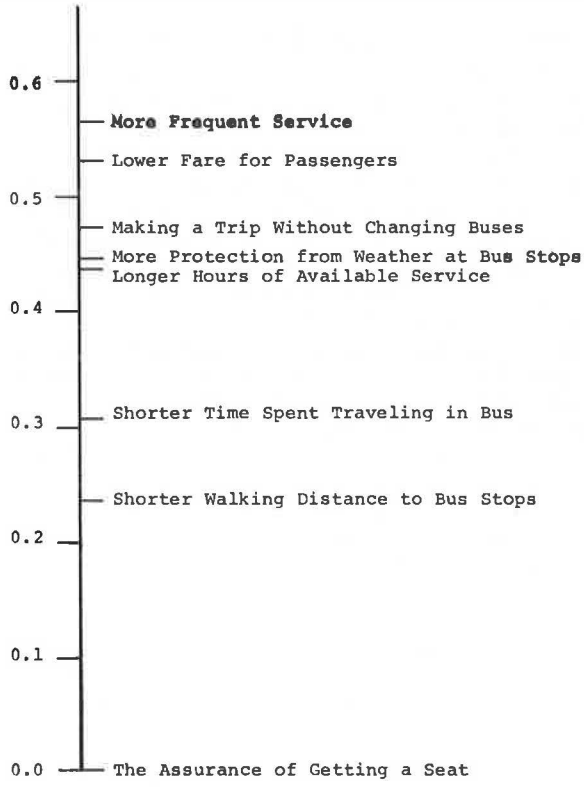

Table 1. Bus users' ranking of community priorities for allocation of tax moneys.

Item	Mean Order of Ranking	Bus User Priority Ranking	General Community Priority Ranking[a]
Police protection	3.05	1	3
Public bus system	3.49	2	8
Public schools	3.58	3	1
Pollution control	4.02	4	2
Streets and roads	5.09	5	4
Public housing	5.17	6	5
Welfare	6.08	7	7
Downtown railroad crossings	6.40	8	6
Public parks	6.70	9	9

Note: The smaller the mean scale value is, the higher the position of the item on the priority list is.

[a]Taken from Figure 1.

of community goals and objectives toward public transportation was a major endeavor. It first required the identification of the individuals who composed the political power structure of the community. A faculty member of the Political Science Department of Purdue University assisted in this portion of the study.

In this study, a questionnaire was used to assess the social, political, economic, and physical factors and to assist in establishing the transportation goals and objectives as they relate to public transportation. The questionnaire was administered to members of the political power structure as well as to persons who were expected, in their own appraisals, to reflect the ideas of those in the power structure. An analysis of the survey of the political structure indicated that it was feasible to have a public transportation system in the GLA. The political structure seemed to recognize the persons in the community who would be most drastically affected by discontinuance of transit service. The leaders seem to view public transportation in the GLA as providing a service to the people rather than as being a business enterprise. It was discovered that there would be some political opposition to continuing bus operations in the GLA, particularly the expansion of present operations.

Guidelines for Managerial Operations for Public Transportation

It was essential that alternative types of organizations for providing area-wide public transportation services be presented to the community. The advantages and disadvantages of each vary in accordance with local conditions. The question of what form a public transportation organization should take is further complicated when the service area extends over several governmental divisions. In addition, the various types of organizations must conform to the regulations provided by state and local governments. The possibilities for management organizations are numerous because many are slight variations of others. The study was centered on the three major options: private ownership, municipal ownership, and public authority.

There are many ways in which a public bus system could operate in the GLA. Several of these ways were explored. A transit authority having a certain structure could offer the more promising manner in which to operate a bus system in the GLA. The planning advantages were that such an authority would offer a method of operating over several political boundaries and the ability to raise sources of revenue through taxation. This method of operation was found to be a more promising form of operation when viewed at the local, state, and federal levels. A transit authority also provided a better financial basis of operation. The Urban Transportation Act of 1965 enacted in Indiana provided the enabling legislation for the establishment of a transit authority with broad powers.

Guidelines for Maintenance Operations for Public Transportation

Efforts of researching, planning, and organizing a successful bus system would be incomplete unless the system included an effective maintenance program. Many managers and supervisory personnel today give the area of maintenance only a passing glimpse in their duties of operating an efficient organization. One should initiate a good maintenance program at the beginning of an organization's operations and continue it throughout the life of the operation. Poor maintenance was one of the contributing factors in the decline of the bus service in the GLA. Maintenance was allowed to deteriorate. As a result, the bus rider's confidence in the system decreased when breakdowns became more frequent as unreliable buses were kept in service. The main objective of this portion of the case study was to establish the basic elements of an effective maintenance program for a bus system operating in the GLA.

A detailed program was outlined, and the computer software was developed for the effective utilization of the proposed program.

Alternative Systems for Providing Public Transportation

The existing system characteristics and performance, composition of ridership, and user and public attitudes toward public transportation would not be sufficient in themselves for a transit study. One has to evaluate the various alternative systems composed

of combinations of different types of equipment, routes, and schedules. The level of service provided with the cost of each proposed system was estimated and reported in the study. Some 14 alternative plans for providing public transportation in the GLA were developed and analyzed. These alternatives ranged from the same routes and schedules as in the present system with new equipment to an expanded system operating on a number of new routes providing extended coverage with reduced headways.

Some of the alternatives provided for fixed-route, fixed-schedule operation during the peak hours with demand-responsive service during the off-peak periods. These alternatives did not exhaust all possibilities. One could combine various parts of the 14 alternatives as to routes, schedules, and/or types of equipment and formulate additional alternatives.

Tables 2 and 3 give the 14 alternatives and the cost associated with each one for this particular case study.

The basic assumptions concerning levels of service used in the development of bus system alternatives for the GLA were as follows: One level of service was to continue the same area of coverage with the same routes and the same headways; a higher level of service was to continue the same area of coverage but to reduce the headways on the present routes; a third level of service was to extend the area of coverage so that all people in the GLA would have access to public transportation and at the same time reduce at least some, if not all, of the route headways from those on the existing system. There were four or five alternatives analyzed for each of these levels of service, using various sizes of buses and combinations of fixed-route, fixed-schedule service and demand-responsive service. All of the alternatives reviewed require a substantial amount of capital investment for a small urban area, some substantially more than others.

The total investment for each of the alternatives varied from about $250,000 to approximately $500,000, with a total annual cost (capital and operating) ranging from about $207,000 to approximately $407,000. By using the present number of passengers, about 430,000 per year, we found that the fixed-schedule fare necessary to meet the total cost of the system varied from 48 cents to 91 cents per ride. If the capital costs were assumed to be subsidized from general tax moneys, the fixed-schedule fare required to meet the operating expenses of the system varied from about 40 cents to 74 cents. By using the maximum number of passengers that the various systems can accommodate and using a peak-period load factor of 1.5, we found that the fixed-schedule or base-period fare would vary from about 17 cents to 34 cents to meet total costs and 13 cents to 28 cents per ride if only the operating costs would be met from the fare box.

Sources of Financing Public Transportation

The sources of financial support of public transportation are varied and dependent on the type of ownership of the transit operation. These sources of financial support will also vary from one state to another. Many sources that are available to a publicly owned transit operation are not available to a privately owned transit company. Various states permit various ways of obtaining sources outside of the fare box for transit operations. There is a wide variance in these regulations from one state to another.

Financial support of privately owned transit companies for capital improvements and operating costs is primarily from fare-box revenues. Capital improvements for privately owned transit companies can be financed through equity capital stocks, bonds, equipment trust obligations, and/or long-term leases. If a city desires to encourage a private company to provide transit service, it may sell municipal bonds or obtain a federal grant for capital improvements, construct transit facilities and purchase equipment, and then lease the facilities and equipment to the private operator. However, the trend since World War II is for public agencies to acquire public transportation systems from privately owned companies because private entrepreneurs have not been able to make a reasonable profit.

Financial support of publicly owned transit may be entirely from fare-box revenues or partially or wholly supported by subsidies from tax moneys in Indiana. Capital im-

Table 2. Summary of alternatives.

Alternative	Total Initial Investment[a] (dollars)	Annual Capital Recovery Cost (dollars)	Annual Operational Cost (dollars)	Total Annual Cost (dollars)	Level of Service[b]	Number and Type of Bus[c]
1	251,452	34,700	172,600	207,300	I	6M, 1XL
2	278,148	36,900	177,400	214,300	I	2L, 4M, 1XL
3	304,844	39,100	182,200	221,300	I	4L, 2M, 1XL
4	331,540	41,500	187,200	228,700	I	6L, 1XL
5[d]	251,452	34,700	206,700	241,400	I	6M, 1XL
6[d]	312,492	40,100	234,700	274,800	I	6M, 7S, 1XL
7[d]	392,580	63,800	223,400	287,200	I	6L, 7S, 1XL
8[d]	334,684	52,400	259,300	311,700	II	12M, 1XL
9	334,684	52,400	286,400	338,800	II	12M, 1XL
10[d]	395,724	74,900	269,000	343,900	II	12M, 7S, 1XL
11[d]	316,460	71,600	335,300	406,900	II	17S, 1XL
12	358,760	45,300	208,800	254,100	III	7L, 1XL
13	413,200	54,200	261,600	315,800	III	9L, 1XL
14	494,860	66,500	308,900	375,400	IIIA	12L, 1XL

[a]Includes $25,000 for 5 acres of land and $105,000 for facilities. Also includes buses, fare boxes, and radios.
[b]I = present routes and schedules; II = present routes and reduced headways; III = extension of area of coverage; and IIIA = extension of area of coverage and reduced headways.
[c]XL = 45-passenger bus; L = 33-passenger bus; M = 18- to 23-passenger bus; and S = 12-passenger bus.
[d]Demand-responsive during off-peak hours. Demand-responsive fares are assumed to be $0.10 higher than the peak-hour or base fare for fixed-route, fixed-schedule service.

Table 3. Cost data for alternatives.

Alternative	Total Present Annual Passengers	Using Present Number of Passengers, Fixed-Schedule Fare to Equal (dollars)		Annual Maximum Number of Passengers for System With 1.5 Load Factor During Peak[a]	Using Maximum Number of Passengers, Fixed-Schedule Fare to Equal (dollars)		Increase in Passengers Over Present (percent)
		Total Cost	Operational Cost		Total Cost	Operational Cost	
1	428,000	0.48	0.40	715,000	0.29	0.24	75
2	428,000	0.50	0.41	665,000	0.32	0.26	55
3	428,000	0.52	0.43	865,000	0.26	0.21	102
4	428,000	0.53	0.44	1,075,000	0.21	0.19	151
5[a]	428,000	0.52	0.44	715,000	0.29	0.24	75
6[a]	428,000	0.60	0.51	715,000	0.34	0.28	75
7[a]	428,000	0.63	0.48	1,075,000	0.22	0.16	151
8[a]	428,000	0.69	0.57	1,430,000	0.17	0.13	234
9	428,000	0.79	0.67	1,430,000	0.24	0.20	234
10[a]	428,000	0.76	0.59	1,430,000	0.19	0.14	234
11[a]	428,000	0.91	0.74	1,100,000	0.32	0.26	157
12	428,000	0.59	0.49	1,200,000	0.21	0.17	180
13	428,000	0.74	0.61	1,430,000	0.22	0.18	234
14	428,000	0.88	0.72	2,150,000	0.17	0.14	402

[a]Total computed by assuming that all buses during peak are loaded to 1.5-seat capacity and off-peak demand adjusted by factor obtained from ratio of present peak-hour demand to calculated demand.

provement funds can be obtained by sale of bonds, borrowing, use of equipment trust obligations, and/or receiving capital improvement grants for facilities and equipment from the federal government through the Urban Mass Transportation Administration of the Department of Transportation.

Recommendations in the Case Study

In performing any study, one has to eventually make some recommendations. One should be extremely careful that the recommendations made are both politically and economically feasible. Perhaps those two considerations have more impact on implementation in a small urban area than any others one might give.

The decision to continue or discontinue bus service in the GLA is a political one. The study team asserted that the systems analyst is not the decision-maker. He should present the various alternatives, including impacts and consequences as determined in the analysis and evaluation of each alternative, with recommendations to the decision-maker. A substantial amount of attitudinal analysis along with various alternatives indicating the cost and level of service associated with each was reported. These analyses should have enabled the political structure in the GLA to arrive at a decision to continue or discontinue bus service. Therefore, it was not the study team that made the decision as to whether public transportation should continue in the GLA.

The choice of the level of service, if the bus system was to be continued, was also a political one. Again, detailed analyses were performed for each level of service. The risks involved in providing public transportation were high. The chances of a financial success were remote. Therefore, a bus service should have been viewed like other public service systems that are not expected to be financially profitable. There were benefits to be derived from public transportation that were not dollar benefits, the same as with parks and recreation, police and fire protection, libraries, low-income housing, garbage collection, street cleaning, and insect control. Thus, the decision to have a bus system, with an associated level of service, was really a political one. From the analyses of the study, the political decision-makers had an estimate of the amount of money that might be required from tax monies. The decision to use tax moneys for a system such as this one should reside with the political decision-makers of the GLA. There were some specific recommendations that were made contingent on the continuation of bus service. These were of a technical nature and could affect the operations of the transit systems.

Specific Recommendations

The following recommendations were taken from the Greater Lafayette Area Bus Transit Study (1):

1. A decision should be made as to whether to continue bus service in the GLA immediately. The present operations only add to the deterioration of ridership.
2. If bus service is to be continued, the plans for continuing service should be on a long-term basis. The decision should be made to continue a system for at least 10 years. A decision should not be made for a temporary system. There is a reason for this recommendation. First of all, the system has declined over several years; it will take several years to bring the level of ridership up to previous levels. It may take several years for people to change their travel habits and to change their mode of travel. A good transit system has to be in operation for a substantial amount of time for people to make a decision not to purchase the second or third car or perhaps to sell some of the cars that they now operate. It should not be expected that one would see any great increase in the number of riders in less than 3 to 5 years. A year of operation will probably not be indicative of the long-run potential of public transportation in the GLA. If the decision is made to continue bus service, the decision should be made to continue it for an indefinite period of time.
3. If bus service is to be continued, it should be continued with the thought in mind that it will not be financially profitable. It may be a profitable venture, but the risk involved will be great. A 25 to 50 percent subsidization of total costs of the bus system

may be required. It will be difficult, if not impossible, for revenue from the fare box to pay for the entire system. An increase in fares will make it difficult to have an increase in ridership. There has to be a substantial increase in ridership for the revenue from the fare box to support the entire system.

4. If the decision is made to continue the bus system, full support should be given by the cities of Lafayette and West Lafayette and Tippecanoe County. They should back the bus system with financial aid and with other political decisions that can materially affect the operation within the GLA.

5. If a bus system is to continue in the GLA, it should do so under a transit authority. The transit authority should have an advisory committee of political appointees, but the manager and the employees of the transit authority should be under a merit system of operation. The transit authority should be given wide leeway in making decisions that will affect service in the GLA. The transit authority should be totally responsible for all operations and management of the bus system. The transit authority should be given taxing power.

6. If a bus system is to be continued, it is recommended that strong considerations be given to operating a fixed-route, fixed-schedule system in the peak periods. Headways should be reduced. A demand-actuated system should be employed in the off-peak periods.

7. Completely new equipment and facilities should be provided. Little equipment, if any, can be salvaged from the present operation.

8. All available outside sources for financing should be explored. Every attempt should be made to obtain funds for this system outside of those from the fare box.

9. During the interim period of purchasing new equipment, creating a transit authority, obtaining outside support, etc., a continual planning process should be going on. This planning group should be developing scheduling procedures for the dispatchers for the demand-actuated portion of the system; it should be examining more closely the exact routes to be employed with a better scheduling of transfers in the downtown area, etc. The entire operation should be planned and programmed by the time new equipment is available.

10. Charter service should be greatly expanded. A substantial amount of effort should be put into utilizing the charter franchise to its greatest extent because of the profitable characteristics of charter service.

11. It is desirable to obtain long-term contracts with the public school systems in the GLA to provide bus transportation.

IMPLEMENTATION OF RECOMMENDATIONS

There were many steps taken during and after completion of the study to ensure that the recommendations made were actually implemented. It was the intention of the study team to ensure that all of the information gained from this study would be utilized for transit planning in the GLA. The study team was as much interested in implementation as it was in transit planning. Therefore, there were many extra measures taken during the study that are not normally found in a transit planning study.

It was felt from the very beginning that the political power structure should be kept adequately informed throughout the study. As various portions of the analysis were completed, the political power structure representing three political divisions of the area was called together into a group, and formal presentations were made to these people. During this time, reactions were reviewed as to the way in which the study was proceeding. Comments were solicited in order to help guide further analysis within the study. Suggestions were sincerely taken, and a conscientious effort was made to incorporate all of them into the planning activity.

It was realized (when the results began to be obtained from the analysis of the attitudes of the general public) that public transportation was not a popular item within the GLA. It was then decided that certain information must be furnished to the general public that would perhaps change attitudes toward public transportation. Because the general public has an indifferent attitude toward public transportation, the measures taken must be very well thought out. If these measures have the wrong impact, the attitudes could become negative within the community.

It was decided that several approaches would be developed to provide information to the general public through the various news media sources. In the GLA there are two local newspapers, three radio stations, and one television station. All of the news media were utilized during this interim period. The first step was to present brief items to the general public on what other people throughout the United States and Canada were doing with problems in public transportation for small urban areas. Other cities such as Mansfield, Ohio; Toronto, Ontario; and Ann Arbor, Michigan, were reviewed in various articles in the newspaper and on television and radio to indicate what could be done to solve the public transportation problems of small urban areas. This news coverage was not a one-time occurrence. It consisted of several articles over a quite lengthy span of time. Care was taken not to discuss any of the recommendations that might be made for the Lafayette area.

During this same period, there was contact made with many civic and professional organizations. Organizations such as the Chamber of Commerce, the Optimist Club, and Society of Professional Engineers were given presentations on all aspects of public transportation for small urban areas. These groups were informed as to the ongoing study and the results that were being obtained from the analysis before it was in completed form. They were instructed in how other cities were solving their problems.

The final presentation was made to the political divisions in May 1971, with the recommendations as outlined here. In approximately 1 month, the political structure made the decision to continue public transportation in the GLA. The two city councils of Lafayette and West Lafayette passed an ordinance establishing a transit authority. However, Tippecanoe County refused to participate in the enterprise. A transit authority was formed during the summer of 1971 and became official as of September 1, 1971. A 7-man board was appointed.

The study team made presentations to the transit authority, outlining to the 7 members all of the information that had been given to the political power structure. The transit authority immediately began a program of its own to keep the people, as well as the political power structure, informed. The authority also began a program to indicate to the people that something was actually begin accomplished. Several bus manufacturers were immediately contacted and asked to furnish demonstrator buses to the Greater Lafayette Public Transportation Corporation. These buses were brought in one at a time and were kept for several days in the community. The buses were demonstrated in the downtown area and at various shopping centers. GLA residents were asked to board and ride the buses and inspect them at their convenience. The buses were then put on various routes in the city, which allowed the employees to become familiar with the different types of equipment that was now available for bus transit service. Considerable effort was made to ensure adequate news coverage by all the media of each bus that came in. During this same time, the transit board established a tax base for the coming year. The tax levy went through all of the appropriate review processes as required by state law without any objection from any of the citizens of the GLA.

During this period, members of the study team were preparing the capital grant application for the matching funds for building new facilities and acquiring new equipment. Each time that something new was performed with the transit authority, an attempt was made to ensure adequate news media coverage.

During November 1971, there was a change of administrations in both Lafayette and West Lafayette. This, of course, required a completely new round of information transfer to the new political structure.

It is felt that almost all of the recommendations have been implemented or are in the process of being carried out. Implementation of the recommendations has been successful largely because of the program to inform the public in a meaningful way of the problems and solutions of public transportation in the GLA. It has also been essential that all of the political structure of the political divisions participating in the project be kept informed of all of the things that have been going on. These two items are perhaps the most important of all of the energies that have gone into transit planning for this small urban community. The professional expertise has very little to do with the ability to implement recommendations. The transit planner must understand that, if his plans are to be accepted and implemented, he must be willing to become politically oriented

from the general public's point of view as well as from that of the public office-holder. Without the cooperation of the power structure in a small community, one finds it almost impossible to implement a workable solution.

It might be pointed out that within the last few years there have been three large studies on the relocation of railroad grade crossings in the GLA. As of this date, there has not been one single recommendation put into effect. Most of these studies were done by outside consultants who did not have a direct interest in the community. They did not work with the local political structure or with the community in formulating the plans. The consultants did not become involved with implementation. The plans of any transportation activity must be compatible with the local community and in accordance with the thinking of the local people. If this cannot be accomplished, there will simply be a waste of effort and resources in the transit planning process.

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