Strategic Planning as a Transit Management Tool

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Transit systems are faced with rapidly rising deficits and growing opposition to increased taxes to underwrite subsidies. This financial situation is placing greater emphasis on systems to manage their operations more prudently and effectively. To maintain this vital service within realistic financial constraints, transit managers will have to rely on sound management techniques in the allocation of scarce resources. Numerous researchers have identified and applied techniques to assess the performance of individual transit routes. However, the industry has not fully exploited management tools used by the private sector to allocate resources. One such analytical tool employed by the business community is a strategic planning device originally formulated by the Boston Consulting Group. The unique aspect of this device is the way in which a role is assigned to each product line or division within the context of an integrated portfolio strategy. Two primary indices are used in the analysis—market share and revenue growth rate. This paper provides an overview of this approach in the private sector and its application to a transit system in which individual bus routes comprise the portfolio. Definitions associated with the strategic planning approach are established for the transit system. By use of data for the Birmingham, Alabama, bus system, the feasibility and desirability of adopting strategic planning for transit system are tested. Routes were categorized on the basis of this technique, and guidelines were established for the appropriate allocation of resources based on the analysis. The results of the analysis demonstrate the suitability of this analytical framework from the private sector to transit. The unusual aspect of the analysis is that it is revenue based and provides a novel way to view transit performance. By assessing all routes within a dynamic (trend) and global framework, it provides a useful diagnostic tool for transit managers.

The urban transit industry in the decades since the end of World War II has experienced three distinct eras. The first was a period of steady decline and deterioration of transit systems that could be attributed to the emergence of the private automobile, rising affluence, urban sprawl, and relatively low energy costs. During this time, transit in America was provided primarily by private operators who relied solely on fare-box revenues to support operations and capital investment. In response to a steady decline in ridership, operators decreased service and raised fares, which in turn further reduced patronage. After nearly a decade of this cycle of declining ridership and service, most privately owned urban transit systems were confronted with the realization that it was virtually impossible to continue to exist as a private enterprise.

This realization was communicated to the public and led to the second era, in which public investments of progressively greater sums were made in transit. This renaissance period witnessed a rapid expansion of service both in terms of frequency and route coverage. Ongoing with this jump in service levels was a substantial program of fleet replacement and expansion, as well as a rejuvenation of other fixed facilities. The result of this capital-intensive effort was a reversal in the secular decline in ridership and the restoration of public transportation as a feasible mode of urban transport. The results were impressive; however, so were the costs to local, state, and federal governments.

Transit systems, faced with rapidly rising costs, modest increases in patronage and revenue, and growing public opposition to taxes, entered the third era. This period is witnessing an attempt by transit operators to hold on to the ridership gains achieved earlier with only limited expansion of service. This situation will place greater emphasis on systems to more prudently and effectively manage their operations. The first era was characterized by cost cutting, the second period by rejuvenation of services and facilities, and the third era will be governed by resource allocation. This reflects the need to maintain a vital public service within realistic financial constraints.

To accomplish this objective, transit managers will have to rely on sound management techniques in the allocation of scarce resources. Numerous researchers have identified and applied techniques to assess performance, including development of individual route financial statistics, in response to transit management's needs (1). However, the industry has not fully exploited management tools used by the private sector to allocate resources (which are every bit as scarce) primarily because the measures that come to mind, such as earnings per share, return on investment, stock price/earnings ratios, and cash flow, imply allocation of profits--a nonexistent commodity in transit.

However, on closer examination, the private sector does possess an inventory of tools that could be adopted by transit managers. One such technique is strategic planning that is used by multiproduct or multidivision companies to guide investment decisions. This competitive analysis is in many ways analogous to urban transit systems if the products or divisions are viewed as the transit routes that compete with each other for limited funds to underwrite operating subsidies and capital investments.

The adaptation and application of strategic planning to transit resource analysis is presented for the Birmingham Jefferson County Transit Authority (BJCTA) (Birmingham, Alabama). For the analysis period presented in this paper, this system operated approximately 4.7 million vehicle miles, transported 9.8 million riders, and owned a fleet of 200 buses.

STRATEGIC PLANNING METHOD

Corporations are faced with decisions regarding investment either among different product lines or different companies or divisions within a conglomerate. For this reason, there is a need for a technique or procedure to perform this competitive analysis on an integrated basis. A tool that has been employed in the business community is a strategic planning device originally formulated by the Boston Consulting Group (2). The unique aspect of this device is the way in which a role is assigned to each product or division within the context of an integrated portfolio strategy. Product roles are viewed in terms of each product or division position relative to its competitors (market share) and its cash-flow potential (sales growth rate). These two indices are used in recognition of the unique situation that faces each product or division. The differences between products or divisions can then be used to determine which should be used to generate cash and which should receive investment funds generated by other units.

The key element of this approach is the construction of a growth market share matrix chart. As shown in Figure 1, the diagram represents the portfolio of products or division by a series of spots and dots. The ordinate of this chart is merely the growth rate in sales, expressed as a percentage. Relative market share (abscissa) has been defined as the ratio of a product or division's dollar sales in relation to the industry's largest competitor (3). For example, a product that had sales of $3.2 million while that of the largest competitor was $9.6 million would have a relative market share of 0.33.

Relative market shares of less than one are observed where a particular product or division is not the industry leader and does not have the largest market share. An index value of greater than one will occur for markets in which the product or division is the sales leader. By using information on each product or division, the results are plotted on the matrix chart of the growth--market share. To distinguish the different sales volumes, the diameter of the circle for each product or division is proportional to the dollar sales. In this way, the chart depicts three unique data items--sales growth, market share, and sales volume.

The use of this approach relies on the well-established relationship between market share and profitability. Because high market share normally implies high profitability, the preferred position is to have market dominance in high-growth markets. Since it is more difficult and costly to increase market share in low-growth markets, a desired element of the strategy is to use cash generated in low-growth markets to invest in the high-growth markets to attempt to increase market share. Obviously, other factors must be considered, such as the cost of achieving market dominance; however, the strategic planning approach does provide an analytical framework to assess performance and make decisions.

Another element of the approach is to classify each element of the portfolio into one of the four broad categories depicted in Figure 2, as follows:

1. Cash cows: Products or divisions that have a high market share and a low growth rate should generate substantial amounts of cash that, strategically, should not be reinvested. In essence, the market dominance implies substantial profits that are not needed to be invested in that industry because of the present competitive edge and relative stability of the total market. In view of the low growth rate, reinvestment would not appear prudent. For these reasons, products or divisions that fall into this category are used to generate cash for investments elsewhere in the portfolio.

2. Dogs: This identification describes products or divisions that have a low market share and a slow growth rate. Because of the slow growth, further investment to increase market share would not be prudent. Also, any modest cash flow usually is used to maintain present market share. For these reasons, products or divisions that fall into this category are often called "cash traps."

3. Problem children: Products or divisions that have low market share and a high growth rate require considerable investment to maintain and increase market share. Because of the high growth rate, they have the potential to eventually become cash cows.

4. Stars: The units in a portfolio that have both high market share and growth fall into this category. Although they generate large amounts of cash because of their market share, they also require considerable cash to maintain market share in a high-growth environment.

As noted previously, the growth-market share matrix provides a framework for portraying products or divisions within a portfolio, as well as a system to classify each element. Further, all industries are subject to the product life cycle in that, as any industry matures, the growth rate tends to decline. Given only enough investment to maintain market share, all products or divisions fall vertical to become either cash cows or dogs, depending on their market position prior to the growth market sharing. Problem children without adequate investment to increase market share will become dogs. With sufficient investment, they can move horizontally and become stars, which then become cash cows. These cash cows are then used to generate investment funds for financing market share increases for problem children. As shown in Figure 2, this sequence repre-

Figure 1. Typical diversified portfolio for a growth-market share matrix.

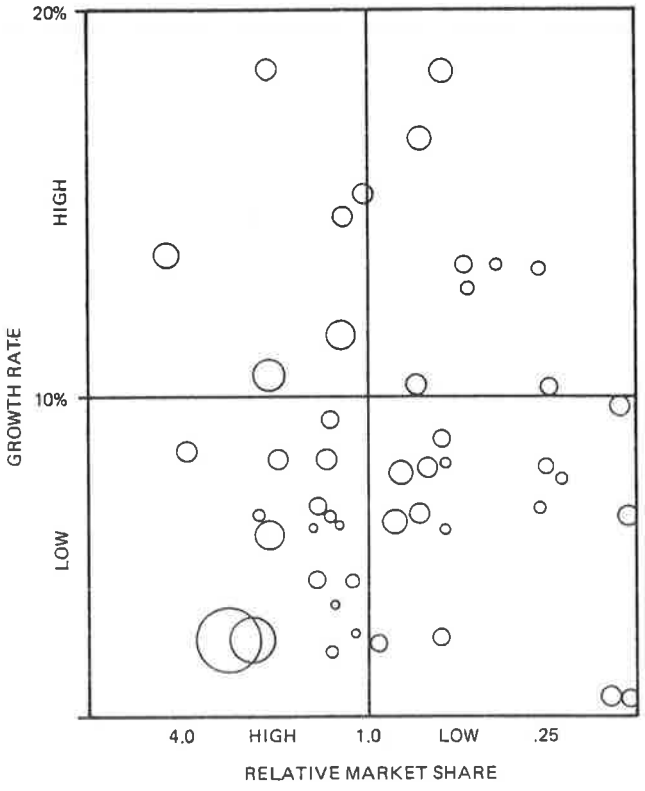
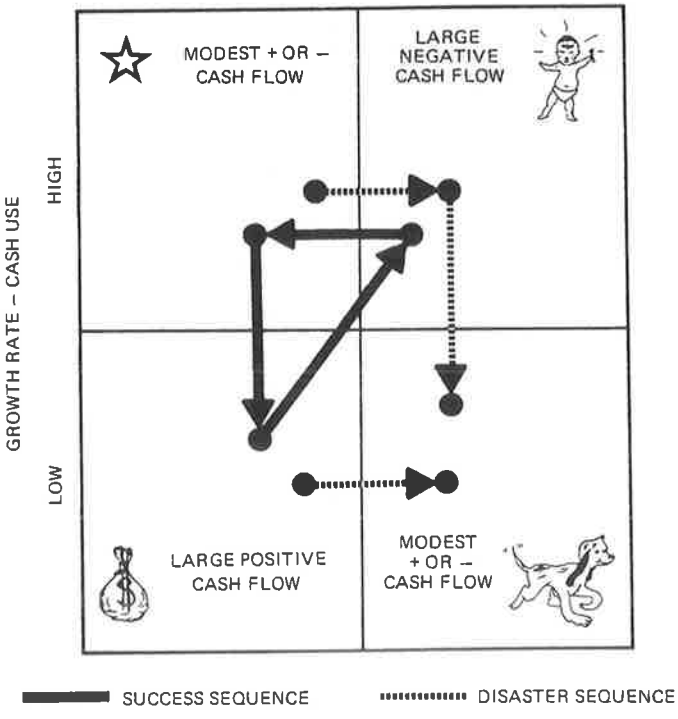


Figure 2. Cash flow and sequences.



sents a successful pattern for a multiproduct or multidivision firm. Also presented on this illustration are two disaster sequences. A weak competitive situation and insufficient investment could turn a cash cow into a dog or a star into a problem child, which could then become a dog with a maturing industry. In general, products or divisions that are dogs should only be maintained in a portfolio as long as they require no investment. They are prime candidates for elimination from the product or division portfolio.

TRANSIT APPLICATION AND RESULTS

The strategic planning approach described was developed for planning in the private sector; however, this technique would appear to have relevance to urban transit systems. One point to keep in mind is that private corporations are striving to maximize profit, but a transit system is attempting to use resources effectively and to provide a vital social service to the community. Nonetheless, the analytical framework to assess performance, categorize elements of the portfolio, and make investment decisions are all necessary elements of transit planning. One advantage of this approach is that it is dynamic in that it examines performance with respect to time. Most transit analysis tools, such as cost centers, are oriented to a single point in time (i.e., a snapshot). For this reason, this strategic planning approach was applied to the BJCTA. This system was selected for the analysis based primarily on the availability of data from an ongoing study. Also, because it is a bus-only system and its size is 200 buses, it is typical of many transit systems throughout the country.

The first step in the analysis was to prepare the growth-market share matrix. Needless to say, some liberties were taken in defining transit terms to be analogous to private sector corporations. In public transportation, the portfolio consists of individual bus routes that comprise the system. In Birmingham, 20 routes are operated, which are analogous to products or divisions. Fare-box revenue for each route was taken as the measure of sales. The growth rate was computed as a percentage change in revenue between two consecutive time periods.

Of greater difficulty is the selection of a transit definition for relative market share. The most technically correct term would be the modal split for the service territory of each route because the dominant competition to the bus system is the private automobile. Since this information would be difficult and costly to obtain, modal split was not selected to determine relative market share. Instead, the relative market share was defined as the ratio of each route's revenue to the average route revenue of the system. This average was merely computed as the total system revenue divided by the number of routes. The selection of this definition appears appropriate in view of the competitive nature of resource allocation among routes, the availability of data, and ease of computation.

Another aspect of the approach is the concept of cash flow and investment among elements in the portfolio. In transit, the analogous term to cash flow is deficit, which becomes the extent of tax subsidy or investment in a particular route. Because of limited funds to underwrite system deficits, the routes compete with one another within a constrained financial situation. A decision to provide more service on one route implies less service on another. The internal cross subsidization among routes is analogous to transfer of funds between product lines or divisions in the private sector. The data used in this analysis for the Birmingham transit system are presented in Table 1. This information was then plotted on the growth-market share matrix for each route. The current revenue was used to determine the size of the circle that depicts each route. One difference is that relative market share was not plotted on a logarithmic scale. As shown in Figure 3, one advantage of this approach is that it portrays considerable information about the system bus routes quickly and conveniently. Another feature of the approach is that it is revenue-oriented, which is different from other analysis techniques that focus primarily on transit costs.

The next step in the application of the strategic planning approach to transit is the selection of axes to divide all 20 routes into one of four categories. For growth rate, the relative performance of each route (low or high) was made with respect to the system's revenue growth--9.1 percent. Since relative market share was based on the system average, the axes for this indication were merely one.

Application of this reference system to Birmingham's bus routes produces the following results:

Category	Routes	
	Number	Percent
Cash cows	2	10
Dogs	7	35
Problem children	4	20
Stars	7	35
Total	20	

As might be expected, there is a wide variation in route performance. Also of interest is that nearly three-fourths of the routes are either stars or dogs.

In many respects, the interpretation of each route category is similar to the private sector model, as follows:

1. Cash cows: Routes in this category would be bus lines in well-established transit territories. Typically, a relatively high level of service is provided to capture riders and this produces a high relative market share. The low growth rate is consistent with the well-established territory and further substantial expansion would not produce a proportional gain in riders. In essence, the market penetration for these routes has attained a limiting value. Planning of service for these routes would not be aggressive.
2. Dogs: These routes exhibit stable conditions in that revenue growth is low. Similar to the private sector, these routes should be maintained as long as they do not require a disproportionate share of tax support. Unlike the private sector model, transit routes provide a definite social service and, for this reason, financial considerations are not the only criteria for service. Planning for these routes would be to carefully monitor their performance to ensure that they do not drain the system financially.
3. Problem children: Routes in this category would suggest transit territories that are susceptible to exploitation. The high growth rate indicates that opportunities for service expansion are present. Typical transit territories for these routes would include areas in the region that are experiencing rapid population or employment growth. For this reason, these routes should be studied actively, and an aggressive planning program of expansion should be pursued. Such a transit-development program for these routes could convert these routes into the system's stars.
4. Stars: These routes exhibit both a high growth rate and large relative market share. Ser-

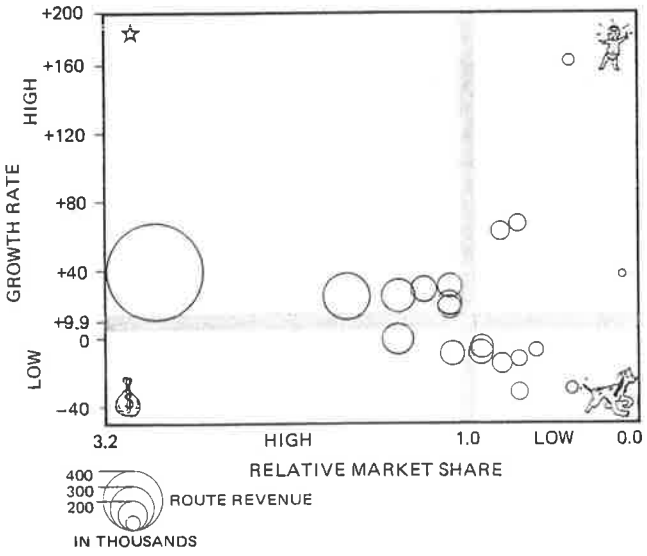
vice planning and expansion for these routes and their territories would be limited in comparison to the activities for the problem children routes. Care should be exercised by transit planners to ensure that service is not expanded too greatly because the territory will mature and the high growth rate cannot be maintained. By carefully monitoring route performance and balancing growth of revenues and service, these routes can become cash cows.

Table 1. Input data to strategic planning analysis.

Route	Revenue ($000s) Prior	Revenue ($000s) Current	Growth Rate (%)	Relative Market Share
1	191.8	239.0	24.6	1.4
2	155.2	200.8	29.4	1.2
3	71.1	119.1	67.6	0.7
4	162.9	178.0	9.3	1.1
5	403.2	508.6	26.2	3.0
6	170.1	162.7	-4.3	1.0
7	256.8	295.8	15.2	1.7
8	179.9	122.2	-32.1	0.7
9	185.4	138.5	-25.3	0.8
10	182.6	166.8	-8.6	1.0
11	16.9	22.8	35.4	0.1
12	106.8	75.2	-29.6	0.4
13	143.5	186.2	29.7	1.1
14	231.2	235.2	1.7	1.4
15	94.1	93.3	-0.9	0.6
16	80.8	130.7	61.7	0.8
17	25.9	67.7	162.1	0.4
18	155.1	180.4	16.3	1.1
19	181.6	170.9	-5.9	1.0
20	125.8	110.0	-12.6	0.7
Total	3120.7	3403.9	9.1	

Note: All values have been rounded.

Figure 3. BJCTA transit route portfolio.



A summary of planning efforts and service expansion follows:

Category	Planning Effort	Service Change
Cash cow	Modest, primarily monitoring	Limited expansion, primarily fine tuning
Dogs	Modest, primarily monitoring	Limited reduction, with service justified on basis of social need or system connectivity
Problem children	Extensive, exploring opportunities for expansion	Substantial expansion
Stars	Less extensive, attempting to balance expansion with expected declining growth rate	Modest expansion, trying to achieve equilibrium between service and revenue as market matures

As described above, the strategic planning approach provides a useful framework for assessing route performance and providing guidance in determining the extent of planning efforts, the appropriate service expansion programs, and resource allocation. One point to keep in mind in applying the strategic planning approach to urban transit systems is that the analysis by routes should be consolidated to permit appropriate actions by transit territories.

From the previous discussion, it would appear that the strategic planning technique has direct application to urban transit systems. To confirm the applicability of this approach, operating and financial results for the 20 routes were combined into the four strategic planning categories. As shown in Table 2, five key operating and financial parameters were computed for each category and presented in terms of the one success and two disaster sequences described previously. In terms of the success sequence (problem child to star to cash cow), all indices would be favorably impacted. In all cases, passenger and revenue productivity would increase while the operating ratio (cost/revenue) would decline.

The first disaster sequence (cash cow to dog) would result in unfavorable changes in the system performance for the five measures. For the other disaster sequence (star to problem child to dog), the results for the BJCTA system require closer scrutiny. For all five measures, the sequence from star to problem child would result in an unfavorable change in the measures. However, the disaster sequence from problem child to dog would, in fact, produce a favorable shift in the performance measures. Two factors can be cited for this situation. The first is that the routes classified as dogs in strategic planning are routes in established transit territories that are experiencing little or no growth in population or jobs that would contrib-

Table 2. Success and disaster sequences.

Factor	Success Sequence: Problem Child →	Star →	Cash Cow	Disaster Sequences: Cash Cow →	Dog and Star →	Problem Child →	Dog
Revenue/mile ($)	0.67	0.72	0.82	0.82	0.71	0.72	0.67	0.71
Revenue/h ($)	8.44	10.54	10.90	10.90	9.40	10.54	8.44	9.40
Passengers/mile	1.94	1.97	2.45	2.45	2.17	1.97	1.94	2.17
Passengers/h	24.46	29.12	32.51	32.51	28.62	29.12	24.46	28.62
Operating ratio	1.99	1.63	1.59	1.59	1.80	1.63	1.99	1.80

ute to an increase in transit use. Further, the nomenclature in strategic planning refers to performance in terms of growth and relative market share. Also, routes in this category are indicative of relatively stable and small routes that are described from the standpoint of providing mobility to a community and ensuring system connectivity.

Second, the real question in terms of success or disaster is whether the problem child routes are converted to either stars or dogs. It is these possible outcomes that account for these routes being so named. Aggressive planning and service expansion for the problem child routes can result in these bus lines becoming stars. Failure to make this correct management decision will result in the problem child routes becoming dogs. Thus, the question is the comparison of the performance measures presented in Table 2 for routes classified as stars and dogs. For all measures except passengers per mile, the preferred sequence is to convert problem children to stars rather than dogs. The seeming anomaly for passengers per mile is attributable to differing operating speeds.

From the previous discussion, it would appear that the strategic planning approach can be applied successfully to urban transit systems.

CONCLUSIONS

The results of the analysis in applying the strategic planning approach to the BJCTA represent only a single case study. Nonetheless, the success of the application and the fact that the Birmingham system is typical of transit systems throughout the nation would suggest the following conclusions:

1. The analytic framework provided by the strategic planning technique in the private sector for multiproduct or multidivision corporations is directly analogous to the urban transport system. In the latter case, the portfolio consists of the individual routes.
2. Because of the limited resources for transit planning and services, as well as internal cross-subsidization, the transit system routes are in competition with one another.
3. By providing a revenue-based analysis technique, the approach provides a novel way of analyzing transit performance.
4. Another advantage of this approach is that it is truly strategic in nature. All routes are analyzed within a consistent framework and this approach affords an opportunity for overall system optimization. Other approaches, such as ordinal ranking and cost centers, can only provide suboptimal investment decisions.
5. By recognizing the dynamics of the urban environment in general and the bus system in particular, the approach provides greater insight into system performance than might be possible with the traditional procedures that examine the transit system at only a single point in time (i.e., a snapshot).
6. By assessing individual routes within a dynamic and global framework, the allocation of system planning and service resources can be made to achieve specific future results.
7. Similar to all such management tools, the strategic planning approach is diagnostic. Plans and programs must be formulated and implemented to remedy route and service deficiencies and exploit opportunities.

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Future Directions for Public Transportation: A Basis for Decision

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The future direction of public transport must be viewed in the context of the major forces that will influence our society. We identify four major forces to consider: population demographics and dispersion, energy cost and availability, overall economics, and technological change. Factors that could far transcend the single personal transport issue (e.g., world war) are purposely not addressed. Within the context of personal and economic forces at work in our society, we recommend that less emphasis be placed on competition between transit and automobile and much more be placed on articulation, system efficiency, and balanced transportation. We recognize that personal, individual transportation will continue to play a major role. The technology and fuel of such transportation may change, but not its basic role. The counterforces do not exist, and nontransportation factors so overshadow the issue at hand that it is not logical to attempt to manufacture them. Much can be done, however, with innovative use of urban personal transportation.

This long-range study is based on a report that was prepared to assist the Urban Mass Transportation Administration (1). It deals with the mobility needs of the American population in the year 2000 and the implications for public transportation. In order to gain a perspective on the time period involved, note that the year 2000 is not any further away from 1981 than was the year 1962. From the point of view of planning transportation facilities (including such long-lasting investments as highways and railways) 19 years is a very short period indeed.

The basic problem, of course, is that there is simply no objective way of knowing what conditions