

Integrated Transit Service in Santa Clara County

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This paper describes the experience of an integrated transit system in Santa Clara County, California. Background information on the county and the origins of the system are presented, as well as a description of the services provided. After 4½ months of operating the full system, elements of the system were dismantled. Some of the reasons for this failure are discussed.

Many words and probably tons of paper have been generated as a result of the ambitious and forthright attempt by Santa Clara County to institute an integrated transit system suitable for the twentieth century. Words and paper notwithstanding, I can report that the attempt was a success. But it was success with a vengeance. In Santa Clara County, we did what others just talk about. The fact that part of our project failed because of a lack of resources does not detract from the importance of the concept to transit operations everywhere. Those who have been able to look past the hardware have recognized this importance and we find that gratifying.

The problem of integrating transit in an adaptive manner to respond to the changing goals and aspirations of the many conflicting trends in our society is only now beginning to be addressed. More commonly, the concept of integrated transit seems to confine itself to making devices work together in the transit business, rather than integrating transit with the infrastructural system.

In Santa Clara County, our design concepts were projected to integrate police, fire, and emergency vehicles as well as arterial, bus-pool, dial-a-ride, and light and heavy rail services. Provision was even made for the very necessary incorporation of private-sector services. Finally, we have started to provide the governmental and management structure to accommodate this total integration.

Happily, the concept of transportation as a functional system helping to link together the other functions of an urban society is still in effect in Santa Clara County, even though a portion of that integrated system has now been constrained by the decision not to proceed at this time with countywide demand-responsive services.

Some brief background information on Santa Clara County will be helpful in understanding the Santa Clara experience since it is only by understanding the nature

of a community that strategies for transportation and transit can be properly understood. Meshing the community with transportation strategies is the first and most important integration.

Santa Clara County has a population of about 1.2 million people and an urbanized area of about 620 km² (240 miles²) in a county whose overall area is about 3400 km² (1300 miles²). There is a strong county government with 15 independent, and independent-minded, cities ranging in population from 3000 to 550 000. In the 1950 census, Santa Clara County had a population of fewer than 300 000 people. By 1960, that population had grown to 640 000. In 1970, the population was about 1.1 million, but many people strongly wish to slow the rate of growth for a broad variety of reasons. A large part of the population is highly educated and therefore well able to articulate a wide-ranging set of ideas for the future of the county.

The county has a large number of both established and experimental regional mechanisms for addressing some of the more comprehensive issues normally associated with large urbanized areas, one of which is the overall transportation issue. Transit, which is the responsibility of the Santa Clara County Transit District (SCCTD), is dealt with by a governing body that is also the Board of Supervisors of the County of Santa Clara, a unit of general-purpose local government. This political arrangement dictates that transit be considered in priority with other urban issues. To ensure that all cities and major interests have an appropriate influence on this governing body, there is also the County Transportation Commission composed of city council members from each of the 15 cities, along with 10 others, 3 of whom are supposed to have some special knowledge of transit.

ORIGINS OF THE INTEGRATED SYSTEM

The Arterial/Personalized Transit (APT) system in Santa Clara County has often been referred to as dial-a-ride. This is incorrect. APT is a system concept, independent of hardware, based on functional services to provide the opportunity of mobility to all the people in Santa Clara County. Dial-a-ride was merely part of APT.

APT was conceived in controversy. Transit has been a controversial issue in Santa Clara County since the first paper was written in 1964 advocating the pursuit of a comprehensive transit effort, during the time when the highway-building program was in its heyday. The controversy has continued among those who believe that the automobile mode should be terminated; those who believe that the automobile is the only way to go; those who believe that electrified, exclusive right-of-way transit is the only solution to long-term travel problems in the Santa Clara County metropolitan area; those who believe that, since fixed guideways take too much time and money to install, buses are the only solution; and those who believe that the public should be left alone, particularly insofar as additional taxation is concerned.

The transit controversy led inevitably to making a study. That study in 1969 recommended a system of fixed-route bus services covering about 70 percent of the 1980 population in the urbanized areas and using 325 buses. This recommended plan was a considerable improvement over the then-existing bus services provided by private operators, which served about 53 percent of the urbanized population with roughly 75 buses. The report was not greeted with favor by those who advocated an immediate rapid transit system.

When the SCCTD was created in June 1972, it became mandatory to deal effectively with the sharp divisions of opinion concerning the appropriate initial size of the bus fleet, particularly to ensure that the bus fleet should not be so large as to preclude productive efforts toward installing the electrified rapid transit system. Goals and programs were adopted. The decision was made to begin countywide transit services with about 200 buses. That decision was a compromise and offered a fleet of a size that could be operated within the financial limitations of the legislation that created the SCCTD, which at that time contained no local taxation capability.

As soon as the compromise decision was reached, a new controversy was created. Sharp disagreement surfaced over the deployment of such a limited number of vehicles for 1.2 million people in 620 km² (240 miles²). Jurisdictions that had transit service from the private companies that had been purchased were insistent that service levels be improved. Jurisdictions that did not have transit service were equally insistent on receiving their fair share of transit service, preferably in proportion to population and certainly in proportion to tax revenues generated by a \$.0025 sales tax.

APT avoided the politics of the deployment controversy and focused on goals. Given 200 buses to serve more than one million people, it was quite apparent that a formula allocation of buses to jurisdictions would prevent achieving reasonable service levels. The concept of judging transit service levels by the opportunities for service, irrespective of jurisdiction, was introduced and called APT. Under this system, there would be a countywide network of arterial routes that would serve countywide travel. Since 54 percent of all trips are less than 8 km (5 miles) in length, the short trips would be handled by demand-responsive services. The number of vehicles needed to respond to demand in a given area would adjust to that demand. On this basis, if demand was low in a given area of the county but very high in another area, vehicles would simply move from the low-demand area to the high-demand area to equalize response time to a call for service. It would be very difficult then for any jurisdiction to argue that it was not receiving its fair share of transit service. The true integration of arterial services and demand-responsive services minimized the perennial problem of the transit operator concerning productive use of a fleet during the off-peak hours and made the best use of a grossly inadequate

number of vehicles.

APT was born of these controversies in an effort to provide at least some transit service with the resources available. It was fundamentally an orderly expression and refinement of the transit desires of the community, including the needs of those who rated themselves transit dependent because of income level or physical handicap. It was intended to be a bridging operation between no transit service and adequate transit service, while both addressing social needs and avoiding the political controversies that were threatening to result in simple inaction. APT was a strategy for approaching the overall goals without complete revamping of service with each step. It was and is a hardware-independent service strategy that was also suitable as a feeder network (collection/distribution system) not only for heavily traveled arterial bus routes but for future fixed-rail facilities of any type.

SERVICES PROVIDED

The arterial portion of APT consisted of 99 to 132 vehicles on 19 routes forming a network over the entire county of 446 km (744 miles) of two-way routes with basic headways of 15 and 30 min.

The personalized transit (PT) portion of APT consisted of 39 to 75 vehicles (the original design called for about 100) in 18 zones within four control areas. Three of the control areas, in the more heavily urbanized northern part of the county, used computer-assisted reservations, scheduling, dispatch, and management. The average zone was 34.4 km² (13.3 miles²) and had a population of 61 000. Address subzones were sized at about 2.6 km² (1 mile²) for convenience.

In addition to these highly visible services, APT also envisioned coach facilities for the self-assisted wheelchair rider as a part of mainstream transit service in which both the handicapped and the able bodied would ride the same vehicle. Such an integration was not only adopted for social reasons, after discussion with handicapped people, but was also required to make effective use of scarce resources.

Commuter specials or bus pools were also instituted and continue to be a part of the transit service in Santa Clara County. The commuter special is the one piece of premium service for which a premium fare was agreed upon to permit recovery of operating costs.

In order to provide these services with a fleet of 212 buses, only 134 of which were new and truly operable, each vehicle ran in excess of 9300 km (5800 miles) per month despite shorter than normal operating hours, both on weekdays and on the weekends. The rate of 9300 km per month per coach in fleet is probably at least 60 percent higher than the rate for other major transit properties in California. This intensive fleet use compounded problems that were to have been avoided by rapid vehicle replacement. The replacements did not materialize.

Ridership jumped, nevertheless, during the 4 months and 17 days that APT was in operation, from fewer than 18 000 riders per average weekday to more than 32 000 riders per day. In the remaining PT service area, ridership in December 1974 was 150 per day with three vehicles. Today, that service carries up to 938 in one day with seven vehicles.

THE FAILURE

The demand-responsive element of APT began on November 24, 1974, and APT was fully installed on December 21, 1974. The PT element was discontinued in the northern part of the county on May 9, 1975. During that period, APT system ridership increased dramatically,

and PT ridership increased steadily from about 1200 on the first day to 6671 on Tuesday, May 6. The demands placed on the system were high and highly visible. Rapid adjustments within the severe fiscal constraints occurred during this 4½ months. The adjustments were ongoing, as was intended in the original concept, but they were inadequate to stem the tide of discontent.

Probably the primary trigger for failure was that the revised countywide arterial network was installed without sufficient consideration for problems of the rider who was displaced, despite the cooperative effort of all cities in designing the revised network. Controversy surrounding the efforts of displaced riders to recover these old fixed routes tended to discredit the entire APT system. Displaced riders both resisted exercising the alternative transit opportunity that existed and were unable to use the PT system because the general demand was so great. A measure of that demand is indicated by the problem of the telephone system. On the first day, more than 50 000 telephone calls for PT service were attempted. Not only was the SCCTD's telephone system on the brink of disaster, but the entire telephone system of the county incurred severe strain, and emergency measures were taken at the telephone company's switching stations.

The very nature of the APT strategy unleashed the dormant expectations of the public and revived old controversies. The problem of the rider displaced from fixed-route services became a rallying point to coalesce discontent with society in general and transit access in particular.

Legislative discontinuity was an important feature in the political failure of a technical and box-office success. APT began full service on December 21, 1974. By January 7, 1975, the complexion of the governing body had changed with the addition of two new members of the five-person Board of Supervisors. A new majority appeared to exist, with little allegiance to previous decisions and with the problem of coping with the highly activist demands of some community interest groups. The solution finally arrived at was virtually inevitable, given the rigid financial constraints and the legislative discontinuity.

There is no question that the demand for the new service, coupled with the scarcity of resources to satisfy this demand, contributed greatly to the demise of dial-a-ride. Under normal circumstances, given a high demand for service, a reasonable response would be to increase the resources needed to satisfy that demand. This was not possible. As demand levels continued to rise, any adjustments to service tactics could not really address the fundamental problem of undercapitalization. Service continued to attract more riders but greater feelings of discontent. The constituency in favor of the service could not enlarge itself rapidly enough because there were too few buses. It was never possible to devote the planned number of buses to demand-responsive service because of the increased peak-load demands in the arterial service, for which schedules and routes had already been published. Under such circumstances, fleet deployment gravitated toward arterial services, which further deteriorated the already inadequate PT service.

The willingness to compromise was gone by this time. Dial-a-ride was singled out as the culprit, despite the fact that ridership in the APT system per coach in fleet per day compared favorably with other major transit operations in California. The problem of the empty bus remained because of the uncompromising attitudes that prevailed during attempts to explain the concepts of APT. The concept of the integrated system was forgotten, and APT was regarded as a series of discrete

transit services independent of other transit services that were being performed. Dial-a-ride was focused on by the community interest groups as the source of all inadequate transit services being provided by a fleet of 200 buses in an urbanized area of 620 km² (240 miles²) and 1.2 million people.

When APT began, eight taxicab companies in Santa Clara County that owned approximately 150 taxis, half of which operated each day, became concerned over the potential loss of business, particularly to dial-a-ride. A lawsuit followed and the judgment was against the SCCTD. Apprehensions concerning the total compensation that would have to be paid to the taxi companies further aggravated the situation.

Attempts were made to reach some accommodation with the taxi companies, but these attempts were also frustrated by the district's inability to incur additional financial obligations. The SCCTD attempted, at various times, to treat the private taxi fleet as a part of the total public transportation system and offered centralized dispatching and scheduling. It also offered an aggressive referral service during periods when our own response times would be too long. It offered referral services for those who might not wish group travel and were willing to pay a premium for private travel. It offered to centralize marketing so that any member of the public wanting to make a trip by anything other than a private automobile would be able to make one telephone call. Unfortunately, these attempts at operational integrations failed. The taxi companies were unwilling to consider anything but the simple payment of dollars by the SCCTD. The lawsuit is still on appeal since the taxicab company owners want to be purchased anyway, rather than paid damages. A similar problem with ambulance companies is possible if demand-responsive services are proposed for only the elderly and handicapped.

Cost computations on dial-a-ride came from a variety of sources, but costs were assigned to dial-a-ride on a proportional-cost basis only and without a proper appreciation for the integrated nature of the system or the peculiarities of the union contract. Under the union contract, labor costs incurred during peak hours on fixed routes are proportionately higher because of restrictions on the total number of hours an employee can work and guarantees to the employee for a certain number of hours of pay if he or she reports for work. Sophisticated marginal-cost concepts were ineffective during this time of intensive and simplistic political battle. Realistic application of marginal-cost theories would have led to the conclusion that dial-a-ride cost virtually nothing compared with our overall rates of expenditure.

During the start-up period, inexperienced personnel were at a severe disadvantage under such high-pressure conditions. Despite intensive training, the learning curve was flatter than it should have been because of ad hoc attempts to respond to high levels of criticism. Service efforts were sharply diluted as panic spread.

LESSONS

Providing transit services in the context of overall transportation mobility for a metropolitan area is a complex problem. Proper provision of these services can best be discussed under the headings of price, product, packaging, promotion, and politics.

Price

The price of adequate transit services is high. The traditional public concept of transit service is that it is an entrepreneurial undertaking that should somehow be paid for entirely by the customer. The customer is usually

defined as the one who rides on transit. Only recently has the idea been introduced that transit services should be treated like any other governmental service and not like an entrepreneurial undertaking. With government operating transit, social values take on increasing importance and influence the conduct of transit service.

Dealing with transit in such a way requires a different pricing approach, but the viewpoint that transit should be paid for solely by the rider lingers on. To the extent that the customer is the beneficiary of the existence of a service or product, the transit customer is the population at large rather than merely the rider. The rider secures a direct, identifiable benefit for which he should pay. At the same time, however, the community at large receives an identifiable, although still intangible, benefit from the existence of transit, and the community should be expected to pay in proportion to that benefit. The transit customer is now everyone in the community who benefits from transit riding, from decreased congestion, from improved air quality, and from decreased consumption of land. The pricing of transit, however, does not yet recognize this new situation.

In addition, decisions on pricing policy by those in government who are inexperienced with pricing theory further complicate the situation. There is the mistaken concept that the price margin should be uniform over all elements of service. Pricing levels should be based on the attractiveness of the product and should provide a functional economic situation. In the APT system, the price for dial-a-ride was established at precisely the same level as that for traditional fixed-route service. The level of service for the two is different, however.

The use of pricing as a means of regulating demand on limited resources is not yet fully understood in government circles. The loss-leader concept has insufficient currency. In addition, fare levels have been established more on the basis of social goals than on economics. That attitude has curtailed the ability to achieve differential pricing by modes of service, except in the arena of bus pools, which are regarded as being primarily for the more affluent.

In addition, some complaints were received from senior citizens who objected to the need to make a telephone call to secure transit service. Many senior citizens view the telephone not as a utility but as a lifeline for emergency purposes only. They have telephones but use a limited-service rate. The need for the telephone call therefore added to the cost for transit service and virtually eliminated the benefit of lower fares for the elderly.

Product

The product offered by APT service was superior and was achieved at a premium of 7 percent or less over the alternative of 100 percent traditional fixed-route transit services. The premium to produce that product was perceived as being considerably higher because of the empty bus factor in the face of extraordinary demand. The product also required using advanced technology, such as computerized assistance for scheduling and dispatching. While the computer did its job superbly and was a minor part of the cost, it added to the perception that APT was a premium-cost service that could not be properly afforded given the financial constraints on the SCTD.

Our use of computer technology does not have to be defended. We could not have operated demand-responsive service in the urban areas of the county without the computer. The scheduling and dispatching programs did exactly what they were designed to do

and more. Reliability was excellent—90 min of hardware downtime in 10 000 h of operation. Furthermore, we are convinced that computer technology improved scheduling effectiveness over manual methods by 20 to 30 percent, as shown by a constantly rising vehicle productivity that reached 6.6 just before the PT service was terminated.

Incidentally, we have continued to use the computers for other transit-related purposes. We recently installed a low-cost automatic passenger information system, and we are beginning to develop a low-cost system for checking the adherence of vehicles to schedules on fixed routes.

Packaging

The packaging for the service was also superior. Graphics on the inside and the outside of the bus were designed for high visibility as well as nighttime safety, and they were designed to help the bus seem smaller in the street than it really is. Special attention was devoted to the selection of the power plant. Buses were going into areas of the county where large vehicles had never gone before. Transit was sold, in some measure, on the basis of environmentalism. After careful consideration, the diesel engine was discarded as a suitable power plant because of smoke, smell, and noise. A gasoline engine converted to propane fuel was selected after a protracted fight with those with more traditional viewpoints.

The interior of the vehicle was specifically designed for customer comfort, but with a view to adequate maintainability and cost considerations. Space between seats was increased for additional leg room. Floors were carpeted. Ceilings were vinyl covered. Incandescent rather than fluorescent lighting was used to provide pools of light at a seat. Interestingly enough, with the reduction in seating capacity the overall peak-hour loading capacity of the bus was increased. In addition, vandalism rates have been lower with the soft interior than with more standard interior bus treatment. Small individual NO SMOKING signs were glued to windows. These signs have been subjected to the only significant vandalism as members of the public have taken the stickers for souvenirs and for use in their own establishments. This packaging strategy continues to attract happy compliments from new riders.

The same vehicles were used for both arterial and demand-responsive service. This packaging decision resulted from the search for a universal vehicle and the need for dynamic balancing of fleet deployment during the course of the day. What actually occurred, however, was that while the bus was in PT service it was perceived as empty and therefore extravagant. In addition, all buses, however they were being used at a given moment, were perceived as being in PT service because of the timing of the start-up, since dial-a-ride was introduced in advance of arterial services. The problem was compounded by the administrative decision to use relatively clear glass in the new large-windowed buses. A better decision would have been to darken the windows of such large-windowed vehicles to enhance interior coziness and inhibit charges of extravagant emptiness directed even at buses that were out of service.

A large integrated transit system that includes demand-responsive services depends on packages of equipment and business systems that are not within the control of the transit operator. Demand-responsive service, for example, requires intensive use of the telephone if the system is to operate successfully. A very large demand-responsive service places intensive operational demands on the telephone system in the area. During the early stages of dial-a-ride, some 50 000 to 70 000 telephone calls were being attempted each day

within a 16-h period. This is a call rate of 45 to 65 requests per 1000 population rather than the rule of thumb of 10 to 26. Uncompleted calls were due not only to our inability to answer such a large number of requests, but also in some measure to the failure of the overall telephone system itself.

Promotion

The promotion of APT was probably superior. Advance information issued was colorful, informative, and, unfortunately, in some respects exhortatory. The placement of the Rider's Guide into virtually every household, before service was begun, excited expectations, and there was insufficient time to explain truly what was inside the package. As a result, it was pure promotion rather than instructive promotion. With a technologically innovative system such as APT, the educational effort should have received more emphasis during the promotional phase. This problem was compounded by informal commentary to civic groups and other interested organizations concerning the potentials of the APT system without adequate explanation as to its practical limitations in vehicles available. The formal and informal promotion of APT loosed unexpectedly high expectations. It is difficult to know precisely what was said in some of the informal promotion, but the suspicion is that there was too much implication of utopia unfettered by practical limitations.

Politics

Politics is not typically taken into account in transit marketing, but the provision of government transit services is political. Political accommodation is therefore inextricably bound up in the technical solutions that are sought. This fact was not properly recognized and the problem of political passions was too casually dismissed by technicians, professionals, and politicians alike, especially when dealing with technologically innovative management solutions for providing ubiquitous transit services. Nor did we recognize how volatile politics really is. The ever-present possibility of the new politician was not factored into design decisions.

In addition, politics governed the decision for a shotgun start of APT. Despite a preference for incremental and gradual beginnings, the policy of a shotgun start was made after a majority of cities volunteered to be first.

CONCLUSIONS

Dial-a-ride died, but there is still some integration of transit services within Santa Clara County, and normal arterial fixed-route bus transit services continue.

Commuter services, also known as bus pools and van pools, are being emphasized. A new van-pooling operation now under way is designed, once again, to maximize service opportunities in the SCCTD. Vans are used for a 6-month trial period to acquaint employers with the concept of van pooling without an investment in equipment or assumption of risk by the employer. After the 6 months, employers and employees have the option to end the project or continue with their own drivers and equipment, and the SCCTD takes its vans and goes on to another employer to aid in establishing private van-pooling efforts.

Ten off-peak local routes serving neighborhoods and major trip attractors have been established since the demise of dial-a-ride in the former PT service areas. Route configurations are based on a review of the 4½ months of operational data coming out of the dial-a-ride effort. Buses run at nominal 30-min intervals and

cover the off-peak transit service time of roughly 9:00 a.m. to 3:00 p.m. These fixed routes on fixed schedules are intended to accommodate as well as possible the midday trips previously accommodated by dial-a-ride.

Full demand-responsive dial-a-ride services are being continued in the southern part of the county covering the cities of Morgan Hill and Gilroy, the community of San Martin, and the surrounding semirural area. This service carries more than 100 people per vehicle per day and is steadily growing. Waiting times exceed 1 h during the morning peak and all afternoon and early evening. Demand-responsive coach service for the handicapped has also been instituted. Interestingly enough, the daily proportion of ridership by self-assisted wheelchair riders exceeds the estimated percentage of people confined to wheelchairs in the population at large.

The consideration of successes or failures in a truly integrated transit system must delve very deeply into behavioral and infrastructural factors. The APT experience in Santa Clara County has led me, for example, to appreciate strongly the fact that there is a definite, albeit undefined, relationship between public perceptions and expectations and that both are highly volatile.

Integrated transit approaches require integrated governmental approaches to urban issues, complete with integrated hazards that are probably higher than those normally experienced by the traditional transit operators. Relationships between the public and private sectors become very important, and I suspect that they are unique to each area in this country. A simple discussion of modal integrations, in this context, becomes superficial and inadequate.

If there is to be truly integrated transit, including integration with the community, transit techniques will have to address problems larger than the simple interfacing of equipment or management techniques. When community goals are known, transit goals can be integrated in turn and appropriate management strategies can be devised. If such an approach is to be adopted elsewhere, I would urge the administrator of such an effort to be particularly sensitive to the realization that he or she can increase service linearly but must face the problem of dealing with geometrically rising public expectations and perceptions.

A final set of comments is required. This presentation has deliberately not been filled with statistics and operational data. Truly integrated transit resides in combining transit with community goals, and these are not statistical issues. Integrated APT in Santa Clara County was pursued with what, in my opinion, was a remarkable partnership that integrated the problem-solving capabilities of the public and private sectors.

We have the tools to integrate our transit services. We need now the will and the management and political structures to make those integrations possible. Management strategies must be based on the recognition that the public interest is not necessarily the interest of the public at any given moment in time. Only if we understand these behavioral considerations, both for individuals and for groups, can transit be truly integrated.