

against the background of the likely development of the 747 and the associated changes in world airline economics, could already have shown in 1960 that the commercial prospects were almost non-existent. But none of this was done.

It would be good to think that governmental decision processes are more rational now. Two examples may prove that perhaps they are. The American SST, Concorde's bigger and faster rival, was also the result of a snap decision for prestige reasons, this time by the Kennedy administration in June 1963, after the Pan Am option on Concorde was announced, despite warnings from an expert committee about the dangers of cost escalation. It too was defended by an embattled administration – the Nixon one – on arguments of prestige and job protection. But it was finally killed by a Senate vote, refusing to provide the necessary appropriations, in March 1971.⁵⁶ In Britain, the government in 1978 announced that Rolls-Royce would provide engines for the new Boeing 757 short- and medium-haul plane, successor to the highly successful 727, and that it was seeking re-entry into the European Airbus project. At last, it seemed, Britain was in the business of 'boring', conventional planes that made money. Perhaps, after all, the Concorde experience had its value.

San Francisco's BART System

San Francisco's Bay Area Rapid Transit, or BART, has many admirers, especially among first-time visitors who throng the city's streets during the year-long tourist season. For many of these, the seventy-one-mile BART system is the archetype of everything a modern urban rapid transit system should be, and a model for the great majority of America's large cities that still lack one. These people are impressed by the calm elegance of the stations, each individually designed with mosaic-tiled walls; by the uncannily silent, air-conditioned, carpeted trains; by the automatic train control system that seems effortlessly to accelerate the train to its 80 m.p.h. programmed speed; by the computerized ticketing system which, through a single strip of plastic and without direct human intervention, debits the passenger for each journey until the credit on his ticket is exhausted. For them, BART seems indeed a modern American technological miracle, comparable almost with the feats of Houston's Space Center.

But BART also has many critics, especially among the 4,100,000 residents of the Bay Area. These critics tend to be very well informed and very vocal. They point to the fact that, in 1976, BART carried only 51 per cent of the passengers forecast when the fateful decision was taken to build the system; that the operating loss (\$40,000,000 in 1975-6) is so great that every passenger costs the taxpayer more than he contributes in fare revenue; that the system is still plagued by technical faults, which prevent it from exploiting its space-age technology; that the system has almost completely failed to end the typical Californian's long love affair with his car.

Most important of all, the admirers and the critics disagree on the wider lessons to be learned from the BART experience. Other American cities (Washington DC, Atlanta) have committed themselves to schemes in some ways like BART. Others (Los Angeles, Denver) have agonized long over the issue, but have so far failed to agree to rail plans or get them accepted. And many experts, including influential ones in the Department of Transportation in Washington, think that BART is an expensive object lesson to these other cities, showing them what they must avoid.

Whatever the outcome of the debate in these cities, there can be no doubt that in the sense used here BART is a Great Planning Disaster. It is manifestly criticized for its failings and it has conspicuously failed to fulfil the predictions made for it. Had the citizenry of the Bay Area the ability to foresee the true future, there seems little doubt that they would have rejected the whole BART proposal out of hand. But, in the critical decisions between 1959 and 1962, the information on which they acted was seriously deficient.

In this chapter, therefore, we shall follow these critical decisions, seeing them first through the filter of the perceptions of that time, and then through the lens of reality in the late 1970s. We shall see how far this reality diverged from expectations, and how the decision-makers had to react to the consequences. Lastly, we shall try to sum up on the forces that led to the decisions to build the BART system, looking at alternative explanations of the facts in terms of different theories of decision-making.

BART DECISIONS: THE STAGES OF COMMITMENT

The facts of BART history are not in dispute; indeed they are exceedingly public knowledge, since they have been retailed by countless local authors.¹ They start with a 1949 Act of California legislature allowing the creation of a Bay Area Rapid Transit District and a 1951 Act creating a Rapid Transit Commission for this district, with powers to make a preliminary study; this duly reported in favour of a full-scale consultancy study, and in 1953

the legislature approved a loan, to match local funds, for this purpose.

Accordingly, in August 1953 the new commission appointed one of four contenders, the New York engineering firm of Parsons, Brinckerhoff, Hall and Macdonald, to carry out the study and report by 1956. There were four basic questions posed by the commission to the consultants: (1) Is an interurban rapid transit system needed? (2) If so, what areas should it serve and along what routes? (3) What type of facility would best meet the area's needs? (4) Would the cost be justified? The consultants' report, delivered in January 1956, logically tried to answer each of these questions – but in different degrees of detail and precision.

1. Need. Unsurprisingly, perhaps, the consultants concluded that there was a need. But, interestingly, it was defined in terms of the chief problem as the consultants saw it: growing population, and rising car use, leading to increased congestion, which in turn posed a threat to the role of the existing centres and sub-centres of the region as concentrations of employment, commerce and culture. So, from the outset, a principal *raison d'être* of the proposed system was its role in preserving the existing spatial structure of the Bay Area.
2. Routeing. This followed logically from the first. The system, initially 123 miles long, would link existing centres, especially the two major city centres of San Francisco and Oakland, by means of an under-the-bay tunnel.
3. Character. The report did look at a variety of technologies ranging from bus to monorail. But, following tradition (they had acted as consultants for the original New York subway at the start of the century), the consultants reported in favour of supported trains, that is conventional trains running on rails.
4. Cost. Here the consultants were vaguest. They did produce a hard cost estimate of at least \$586,000,000 and perhaps \$130,000,000 more. And they were quite straightforward that this would mean an annual subsidy of at least \$33,000,000 to \$38,000,000 that would not be met from revenue. But they did not deal with the justification except in general terms, and their

final conclusion bordered on rhetoric: 'We do not doubt that the Bay Area citizens can afford rapid transit: we question seriously whether they can afford *not* to have it.'²² The Parsons, Brinckerhoff report thus gave technical endorsement to the proposal, making it seem credible and even respectable; thus it was a vital first stage in winning political support. But from then on, several hurdles had to be negotiated.

First, since public subsidy was demonstrably needed, an acceptable way had to be found of providing it. A study by Stanford Research Institute in March 1956 suggested property taxes, with a higher rate for those areas directly served by the new system, plus sales tax, plus bridge tolls from the existing San Francisco-Oakland bridge.

Secondly, an agency would need to be set up with a commitment to build. The Stanford study suggested that a public agency was appropriate, and in the summer of 1957 the legislature passed an Act dissolving the Rapid Transit Commission and creating a permanent San Francisco Bay Area Rapid Transit District (BARTD), with effect from 11 September 1957. Its remit covered five counties: San Francisco, Marin and San Mateo counties west of the bay, and Alameda and Contra Costa counties to the east; any of these could withdraw and four more distant counties could join if they wished. Most importantly, the district could raise money both by issuing bonds up to 15 per cent of the assessed property value, and by levying property tax; it was also allowed to issue revenue bonds payable only from revenues, and to levy a special tax for general administration, maintenance and operation. This last was immediately used to pay for the general expenses of the new district.

Thirdly, public opinion had to be rallied. The major newspapers of the Bay Area were unreservedly in favour, both in persuading the legislature to set up BARTD, in 1956, and subsequently. But there was opposition from highway interests in the State Senate. Finally, in 1959, the legislature in Sacramento approved a bill providing that as long as voters approved a minimum \$500,000,000 bond issue, then some \$115,000,000 could be appropriated from Bay Bridge toll reserves to pay for the

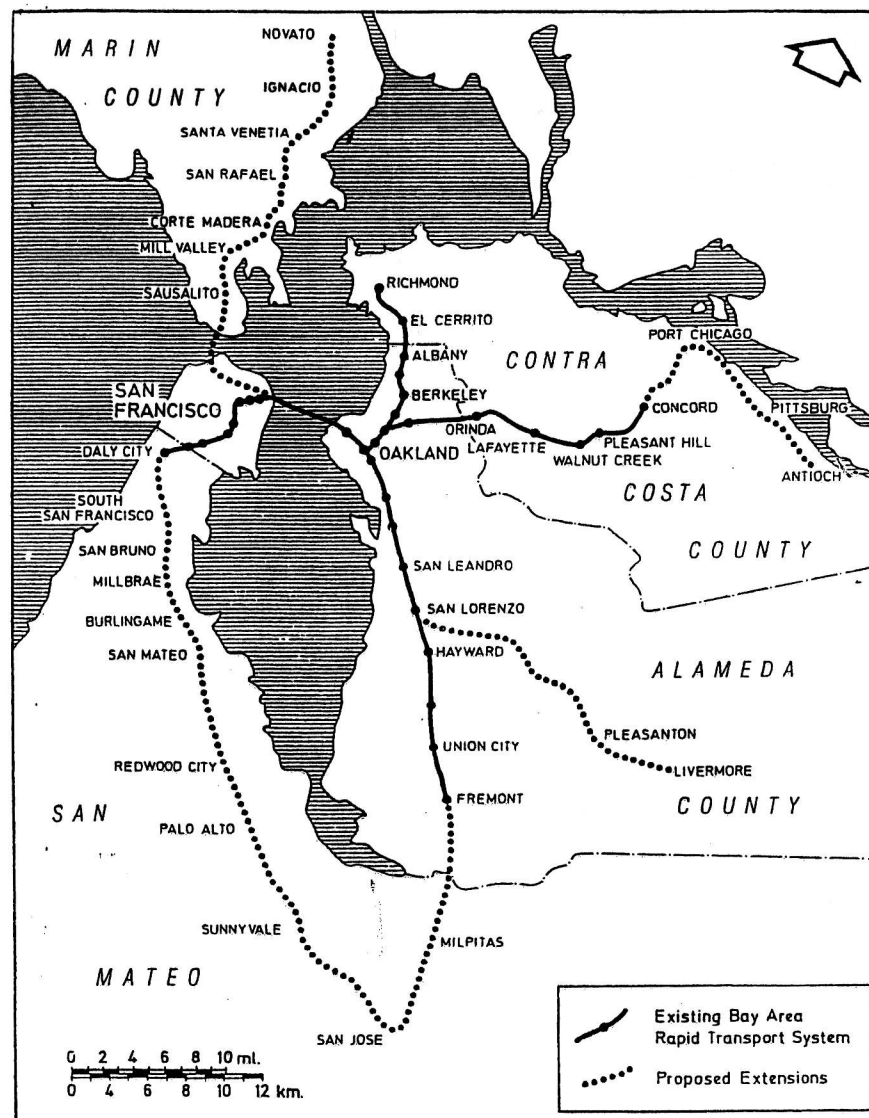


Figure 4: The BART System.

San Francisco's BART System

underwater tube section between San Francisco and Oakland. Meanwhile, the first signs of trouble had emerged: the engineering consortium appointed in April 1959 to produce the detailed system design (consisting of Parsons, Brinckerhoff, Quade and Douglas, the new name of the previous consultants, plus Tudor Engineering and the Bechtel corporation) reported in May 1961 that the package would cost \$1.3 billion – over \$600,000,000 more than originally forecast, and some \$400,000,000 more than legislative powers permitted. The response was interesting; in April 1961, after much controversy and manoeuvring in Sacramento, the legislature approved a bill allowing a bond issue to be approved on a 60 per cent favourable vote, as against the two-thirds majority that was usual in Californian law. This was critical for two reasons: first, it was thought that the proposal might win 60 per cent support but not two-thirds; and secondly, if it failed to pass by November 1962 then the 1959 arrangement to apply bridge tolls would lapse.

From then, it was a race against time. It was complicated in one way, but simplified in another, when first San Mateo county (in December 1961) and then Marin County (in May 1962) withdrew, the latter after heated controversy about the technical possibility of running trains on a lower level of the Golden Gate Bridge. This left a truncated seventy-five-mile system, estimated to cost \$923,200,000 for fixed infrastructure. Of this \$132,700,000 represented the transbay tube, to be financed from bridge tolls, leaving the remainder to be funded from a \$792,000,000 bond issue. Additionally, rolling stock estimated to cost \$71,200,000 would be funded from revenue bonds against a pledge of revenues.

The first step was to win official endorsement of this plan from the Boards of Supervisors (or local councils) of each of the three counties (San Francisco, Alameda and Contra Costa) left in the district. San Francisco readily agreed, Alameda (including Oakland) concurred more reluctantly and Contra Costa approved in July after considerable pressure had been put on an undecided member. Thence, a committee of citizens was formed to 'educate' the citizens to vote for the proposition. Business, especially the

major Chambers of Commerce and the Bay Area Council, was enthusiastic; some big corporations helped to pay for public relations, and there was no real opposition. Finally, in early November both the San Francisco daily newspapers, the *Chronicle* and the *Examiner*, gave their endorsement. The proposition passed by 61 per cent on 6 November 1962. Though San Francisco voted nearly 67 per cent in favour, Alameda recorded just over 60 per cent and Contra Costa less than 55 per cent. This proved the perspicacity of those who had secured the change from a two-thirds rule and who had provided that the three counties' votes should be merged. BART was now in business – or nearly so.

In fact almost immediately the district had to fight a major legal action alleging that the bond issue election was invalid and that the contract for engineering services, issued by BART to the consultants immediately after the election, was also invalid. Though the district won, it claimed afterwards that the action had cost between \$12,000,000 and \$15,000,000 in extra construction costs due to inflation.

BART UNDER CONSTRUCTION: 1962–74

Three weeks after the bond issue, BART hired the Parsons, Brinckerhoff-Tudor-Bechtel consortium as consultants, without asking for alternative bids. The citizens' suit also contested this action, and though the judge found it perfectly legal, it did emerge that the BART directors had virtually no alternative because between them they had little engineering expertise and therefore little ability to hire necessary staff directly. Further, the financial agreement with the consultants, which the judge also found good, gave them no incentive to economize, since it awarded them a fixed percentage of the construction costs.³

The crucial decision had already been taken, on the basis of the consultants' report just before the bond issue election, to develop BART on the basis of a very advanced, indeed unknown, technology. The cars would be of lightweight construction; they would be controlled not by drivers but by computerized

San Francisco's BART System

automatic train control. This involved advancing the existing state of the art in one giant leap—as *Fortune* magazine put it, rather like going directly from the DC-3 to the 747.⁴ This would involve the necessity of using a large element of technology that was non-proven. Aerospace engineers, Burck says, have an axiom that if more than 10 per cent of a project is new technology, then there will be problems. BART's proportion was much higher than that; indeed it was almost a 100-per-cent new system.

Since the BART directors were by definition novices in unexplored territory, they handed all this work over to the consultants, who were to manage design and procurement. In turn, the consultants would hire appropriate companies not merely to build equipment, but effectively to design it first. No one was given the job of overseeing what aerospace technologists call systems engineering: anticipating the problems that would arise in putting new technologies together into a system. Further, since the technology was novel, neither BART nor its consultants could provide precise specifications of what they wanted. Instead, they supplied performance specifications: objectives that a system had to meet. Thus the train control system should provide 'automatic and continuous detection of the presence of trains'; cars were to weigh no more than 62,000 pounds and to be able to accelerate at 3 m.p.h. per second. It was left to the manufacturers to design the goods to these specifications. As *Fortune* again put it, while the New York subway authority would specify not just an apple but a Red Delicious, BART just asked for a palatable fruit, leaving it to the grower to define what that might mean.

In practice the consultants found that traditional railroad manufacturers were incapable of meeting specifications of this kind; they had got out of the habit of technical innovation. So they called in aerospace manufacturers to provide the cars and control systems: Rohr for the cars, Westinghouse for the controls. One problem was that Rohr had had next to no experience of the problems of railroad operation. They had to start from scratch.

This had three predictable and associated results. The first, that in practice the new equipment proved to develop all kinds

GREAT PLANNING DISASTERS

of snags, some of them serious. The second, that it took longer to design, and in particular to be brought into operation, than had been predicted. And the third, that the costs of the operation escalated.

The biggest problems came with the control system. Such systems are used on rapid transit systems elsewhere in the world, for instance on London's Victoria Line, opened in 1968-9. Experienced suppliers did tender for BART, but its consultants opted in October 1967 for a new Westinghouse system, as yet unproven. Once in operation, it was found that it produced 'ghost trains'—reports that track was occupied when in fact it was not. This proved to be caused by overheating of the detector boxes, and was cured by covering them. Much more seriously, a car stopped without power could be lost by the system. For this reason the California Public Utilities Commission, which is responsible for licensing, refused to approve the system, so that BART actually had to open in 1972 with an archaic system of manual block control, more appropriate to George Stephenson's Stockton and Darlington Railway than to the space age. True, the defect could prove dangerous only in very special and rare circumstances. But it proved so nagging that even by November 1976 the system was still not working as originally planned; at that time the original aim of a 90-second headway and a 45 m.p.h. average speed was abandoned, and maximum speed was cut from 80 to 70 m.p.h.

The lightweight cars proved the other major problem. Even in 1975, three years after the start, 40 per cent were out of action on a typical day; in the first five months of 1977, breakdowns still averaged twenty a day. Failures were legion among the motors, electronic components, brake systems, door controls and air-conditioners. Most of these could not be laid directly at the door of Rohr, the main contractors: they were component failures, exacerbated by the fact that Rohr had little tradition of controlling and coordinating subcontractors.

Mainly because of these control problems, completion of the system was seriously delayed. In the 1962 consultants' report, the system was to have been four-fifths finished by 1 January 1969, and complete on 1 January 1971. In fact service on the East Bay

section was started only in September 1972, and on the transbay tube in October 1974. This last delay was due mainly to problems with the automatic train control system, which was particularly crucial on the seven-mile, 80-m.p.h. section under the bay; a complex and extensive back-up system had to be designed to guard against the problem of the lost trains, and even this was not completely satisfactory at the time of opening.

These delays and modifications cost money. During the development of the control system, no less than 114 change orders were issued, leading to an escalation in the cost of the contract from \$26,200,000 to \$35,800,000. Then, in 1973 BART and Westinghouse had to negotiate a \$1,300,000 contract for the back-up control system; further modifications, called for by a Senate panel report of January 1973, would take an estimated \$5,000,000 for modification to cars and control systems.⁵

Total costs therefore rose sharply. Already by 1965 BART announced that it would exceed the original estimate, and in July 1966 it issued a revised figure of \$941,700,000, which was \$150,000,000 more than the 1962 estimate – together with a revised amount for the transbay tube at \$179,900,000, which was \$41,200,000 up on 1962. The latter was covered fairly painlessly by raising the limit that could be supplied from toll revenues, but the basic system proved more difficult. A 1967 suggestion for an additional bond issue met with opposition, and by April another proposal had emerged: raising the bridge toll, and drawing on state truck taxes. This too failed to pass the legislature, and in July 1967 BART announced a freeze on future construction. During the spring and summer of 1968 a number of other measures to aid BART, through extra tolls, extra taxes and a mixture of both, all failed. Finally, after bitter fighting, the legislature passed a Bill on 27 March 1969, approving a $\frac{1}{2}$ ¢ additional sales tax in the three-county district which would service up to \$150,000,000 of bond sales.

By January 1971 the total costs of BART had risen to \$1,367,200,000, of which general obligation bonds amounted to \$792,000,000, sales tax bonds \$150,000,000, toll bridge funds \$180,000,000 and Federal grants \$125,000. The final total, com-

puted after BART began operation over the whole of the seventy-one-mile system in October 1974, was \$1.6 billion. And only at that point was it possible to begin to judge the performance of the system in practice.

BART IN OPERATION

Fortunately, BART's progress has been checked by a massive monitoring study: the BART Impact Program, sponsored by the Federal Departments of Transportation and of Housing and Urban Development, and conducted mainly by consultants to the Metropolitan Transportation Commission. Though it will be some years before a final evaluation is possible, by 1976–7 enough evidence was available for a reasonably definitive verdict. And that verdict is highly unfavourable.⁶

The 1962 consultants' report⁷ was the document on which the critical decisions to build BART – above all the November 1962 bond election – were taken. It contains predictions of traffic that can be compared with reality, always bearing in mind that BART in 1976 and 1977 was failing to work as originally designed, in matters of both frequency and reliability. M. M. Webber shows that, comparing the 1962 forecast for 1975 with the 1976 reality, traffic was only 51 per cent of forecast: 131,370 passengers on an average weekday, against a forecast 258,496. Further, though the 1962 report expected that 61 per cent of passengers would divert from cars, in fact only 35 per cent actually did so: 44,000 against a forecast 157,000. And, as these people left spare capacity on the highways, so did additional traffic arrive to fill it up. Webber shows conclusively that 'BART has brought about a rise in total transbay travel by both auto and public transit'.⁸ In the whole Bay Area, the effect on traffic is so slight as to be undetectable. Because of this, traffic volumes and congestion are still at pre-BART levels and, with increasing car use, can be expected to rise in future. Half BART's transbay riders in fact came from buses, with serious effects on the viability of bus operation.

Overall, the 1962 report forecast that by 1975–6 BART would be producing an operating surplus of \$11,000,000. The reality

San Francisco's BART System

(based on preliminary figures for 1975-6) was a deficit of \$40,300,000, and BART was kept going only by a temporary extension of the $\frac{1}{2}$ c sales tax, agreed by the legislature as an emergency measure in 1974.⁹ In 1976 this was extended until 1978, and in 1977 an act permanently established it.¹⁰ In the year 1977-8 fare revenues were expected to yield less than 35 per cent of operating expenses; in one form or another, the taxpayer was contributing \$2 for every \$1 raised in fare revenues.

Webber's analysis shows that only 11 per cent of the capital investment and 37 per cent of operating costs (in 1975-6) were paid for by beneficiaries, the capital cost by motorists in the form of bridge tolls (for which they gained more roadscape, a function of the improvement of the double deck San Francisco-Oakland Bridge), the operating costs by fares. The rest of the costs are spread right across the BART three-county district. Since the main sources of revenue are property and sales taxes (both inherently regressive kinds of taxation), Webber and others argue that the main burden falls on the poor, while traffic surveys show that the main beneficiaries, the passengers, are disproportionately from the higher-income brackets. As Webber laconically concludes, 'Clearly, the poor are paying and the rich are riding.'¹¹

This is perhaps unsurprising, given that BART was designed from the start to connect white-collar suburban commuters with downtown San Francisco and Oakland. What is perhaps more surprising is that, according to estimates by a group of economists at Berkeley, both buses and cars are cheaper in real costs than BART. The main reason is that even if BART achieves full design efficiency, the Berkeley study indicates that it will still cost more than buses to run – and that it may even cost more to run than a car for each passenger.

These sums are based on the economist's concept of costs. On narrower accountancy criteria, taking account of BART's need to repay its borrowings each year at its favourable 4.14 per cent interest rate, plus the need to cover operating costs, Webber finds that the cost per trip averages \$4.48. So, with the average fare at 72c, the subsidy averages no less than \$3.76 per journey.¹²

GREAT PLANNING DISASTERS

Admittedly, BART's costs were high because the district, as a pioneer, got relatively little Federal aid; systems starting in the 1970s would fare better with Washington. But they also reflect the extraordinarily labour-intensive character of the BART operation, despite the emphasis on automation.

In fact operating costs on BART, as on other transit systems in the Bay Area, were rising far faster than inflation in the mid-1970s. BART's operating costs rose 105 per cent in only two years to 1975, while AC Transit (the area-wide bus agency) saw its costs rise 104 per cent over a five-year period, and MUNI (the local rail-bus system in the city of San Francisco) had an increase of only 46 per cent over the same five-year period. Personnel costs on BART represent 67 per cent of total costs, despite the highly automated character of the operation, against 85-6 per cent on the other two systems.¹³ And on all three systems, operating costs have risen while fares have remained roughly constant. Though BART's fares only covered 31.8 per cent of costs in 1975-6, AC did slightly worse and MUNI only slightly better. The predictable result was that all three systems were running deficits by the mid-1970s and that these were expected to worsen by the end of the decade. By 1979-80, indeed, the accumulated five-year deficit for the three systems was expected to be as much as \$233,700,000, of which BART alone would contribute \$173,400,000. Thus it can be argued that BART not only failed to pay its own way, but also damaged the viability of the existing systems. By failing to divert many car drivers, but instead taking passengers from the buses, it placed the entire public transport system of the Bay Area in jeopardy.¹⁴

As Webber concludes:

The most notable fact about BART is that it is extraordinarily costly. It has turned out to be far more expensive than anyone expected, and far more costly than is usually understood. High capital costs (about 150 per cent of forecast) plus high operating costs (about 475 per cent of forecast) are being compounded by low patronage (50 per cent of forecast) to make for average costs per ride that are twice as high as the bus and 50 per cent greater than a standard American car. With fares producing only about a third of the agency's out-of-pocket costs,

riders are getting a greater transportation bargain than even bus and auto subsidies offer; and yet only half the expected numbers are riding.¹⁵

A RETROSPECTIVE VIEW: WHAT WENT WRONG?

So, by any reasonable criteria, BART is proving a planning disaster. The question must be where and how the mistakes were made. By going back over the history with a degree of hindsight, it is possible to chart the main lines.

First, BART was posited on its ability to stem the apparently inexorable trend towards the private car. It has manifestly failed to do so, carrying as it does only 2.5 per cent of all trips within its area and 5 per cent of peak trips. The basic reason, Webber stresses, is that it simply does not serve the needs of the Bay Area residents. These people care about door-to-door journey time; BART's planners were obsessed with the time on the BART journey alone. By choosing a rail system, they created a configuration that puts BART out of walking reach for most people. Since they must use buses or cars to feed into BART stations, most consider that they might as well continue with those modes. In a Berkeley study of user attitudes, 59 per cent said that it was impossible to use BART for the work journey, 86 per cent of these saying that this was because it was too far from home or job.¹⁶ Webber concludes: 'It is the door-to-door, no-wait, no-transfer features of the automobile that, by eliminating access time, make private cars so attractive to commuters – not its top speed. BART offers just the opposite set of features to the commuting motorist, sacrificing just those ones he values most.'¹⁷

The original mistake, therefore, was in perceiving the problem to be solved. It was not seen in the way that the potential passengers – the only people whose views mattered – would see it. Rather, it was seen in terms of the obsessions of the planners, who were in turn viewing it from an operator's point of view. The 1956 consultants' report makes it clear that they thought the line-haul speed was far more important to the commuter than the feeder time; but they had no direct evidence of this, and they

were clearly wrong. Subsequent studies, the world over, have proved conclusively that people place a far higher value on waiting and transfer time than on time in motion – even the slow motion of congested traffic.

Allied to this was the failure to grasp that even if successful in diverting car commuters, BART could have little overall impact because too few of these people lived near the projected system. And here, it seems, BART planners made a quite unjustifiable commitment of faith: they assumed that, in some way, the system would work over the longer term to shift the patterns of living and working in the Bay Area. Indeed, the crucial 1956 report specifically claims that BART would encourage the development of large, nucleated, high-intensity business districts in appropriate locations.¹⁸ What this ignored was the fact that Bay Area residents were even then spread over a wide area, and were becoming more widespread all the time. The system could not reach the majority of these people except by transfers from buses or cars – and, as we have just seen, in practice people do not find that worth while.

The system could have worked, in fact, only if Californians had abandoned Californian living patterns and had taken up European ones. And the 1962 report, from the same consultants, seems to be suggesting that indeed this might happen. The major benefits, according to this report, would not be transport ones: they included the preservation of urban centres, the generation of higher property values, prevention of sprawl, better employment conditions and access to social, cultural and recreational facilities.¹⁹ In fact the voters in the subsequent bond election did not find the issues presented in this way;²⁰ if they had, they might have rejected them. But it may have been very important to other key actors.

The first of these were the original engineering consultants who wrote the early planning reports: they effectively pre-empted the public interest in laying down a 'correct' pattern for the region's development and in asserting that development of rapid transit could help secure this pattern.²¹ In doing so the planners ignored the fact that the people of the Bay Area were attached to their

cars for good and rational reasons, as they themselves perceived them; the consultants assumed that these patterns could be broken, yet they offered no empirical justification.

It is important to be fair to the consultant-planners. The 1949 California Act, establishing the BART district, had specified a rail-type solution. The Department of Transportation's conclusion, in 1975, was that it was impossible to identify significant numbers of professionals who, at the critical time, during the 1950s and early 1960s, seriously questioned the rail concept. Buses were then losing traffic to cars. A 'saleable' system had to be rail-based. The notion of low-capital-intensive system was unknown. The 1956 consultants' report was received with almost unalloyed enthusiasm by the public, the press, the professional press and the California legislature. During the whole period from 1951 to 1957, no one apparently suggested any serious alternative to the BART concept.²² Indeed, the very appointment of the consultants probably signified acceptance in advance of the rail idea, since they were known to be pro-rail.²³

The second group of key actors consisted of those influential people, especially in the San Francisco and Oakland business worlds, who saw real advantage in the new patterns of development that the consultants promised, in particular the enhancement of the major commercial centres. These were influential in the Bay Area Council throughout the 1950s, then in the Blyth-Zellerbach Committee of 1961-2, which was an organization of business leaders with overlapping membership with the Bay Area Council; and in the Citizens for Rapid Transit organization, which was supported by contributions from those business interests (especially banking and construction) that stood to benefit from the bond issue.²⁴ These links were extraordinarily close, interconnected and persistent (Table 12). Despite this evidence, K.M. Fong, in his thesis on the subject, doubts that at any time there was some kind of conspiracy by these interests to build BART. The business leaders did not overtly represent their companies' interests. Rather, like the consultants and the public, they saw their campaign as being in the general public interest: what was good for Bay Area business was good for the Bay Area. And

Table 12
PART: ILLUSTRATIVE INTERACTION AMONG KEY ACTORS

Professional Affiliations as Officers, Directors, or Elected Officials

[illegible]

The chart represents an illustrative list only. No effort has been made to be exhaustive.
Source: Metropolitan Transportation Commission (1975), 42.

[illegible]

Corporate action									
Funded Bay Area Council			X	X				X	
Funded Citizens for Rapid Transit	X	X	X		X			X	
Received BART Contracts	X	X	X				X	X	X

Fong, like the Department of Transportation, concludes that everyone – planners, political leaders, newspaper writers – shared the same belief in rapid transit: 'It may be unfair to judge the decisions of the 1950s and early 1960s by the preferences of the transportation planners of the 1970s.'²⁵

The next key group were the voters – especially at the bond issue election of November 1962. Here, a statistical analysis of the actual vote indicates that opposition was localized – especially from communities, such as those in eastern Contra Costa county, that would get no direct benefit. But it is difficult to isolate reasons for support, which was fairly generalized. Certainly the poor did not perceive the regressive effect upon them. Nor did geographical areas clearly identify their interests pro- or anti-BART. But it must be remembered that the issue was very generally seen as one of traffic congestion; BART was presented as an alternative to forty extra lanes of freeway, and voters may have seen it as a way of getting other cars (not theirs) off the highway.²⁶

Later, at the critical and hard-fought 1969 vote on the increase in sales tax, the State legislators became the key actors. But by this time, BART was seen as a *fait accompli*; the only question was how to find the \$183,000,000 needed to complete the system, whether by sales tax or by a tax in one form or another on cars. It seems that the sales tax won, despite the dislike of Bay Area leaders, because the opponents of car taxes disliked them even more. They included the highway lobby (for obvious reasons), and also Governor Reagan (for reasons of fiscal conservatism, and because he wanted to offer voters the prospect of a new Bay Bridge out of the existing bridge tolls). Certainly, no one then considered questions of equity between income groups or between areas; the sales tax was the product of political expediency in a difficult and complex situation.²⁷

Most commentators on BART history, in fact, seem to agree that in practice the decision-making process was highly constrained by a perception of what the decision was about, and that this narrowness of vision was shared by businessmen, media people and voters alike. The technical planning process set no formal goals, looked at no alternatives, and made no formal

evaluation until 1961. Obvious alternatives like the use of existing rail tracks on the lower deck of the Bay Bridge (which were taken up in 1958) were considered but dismissed. In any case, no one was then proposing alternatives such as reserved freeway bus lanes. The problem was seen as one of traffic congestion coupled with protest at freeway construction, in which San Francisco led the nation and the world. Mechanisms for public consultation and participation were weak. Although business interests did stand to benefit, no one was really against them. These business leaders, once established on the BART board, were so committed to the idea of rapid transit that, after the bond result, they were willing to give the whole planning job to the consultants – even to the extent of allowing fees as a percentage of costs.²⁸

This in turn provides a part-explanation for the apparent willingness of the board to tolerate cost escalation. In fact, BART's record on this score is rather better than that of most comparable major public projects.²⁹ The escalation that did occur (40 per cent down to 1971) was mainly due to the failure of the original estimates to allow for possible contingencies beyond the typical engineering contract (which was by practice set at 10 per cent), plus an unrealistic construction schedule that failed to allow for the local community opposition that arose in the early 1960s (Berkeley objected to overhead structures, and voted local bonds to underground its section), plus – most important – inflation engendered by the Vietnam war. The original estimates did provide for 3 per cent per annum inflation, but the actual rate during the construction period for the San Francisco Bay Area was 6.5 per cent, a little above the average for twenty major American cities.³⁰ All these causes are fairly typical for major civil engineering projects in the 1960s and 1970s, especially those where the state of the art is uncertain.³¹

So there is fairly general agreement, among Bay Area experts, over what went wrong. At the critical times when decisions had to be made, in the 1950s and 1960s, almost everyone – technical experts, politicians, media people, the general public – had a certain perception of the problem. It was seen as traffic congestion. Some alternative to the private car was needed,

San Francisco's BART System

and rail rapid transit was the one seriously considered. Sums were done to show that drivers would divert from their cars and make the system viable. But no one apparently considered whether this was plausible. Similarly, the cost estimates were accepted without even elementary scepticism. The fact was that everyone wanted to believe the predictions, because they seemed to offer a way out of serious present problems. Because of this desire, there was a mass suspension of disbelief, and almost ideological commitment to a new system. Further, because only a completely new technology could perform the needed miracle, the Bay Area committed itself to a vast research and development exercise with all the risks that that entailed. Perhaps, even had the true extent of the uncertainty been known, the voters of the area would not have taken the gamble they did. But no one seemed concerned even to estimate it.

BART'S LESSONS: THE AMERICAN RAPID TRANSIT DEBATE

BART failed, on vital criteria, in a metropolitan area that seems almost ideally suited for an experiment in rail rapid transit. The San Francisco Bay Area has a highly unusual configuration: the urban area takes a 'doughnut' shape around the bay,³² and mountains rising from the water create another constraint, so that settlement becomes discontinuous inland; all this makes for long hauls under water or through hills – a circumstance uniquely favourable to rail rapid transit. Further, the central business core of San Francisco has proved extraordinarily resilient, with major new high-rise office developments; and the population of the city (admittedly, a minority of the total Bay Area population), displays a positively European preference for medium-density row housing close to the centre, in sharp contrast to the even, low-density sprawl and the decayed centres typical of most large American metropolitan areas in the 1970s.

Despite this, in the late 1960s and 1970s a number of these more typical areas have debated the wisdom of rapid transit investment, and some have committed funds. Others have

GREAT PLANNING DISASTERS

agonized, but have so far held off. And there is increasing evidence that the BART experience is one of the most important elements in their decisions.

The critical new fact behind these debates has been the Federal entry into mass transit – a neat example of the UR element in planning. A 1964 Urban Mass Transportation Act established a programme of Federal matching grants to marry with local money. Then, in 1968, an Urban Mass Transportation Administration (UMTA) was set up within the Department of Transportation. It was followed by an Urban Mass Transportation Assistance Act in 1970, committing at least \$10 billion of Federal money over twelve years. By end-March 1974, UMTA had distributed over \$2.5 billion through 394 separate capital grants. All this was far from the circumstances of the early 1960s, when the people of the Bay Area had to carry the whole R and D costs of BART themselves.

Of the total planned capital spending by metropolitan areas over the period 1972–90, amounting to \$61.7 billion, no less than 66 per cent (\$41 billion) would be for rail rapid transit.³³ And, since the rail plans were concentrated in the nine largest urban areas, these received the lion's share of the funds; \$511 per head over the period, as against \$230 per head for all other urban areas. This heavy expenditure in turn reflected a concentration of funding on no less than 1,600 miles of new rail lines, most of it rapid transit (that is, urban short-distance rail transport of the BART type). A large part of the total was for five projected systems in cities where there had been no such system before: Washington, Los Angeles, Baltimore, Detroit and Atlanta.³⁴ And it is in these cities where the BART experience is most relevant.

Washington is one city that has taken the plunge: its Metro system, scheduled to open for the Bicentennial in 1976, actually managed to complete a token stretch of line in that year but a more complete inner-city network by late 1977. Here the story is in many ways similar to BART. A regional plan of 1959 recommended a balanced package including a 248-mile freeway network (most of which was later abandoned), an express bus system and a modest thirty-three-mile rail system, half in subway, to be developed by a special-purpose Federal agency. Congress

in 1960 accordingly created the National Capital Transportation Agency, which duly set out to study rail transit and in 1962 reported to the President in favour of an eighty-three-mile, \$796,000,000 system. It was significant that neither the 1959 nor the 1962 reports had any formal consideration of planning goals, save for the vague objective of 'improving transportation'; and that the 1962 plan produced no fully quantified analysis of alternatives. But in 1963 the NCTA lost responsibility for freeway construction, and henceforth pursued a single-minded goal of building transit. Its 1962 plan was rejected by Congress a year later, but in 1965 its more modest twenty-five-mile, \$431,000,000 scheme was approved; accordingly, in 1966 President Johnson replaced it by a three-state Washington Metropolitan Area Transit Authority (WMATA) committed to building transit. In turn this authority returned with a plan for the ninety-eight-mile system, and in November 1968, six years after the BART vote in San Francisco, Washington voters approved the necessary bond issue by 71.4 per cent. Construction accordingly began in December 1969.

Since then, however, Metro has become the centre of BART-style controversy – and for similar reasons. Costs have escalated, from an original estimate of \$2,500,000 to \$8,000,000, due to delays in construction plus the effect of inflation; as with BART, the 10 per cent contingency allowance for costs proved hopelessly optimistic. Additionally, inner-area residents have become increasingly suspicious that the completed system will serve suburban commuters at their expense. So the issue, in the mid-1970s, was whether to complete the system, or to cut out extensions serving thirty-six stations, thus losing 26 per cent of forecast passengers and 35 per cent of forecast revenue, as well as running the risk of legal actions from those areas which would lose service. The only way out of this dilemma would be somehow to obtain extra Federal funding retrospectively – or to divert highway funds, a move that would arouse opposition from the State of Virginia, which is one of the three parties on WMATA.³⁵

Professor Henry Bain is one of those who criticize Metro, and call for a cutback, quoting the lesson of BART. He writes:

GREAT PLANNING DISASTERS

Five million dollars is too much to spend on *anything* unless it will do some very wonderful things for people. There is something about our decision-making process that causes us to spend millions on studies and plans, and billions on projects and programs, without ever looking squarely at some basic facts that seem to call for some quite different courses of action.³⁶

Bain points out that Metro's financial performance is posited on one million passengers a day – eight times the level BART is achieving. The problems, in practice, will be the same. Population is too sparse around the suburban stations to pick up enough clients. Once in their cars, people will continue to drive them to their destination if they can. Even if some transfer to Metro, Bain urges, the same phenomenon will occur as in San Francisco: by an Iron Law of congestion, traffic will expand to fill the available space.

Bain does however conceive that there are some favourable indications for Metro, not present for BART. Washington has an exceptionally large and spread-out central business district, in which traffic congestion is rife for long hours of the day. (San Francisco's CBD (Central Business District), in contrast, is very compact; many trips are on foot.) It can also provide quite successfully for the low-income residents who live in the inner area, only about a hundred square miles in extent, around the central area. Bain's argument is that the system ought to stop here, and that the suburban counties should connect by commuter buses. In 1978 the issue was not resolved, but the system was proving to be strike-ridden and unreliable as well as expensive.

Atlanta, Georgia, is another city that has taken the fateful step. The citizens of its region voted in 1971 to accept a sixty-mile, \$1.3 billion system together with improvements in bus systems, some involving reserved busways. Here, as in San Francisco, local business interests have strongly backed the plan, feeling that it will cement Atlanta's role as one of the United States' strongest regional growth centres. And here too the consultants are Parsons, Brinckerhoff, Tudor, Bechtel. But the system, on which construction started in 1975, has already escalated in cost from \$1.3 billion (in 1971) to \$2 billion, because of the delays

in construction (partly occasioned by Federal insistence on an Environmental Impact Analysis). The Metropolitan Atlanta Regional Transit Authority (MARTA) has already received \$200,000,000 in capital grants plus a \$600,000,000 discretionary capital fund, amounting in total to some 10 per cent of presently committed funds; but this, together with 20 per cent local funding, would pay for only 13.7 miles of the system. Meanwhile MARTA is saddled with the obligation to run the existing Atlanta Transit System which runs at an increasing operational deficit. Thus, currently, transit planning in Atlanta is on the horns of a dilemma. Either it must claim more money from Washington or the State government, or it must rely more on a regressive sales tax. If none of these work, then fares will rise, denying the basis on which the 1971 proposal won broad popular acceptance. As the Office of Technology Assessment concluded in 1976, 'If UMTA policy holds, and if funds are not available on the State or local level, the Atlanta transit system will look far different from the way it was originally envisioned.'³⁷

This hints at a tougher line on the part of UMTA. Indeed, in 1976 the Authority turned down the proposal for a very ambitious scheme in Denver, Colorado. This would have been a personal rapid transit system in which passengers rode small cars to their desired destination, with the aid of sophisticated computer technology. A prototype was tested at Morgantown, West Virginia, where it served the scattered campus of the local state university; it was at first plagued by technical defects but is now being expanded. Another system is operating at the giant Dallas-Fort Worth airport in Texas, serving an area that when fully developed will be larger than New York City; neither is this yet functioning as a proper personal rapid transit system, and there are doubts about the feasibility of developing the necessary technology - which was undoubtedly one of the reasons for the UMTA rejection of the Denver proposal in favour of a more modest bus-based scheme.³⁸

This decision may have been symbolic. For Denver is one of a number of large metropolitan areas of the American west which have experienced their major growth since 1945, that is, in the

age of mass car ownership, and which in consequence have developed on a decentralized, sprawling pattern. Phoenix in Arizona, Salt Lake City in Utah, San Diego in California are other examples. But the ultimate example is of course provided by the 10,000,000 mass of humanity in the 10,000-square-mile Southern California megalopolis based on Los Angeles. And it is here that the greatest rapid transit controversy has swung back and forth.

Los Angeles is known worldwide as the freeway metropolis, though its 400-mile system is now challenged by other major American urban areas. What is less known is that it once had the longest rapid transit system in the world: the Pacific Electric Railway, which at its peak in the 1920s boasted 1,114 track miles, 4,000 cars and more than 106,000,000 passengers a year. That system was allowed to decay from the 1920s onward, as car ownership rose, because in practice no one was prepared to save it.³⁹ But this was not for want of studies and plans. In 1925, 1933, 1939, 1945, 1947-8 and 1959-60 there were published reports for ambitious improvements to the existing system and/or the construction of new subways. But all foundered, and the last Pacific Electric train ran at the end of the 1950s.

The 1959-60 group of reports, by the consultants Coverdale and Colpitts, recommended a priority development of four radial lines serving the city centre; but the detailed financial analyses suggested that they could not be expected to pay except at an unrealistically low interest rate. Then, in 1968 a further consultant's report advocated an eighty-nine-mile, five-line system as the first stage of a 300-mile network. As in the previous plan, indeed as in virtually all previous plans, these would cross the central business district. But the voters of the area rejected this plan in a November 1968 bond issue.

This in no way deterred the rapid transit advocates. By 1971 the City of Los Angeles Department of City Planning was proposing a similar system. Then, in 1973, the Southern California Rapid Transit District (SCRTD), which had also been responsible for the 1968 report, proposed a \$7 billion system requiring Federal help plus a major bond issue: \$148,000,000 in 1975, rising to \$300,000,000 a year in 1999 would be needed to

service it. Of the \$7 billion, no less than \$6.6 billion would be required for rapid transit: 116 miles of 'fixed guideway' (i.e. rail) along six heavily trafficked corridors. Busways, proposed for two other corridors, would cost a little over \$250,000,000. By the end of the twelve-year construction period, in 1986, the entire system could be running at a \$287,000,000 a year deficit, which would be met by a bond issue plus a $\frac{1}{2}$ per cent sales tax plus highway funds.

The next year, however, it proved that this plan was insufficiently ambitious. A new plan, unveiled by SCRTD after consultations with local government, suggested building an ultimate network of 242 miles of transit, of which the initial 145 miles alone would have cost some \$8-10 billion: as a Los Angeles planner succinctly put it, the biggest public works project in the history of mankind.⁴⁰ But in fact it was really just another version of plans that had been circulating in 1968, and earlier.

The immediate funding problem was to raise a $\frac{1}{2}$ c sales tax to start operations, though the 1974 report made it clear that more ambitious support would be needed soon after 1981.⁴¹ The proposal went to the polls in November 1974, with heavy support – from four out of five county supervisors, from Mayor Thomas Bradley, from the *Los Angeles Times* and major radio stations, from the League of Women Voters, the Chamber of Commerce, the Auto Club of Southern California, and even the Sierra Club. Yet again, as in 1968, it failed by 56.7 to 43.3 per cent. Los Angeles city voted 54 per cent in favour, the working-class suburb of Compton voted 71 per cent yes, and even the citizens of Beverly Hills (who can hardly have expected to use the system intensively) voted 61 per cent. But the proposition was lost on the blue-collar votes of areas far from the proposed routes.

Marcuse and others argue that they were right. The proposed system would attract only 6 to 8 per cent of all trips, and many of these would come from the bus system; only 3.5 per cent were expected to switch from their cars. (Today, Los Angeles has a far lower proportion of public transport users than San Francisco, Washington, Boston, Chicago, Philadelphia or New York.) Because population is actually declining along the corridors as further dispersal takes place, by 1973 already no corridor met

the critical criterion, of 20,000 peak-hour frequency, necessary to justify rail transit. The system would create an enormous tax burden, which would chiefly fall on the poor; but these people would get few benefits, since most of them lived far from the routes, and their jobs were outside the central area. (In fact the great majority of all citizens could not directly benefit.) Some low-income jobs would be lost. Researchers have calculated that the present pattern of taxation greatly benefits the car driver in Los Angeles at the expense of the bus passenger.⁴² But if this is so, the new rapid transit would make the inequity worse; so Marcuse and others argue.⁴³ In fact, Marcuse claimed, the capital cost was sufficient to buy every family in the city a Honda Civic.⁴⁴

Faced with this rebuff, the rapid transit interests refused to lie down. In 1975 they returned with the idea of a single 'starter line', fifty-three miles in length, costing \$4,527 billion for capital and operating costs down to 1994. It would require the sales tax, already defeated in the 1974 vote. Meanwhile, until it could be agreed, the emphasis would be on the so-called Diamond lanes (reserved bus lanes) on the existing freeways.⁴⁵ By 1979 one of the Diamond lanes, along the Santa Monica freeway, had been abandoned; and a 'starter line' along Wilshire was again being considered.

So for the moment the matter rests, though doubtless not for long. The Los Angeles saga is an amazing illustration of an attempt to sell rail rapid transit to an area that has demonstrated it does not want it. One reason, the Office of Technology Assessment make clear, is that the SCRTD is enthusiastic about rapid transit and depends for its support on areas whose demand for equal treatment are by definition bound to lead to over-ambitious plans. Because the district has no representation from Los Angeles city, it may be ignoring the real needs of city residents, which are mainly for short-distance travel. (Oddly, for those who think of Los Angeles as the city of car-based mobility, the average journey to work is short, with 50 per cent going less than six and a half miles.) The legislative mandate, plus a commitment to a BART-type system, made SCRTD uneasy with the job of evaluating a full range of modes, though the Federal UMTA was

San Francisco's BART System

encouraging it to do so. Similarly, the district argued for a 145-mile system leading to a 240-mile one, even though its own studies indicated that only about sixty miles were absolutely good for rail. The scale of the resulting budget undoubtedly alarmed many voters and killed the proposition at the 1974 vote.⁴⁶

SOME LESSONS

The lessons of BART are at one level fairly clear, at another level less so.

At the first level, it is easy to use the benefit of hindsight. Rapid transit for the Bay Area became likely, even probable, as early as 1949 – as soon as the legislature set up first one body, then another, committed to the idea of exploring the need for rapid transit and then presenting the case to the public. To some extent, the exercise from then on was one of public relations. (Exactly the same has happened in Washington and Los Angeles, save that in the latter city, remarkably, the voters have resisted the case.)

Secondly, there was a considerable political force working in favour of BART, and of similar schemes elsewhere. But it would be much too facile to call it a conspiracy of downtown business interests, grinding their own axes. Many people, who wanted to be thought independent, also came to identify the future of the central business district with that of the larger urban mass. The role of that centre, and of people who travelled to it, came to be distorted out of all proportion; the interests of the great majority of residents and workers, who have other needs, were pushed into the background. This was only possible because of some distortion in mass perceptions. It was probably triggered by general frustration at traffic congestion and at the side-effects of mass car use. Rail transit appeared a miraculous and a virtuous answer, and no one stopped to ask rigorously how far it would really provide a cure.

Thirdly, and associatedly, there was a general suspension of disbelief about costs and technical problems. It was assumed that the highly optimistic timescale of the consultants could readily be followed; that there would be no technical snags delaying the

GREAT PLANNING DISASTERS

project; that the rate of inflation would be gentle. No one, apparently, was tempted to act the joker and question some of these naïve beliefs.

Fourthly, and perhaps most oddly, there was a belief that the advent of a new technology would change established behaviour patterns: that Californian suburbanites, long wedded to their cars, would desert them for what they would perceive as a new form of transportation, quite unlike older, traditional kinds of public transport. Even more oddly, over time it would cause them to abandon their preference for low-density detached housing and to live more densely around transit stations. For this there was no empirical justification from behavioural studies. Again, it seems to represent some form of political wish-fulfilment.

But, it can be argued, it is unfair to use the benefit of hindsight. The people who made these decisions were time-bound and culture-bound. They reacted to events as they saw them, which they could not quite cope with: to the fact of rising car ownership, to the smog menace, to the apparent threat of endless freeway construction. The range of possible solutions seemed very small: traditional buses clearly were proving unattractive, and only a high-technology, capital-intensive solution seemed to offer much hope. Small wonder, then, that there was some naïvety in the response.

That is fair, but it does point lessons for the future. It does suggest some approximate ways in which we can guard against the same mistakes in the future. (Indeed, there is evidence that in the United States and elsewhere, the very scale of government involvement is bringing with it a much more systematic and hard-headed approach to project evaluation.) Clearly, such an approach would contain at least three main elements: the nature of the problem should be analysed much more critically; a systematic attempt should be made to identify the widest possible range of solutions; and estimates of timing and costing deserve a particularly sceptical look on the basis of accumulated past experience. We shall return to these principles, and treat them in more detail, at the end of this book.

General