A5010: Committee on Transportation Demand Management
Chairman: Philip L. Winters

Transportation Demand Management

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Rolling out of bed, José checks his CommuterAlert traveler information system while his coffee brews. The regional commuter assistance program was offering the system through a local automobile dealer when José purchased the family's vehicle. CommuterAlert is predicting that his 10-mile commute on I-275, which normally takes 29 minutes, will now take 46 to 52 minutes. In his printer are identified pickup locations for three part-time carpool partners. José knows that picking them up will allow him to take advantage of the toll discounts on the high-occupancy toll facility. He remembers being skeptical of the initiative to equip the high-occupancy-vehicle lanes for electronic toll payments. Now he can't live without this travel option.

As his breakfast cooks in the microwave, José decides to hold an interactive netConference from home today instead of going into the office. With a push of a button, he notifies his designer in Miami and the rest of the staff that he'll be at home today. Using his flextime account, he decides to jog before beginning work at 9:00 a.m.

In the meantime, his wife tells him that she needs the family vehicle to visit her bedridden mother. Since they have stopped owning two vehicles, Brendan, his college-age son, will have to use the family's Mobility-Pass to rent a CarShare Club vehicle at the shopping center or bike to the light rail station for his trip to the city's first urban televillage.

José was surprised to hear his son explain the economic benefits of moving work to the workers. The urban televillage is equipped with a user training program, daycare, and flexible space. The televillage has allowed the foundation to train underemployed workers and contract with employers from New York to San Francisco. For his master's thesis, Brendan is documenting the growth of small businesses that develop to support the televillage.

As José sips his coffee, he picks up the family's monthly TransportBill and notes that the family's peak-hour travel use is down 12 percent from last year’s. Dumping the taxable parking space in favor of the pretax purchase of the MobilityPass helped lower the costs, as did the reduction of insurance costs through the pay-as-you-drive insurance. Advice from his company's Employee Transportation Coordinator on how to optimize the predictable family trips to the grocery store, library, and gym seems to have made a difference, too.

BACKGROUND

As we approach the next millennium, the preceding scenario illustrates how technology, policies, and procedures fit together to help influence travel behavior in our mobile society. These modified behaviors will help achieve goals such as reductions in traffic congestion and air pollution. Behavior may be influenced by mode, frequency, route, time, or cost. Transportation demand management (TDM) is the all-inclusive term given to this variety of

measures used to improve the efficiency of the existing transportation system. TDM products and services include encouragement to use alternatives to the single-occupant vehicle such as carpools, vanpools, transit, bikes, and walking. Alternative work-hour programs such as the compressed work week, flextime, and telecommuting are also TDM strategies, as are parking management tactics such as preferential parking for carpools and parking pricing.

The need to influence travel behavior becomes clearer as we examine recent trends. During the past several decades, commuting behavior could be described as more people in even more vehicles traveling to more places. Although the population increased nearly 22 percent from 1976 to 1996, licensed drivers increased 34 percent. The suburb-to-suburb commute became the dominant commuting pattern. Not only were there more drivers, there were 77 percent more vehicle miles of travel (VMT).

Nevertheless, supply has increased at a much slower rate than demand. When adjusted for inflation, highway capital outlay in constant dollars increased by 56 percent from 1976 to 1996, but road mileage only increased 2 percent. In fact, highway expenditures by all units of government, with inflation removed, were about 56 percent of what they were for each vehicle mile of travel in 1976.

The result of these growth and demographic trends is more traffic congestion. By 1996, about half of peak-period VMT occurred under congested conditions. According to the Texas Transportation Institute (TTI), which has been measuring road congestion since 1982, “[I]t is very difficult to maintain the financial and public support to add roads and lanes as fast as travel volume grows. There are only 2 of the 70 areas studied—Houston and Phoenix—with congestion levels lower … in 1996 than in 1982” (*1*,p.116). Automobile travel as measured by VMT has grown at an annual rate of about 3.2 percent, whereas the population has grown at an annual rate of 1.0 percent.

Sitting in traffic is not the only impact from these demographic trends and travel habits. The Environmental Protection Agency (EPA) estimates that mobile sources of air pollution account for as much as half of all cancers attributed to outdoor sources of air pollution. The vehicle emissions control program has achieved considerable success in reducing emissions that contribute to smog. Cars coming off today's production lines typically emit 70 percent less nitrogen oxides and 80 to 90 percent less hydrocarbons over their lifetimes than did their uncontrolled counterparts of the 1960s.

The introduction of lower-volatility gasoline combined with the replacement of older cars has resulted in air quality improvements in many U.S. cities. However, unhealthy ozone levels are a problem across the United States, with nearly 100 cities exceeding the EPA National Ambient Air Quality Standard. Fifty-seven million people live in the nine cities that are considered "severely" polluted, experiencing peak ozone levels that exceed the standard by 50 percent or more (*2*).

Advances in technology also create opportunities and challenges. Intelligent transportation systems (ITS) products such as smart cards and advanced traveler information systems (ATIS) could influence the nature of the travel demand. Smart cards can be used where value pricing projects are deployed as a higher charge to use roads during peak travel times, discounts for transit, or both. ATIS can inform people of current conditions and encourage them to alter their route, mode, or time of departure. These technologies help enable the transportation community to apply private-sector pricing in which prices reflect the level and time of demand. Congestion and emissions could decline

when these revenues are partially reinvested in alternatives to driving alone. The Internet, mobile phones, laptops, and other technologies also can create the transportation challenges of making it easier to live, shop, and work from anywhere.

However, technology alone will not solve the growing congestion and air pollution problems. EPA has concluded that further technological refinements to emission controls will produce only minor reductions in emissions, and at a large cost. The problem remains the increasing number of vehicles on the road and the number of miles they are driven. Clearly, the programs, policies, and procedures that encourage alternatives to driving alone must be in place for ITS to reach its full potential.

Many communities are recognizing TDM as a necessary part of the congestion solution. TTI noted that almost all the urban areas in their roadway congestion study were pursuing more than one technique to improve mobility. These communities seek to lower congestion by reducing the number of vehicles on the road or by increasing the number of people in each vehicle. These urban areas also are trying to change the amount of time that vehicles use the road to reduce the load on the system at peak travel times.

It is clear how TDM strategies such as ridesharing reduce congestion. Vehicle trips and mileage are reduced by having more people share the ride in fewer vehicles. However, other TDM strategies also play an important role in changing the time of the trip or the need for a vehicle trip. For example, telecommuting allows people to work from home, reducing VMT on the days that they telecommute. Lower parking costs for carpools or vanpools can provide an incentive for people to use those modes of travel. Allowing people to cash out the value of their parking space, use a rideshare mode, and pocket the savings can provide another incentive. Employers with variable work hours such as compressed work-week programs can allow people to alter their arrival times to avoid peak-period congestion.

STATE OF THE PRACTICE IN TDM RESEARCH

Research into TDM has focused on the evaluation of the effectiveness of TDM and the development of tools to forecast the impacts. Effectiveness evaluations consist of empirical studies of TDM programs using aggregate data at the regional level or disaggregate data at the individual site level. The objective of these historical evaluations is to report progress and adjust implementation strategies. Some of the localized studies focus on before-and-after studies of individual TDM strategies (e.g., the guaranteed ride home). However, few studies monitor the performance of the TDM effort over time to track relative impacts. These longitudinal studies could ascertain those techniques and approaches with long-term benefits. Very few of these studies have used control groups (employers or commuters) to determine the relative impact of various TDM strategies under different environments.

Collectively, these studies provide evidence of the effectiveness of TDM programs to reduce vehicle trips by increasing vehicle occupancy, reducing VMT, or both. At the regional level, 3 to 5 percent vehicle trip reduction has been reported. At the site level, 20 to 40 percent vehicle trip reduction has been achieved, usually through a combination of parking charges and financial incentives.

The second major area of TDM research has been the development of tools to predict the impact of TDM strategies. This area has primarily focused on forecasting commuting behavior from data aggregated at the employer level. There remains a need for research at the regional or corridor level. These tools are necessary for integrating TDM into the transportation planning process and developing realistic expectations. Empirical evidence

suggests that setting high targets for trip reductions without significant financial and policy changes creates unrealistic expectations and jeopardizes long-term progress. The development of realistic TDM expectations was identified as a high-priority research need at the TRB TDM innovation and research symposium in 1994 (*3*).

A Transit Cooperative Research Program (TCRP) study of the cost-effectiveness of TDM (*4*) reported that it was difficult to assess the travel impacts of TDM because few employers had a baseline measurement. Business reasons rather than transportation goals were often cited by employers as their motivation for implementing TDM programs. The research also found that employers did not use cost-effectiveness as the sole criterion for deciding which TDM strategies to employ. Usually employers need only demonstrate a "good faith" effort to achieve the mandated trip reduction objective. Employers frequently opted for the most expedient measures (e.g., preferential parking) over the most cost-effective (e.g., parking pricing). Therefore, TDM effectiveness was often determined by what was easy to implement rather than by what was most cost-effective.

TDM programs, whether mandatory because of a regulation such as the Employee Commute Options (ECO) program or voluntary, are successful when there is agreement on the nature of the problem by all affected parties and a reasonable course of action. For example, Arizona, Oregon, and Washington enacted Commute Trip Reduction laws as a part of air quality and congestion mitigation strategies. Research from these areas has demonstrated that the private sector will participate in trip reduction programs and reduce single-occupant vehicle usage among employees if employers agree that a problem exists that trip reduction can solve and targets are based on evidence of what is actually achievable.

At the same time, the evaluations being conducted by the transportation community often fail to document the successes of TDM in business terms (e.g., reductions in turnover). The transportation community may need to expand the list of performance measures if it is to appeal to employers and developers to help influence travel behavior. The TRB TDM symposium participants also identified the need for research on enhancing the understanding of businesses and commuters as consumers.

Empirical evidence has shown the role that parking pricing and availability have had in vehicle trip reduction. However, additional research into broad applications of parking management strategies is needed. The analysis of parking management strategies to support TDM was identified as a high priority at the TRB TDM symposium. The Commuter Choice Initiative, a national examination of the extent of employer parking policies, found that nearly all employers provide free parking and most had no idea of the true cost of parking (*5*).

Research has found that commuters in different markets responded differently to the same mix of strategies. Small-scale targeted marketing and advice has shown promise for encouraging the reduction or chaining of noncommute trips. The need to understand the commuter extends to the examination of carsharing clubs that have developed in Europe and are being introduced in the United States. These programs allow the individual to have access to a vehicle in much the same manner as with a motor pool. Longitudinal studies will help assess whether such programs may influence people to locate near transit service and avoid the need to own an extra car. Research in the deployment of ITS strategies such as traveler information systems can improve understanding of how people respond to different methods of receiving information. Studies on the effectiveness of high-occupancy toll road

policies and technologies will address equity and environmental justice issues as well as document the impacts on mode choice and congestion.

FUTURE RESEARCH IN TDM

If TDM is to achieve public goals of reduced congestion and improved air quality, future research in TDM will need to enhance the market-based approaches necessary to make the programs succeed. The research will also need to seek better integration with the ITS and transportation planning communities. Finally, a well-trained and well-equipped transportation professional will require the development of TDM tools and the skills to use them.

Evaluation of TDM Benefits and Costs

Businesses generally neither see transportation as their problem nor account for the benefits of TDM as accruing to them. Many TDM programs will need specific methods for calculating the tangible and intangible business benefits of TDM to employers. Future research should help demonstrate the effectiveness of TDM strategies in meeting the challenges facing business as well as continue to assess the transportation and air quality impacts.

One of these challenges is a shrinking labor force. For the period covering 1990 through 2005, the Bureau of Labor Statistics projects a slower rate of increase in the labor force than the rate that prevailed over the period 1975 through 1990. A more pronounced slowing is expected in the working-age population than in the non-working-age population. The projected rate of employment growth is 1.2 percent annually for the period 1990 through 2005, compared with 2.3 percent annual growth over the 1975 through 1990 period. Research is needed to quantify benefits such as enhanced recruitment and retention, reduced tardiness, and increased productivity.

Another challenge is the desire of businesses to reduce costs for office space, utilities, and parking. More employers are adopting telecommuting as a work-life benefit or overhead reduction strategy rather than as a trip reduction program. The result is that the number of workers who telecommute has increased from 4 million in 1990 to 16 million in 1998. Again, the TDM profession will need to present these types of TDM strategies from a business perspective.

Finally, with changes in the Transportation Equity Act for the 21st Century (TEA-21), employers can take advantage of changes in the federal tax treatment of commute-to-work fringe benefits to offer benefits that are low in cost to the employer. Employers can now provide a tax-free benefit or deduct the cost of transit, vanpool, or parking as a pretax payroll deduction, or use both strategies. Research on the resulting travel behavior changes will be required to assess the transportation implications of this policy.

Development of TDM Tools

The ability to model the impacts of TDM within the current transportation planning process is critical to helping communities define expectations for TDM and establish the investments commensurate with those expectations. Research is required on how communities can evaluate the potential impact of TDM programs and policies in a meaningful way. These models should assist transportation planners and local decision makers in evaluating TDM in the context of impacts and other transportation investments.

A need also remains for an employer parking valuation tool. The role of parking in influencing travel behavior has been well documented, but a parking valuation tool would enable employers to recognize the true costs of "free" parking and provide a basis of cost comparison with other strategies such as transit subsidies.

Market Assessment

The expansion of TDM programs will hinge on the ability of TDM agencies to quickly identify and respond to market demands and opportunities. More research is required in specific niche markets, such as research to determine if mobility options such as carsharing, personalized advice, or both can be successfully extended to reduce other noncommute vehicle trips. In addition, TDM's expanded role in the arena of welfare-to-work and access-to-jobs will require an investigation into the technical and policy considerations for serving these specialized markets. Finally, research into the organizational and financial structures for delivering these mobility management services will be needed.

Integration of Technology and Supporting Policy

Much of TDM's future is intrinsically linked to integration with technology advances and to value pricing. Research will be needed to determine the extent of market needs and to project responses resulting from the deployment of new technologies. In the area of value pricing, TDM research will be needed to assess the impact of areawide parking "cash-out" programs, which provide employees the option of trading in employer-provided parking spaces for cash.

Building Professional Capacity

Although additional research into the effectiveness of TDM and tools are needed, we also must build and integrate the professional capacity for implementing TDM. Traditional transportation professionals with educational backgrounds in civil engineering will work in teams that also include marketing professionals, electrical engineers, social caseworkers, and land use planners. Clearly, the required skill mix will be different, and our universities must be prepared to respond to the changing nature of transportation.

CONCLUSION

If present trends continue, increases in the total number of vehicles on the road and in the amount they are driven will continue to cause significant traffic delays and overwhelm the benefits gained from improved emissions controls on vehicles. Therefore, viable alternatives to single-occupant driving need to be available and used in order to ensure the healthy air quality we all need and to maintain the personal mobility we all depend on. As we look to the future, TDM professionals face the uncertainty with optimism and renewed vigor. In the words of Yogi Berra, "The future ain't what it used to be."

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