

Wanted: Pliable Paradigms for Transportation Investment

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CLEARLY, THIS IS A time of new directions and opportunities in surface transportation in the United States. Explored here is how full advantage can be taken of those new directions and opportunities. If transportation professionals develop new perspectives and learn about the specific needs of our customers, products can be appropriately tailored to foster an effective and efficient transportation infrastructure. Applying the new directions embodied in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) demands a sea change in the way we think about transportation investments and the role they will play in society. That change in thinking and how it affects organizations charged with implementing this law are explored here. Special note is taken of the planning process so crucial to its success. In the language of the day, provisions of ISTEA will prompt pliable paradigms to guide future investment decisions and assessment of their worth.

The title and declaration of policy in ISTEA point to the new order. Enactment of ISTEA provides prima facie evidence that efficient achievement of transportation objectives will be defined principally in terms of the customers transportation must serve and by the constraints within which it must operate. The Bush administration's National Transportation Policy was the first step to fundamental, far-reaching changes in American transportation. It reflected the need to

develop a strategy that will ensure that the multibillion-dollar decisions concerning transportation investments that are made in the 20th century pay off in the 21st.

The focus of concern among the participants at this conference has been the increasingly large and complex transportation needs in the urban environment. In seeming contradiction with this focus, many of the things discussed here have traditionally been considered in the context of freight movements and business-related transportation needs and less frequently applied to the movement of people. However, at the heart of the message is a challenge to find ways to think of transportation not in terms of competing modes or passenger versus freight, but in terms of the specific societal functions it serves: economic, social, and environmental, for example. Recall how transportation has influenced the integration of this continent and thus the national culture. Can the failure of the Soviet Union to integrate the individual republics with efficient transportation from Moscow to Kiev be pointed to, for example, as a contributor to its dissolution? Would more timely movement of vegetables from the farms to the cities have slowed the demise of the union?

Transport serves functions across regional, urban, suburban, and rural boundaries. It serves customers, not places. Is it possible to overemphasize that before transportation needs can be addressed, planners must understand who the customers are and the full nature of their transportation needs? The answer is indeed not. This customer focus is at the core of seminal private-sector management thinking, and so it must be for transportation professionals.

The transportation services customer list has grown to include not only commuters, carriers, households, and shippers, but at least three other types of clients: (a) consumers of the externalities of transportation (e.g., people breathing polluted air), (b) those affected by land use decisions intertwined with transportation patterns, and (c) those who pay the opportunity cost of public investment (e.g., advocates of alternative uses of public funds).

To serve that extensive clientele, we must learn to do our homework outside the traditional transportation disciplines and concerns, paying close attention to the tremendous breadth of economic and social forces driving the evolution of cities as marketplaces, manufacturing centers, and liveable spaces. We must keep checking up on what we think we know; changing factors such as energy cost and availability can quickly change customers' needs.

Changes in basic assumptions on which transportation is forecast are continuous (e.g., changes in land use and commuting patterns). With a business-as-usual mindset, we could find ourselves planning and reacting without a firm grounding in contemporary reality. The large numbers of working women and mothers; two-, three-, and four-car households; and federal tax laws on real estate made circumstances ripe for developers to bring offices and stores nearer to where many prefer to live—in suburbia. Joel Garreau links this convergence with the development of “edge cities.” This land use phenomenon wreaks havoc on transportation systems (highway and transit) that are designed to move people in a means consistent with more traditional urban forms (i.e., between central cities and the immediate suburbs).

Even as urban forms change and the transportation inefficiencies of dispersed suburban life are recognized, it has become increasingly clear that Americans favor dispersion and want more mobility. Americans also want energy efficiency, social benefits, a sound economy, and a clean environment. The trade-offs between and the complementarity of these goals will be determined by the needs, desires, and community values of an increasingly broad set of stakeholders. This is the central, contemporary lesson for those who manage the transportation system, both its infrastructure and operation. As the country’s development matures, as basic access is provided, the earlier strategies for investment necessarily shift. This lesson, broadly applied, will change the way the transportation community sees, and thus serves, its customers.

Although we do not know just how to meet all these diverse transportation expectations, the impacts of public infrastructure investments on the economy are becoming clear. Also, there is a growing, surprisingly strong, recognition of the need to sustain an acceptable growth rate for the U.S. economy as the nation’s most important long-run economic goal.

In an open letter to Congress, the President, and the Federal Reserve, more than 100 prominent economists argued that economic recovery and higher growth productivity could only be achieved by increasing the rate of investment in people, infrastructure, technology, and machinery. What was so amazing about this call for significant expenditures to spur economic growth was the full recognition of the impacts on the budget deficit, which was heretofore one of the biggest concerns of this profession.

Increasingly, the remedies proffered by business analysts of all political stripes coalesce around long-term investment in education, research

and development, and infrastructure. Illustrative is a recent *Business Week* cover story, A Growth Policy for the '90s. It listed seven items, the fourth of which was infrastructure. Economists and political leaders, particularly many governors, are beginning to appreciate the stimulating effect, beyond on-the-site job creation, of an efficient transportation network on overall private economic activity. They are recognizing the nature of an adequate and well-maintained public stock of infrastructure to the profitable and efficient production and distribution of private-sector goods and services. An increase in public infrastructure investment, such as in highways, raises the growth rate of labor productivity in two ways: (a) directly, by allowing the available private capital stock to be used more efficiently and (b) indirectly, by promoting private investment, making more private capital available per worker.

The leverage of a relatively small public transport infrastructure investment on the significant private sector transport expenditure is enormous. Highways are generally supplied by public agencies, whereas operating costs and vehicle capital costs are incurred by private entities. They are intrinsically inseparable, and the attributes of the highways clearly have a major impact on operating costs. Whereas public disbursements for highways are less than \$80 billion per year, private and public out-of-pocket expenditures related to the use of these facilities total nearly \$1 trillion per year. Travel time and safety costs also total nearly \$1 trillion per year. Thus, although public highway investments amount to a tiny percentage of total highway costs, they have a high positive leverage on private-sector efficiency.

The 1990 Economic Report of the President expresses the sentiment well:

Inadequate government infrastructure can impede improvements in productivity growth [and] taking advantage of productive opportunities to maintain and improve the infrastructure is an important part of Federal, State and Local government policies to raise economic growth.

It is clear that the turning point coinciding with the so-called post-Interstate era and ISTEA signifies much more than a change in the structure and financing mechanisms associated with the Federal-aid highway program. New pliable paradigms are needed for transportation investment. Paradigm shifts are frequently encountered in the physical sciences, where hard evidence of a contrary nature forces, often abruptly, a change in view. Unfortunately, the nature of the social

sciences yields more gradual change, making these shifts harder to identify.

Joel Barker, in his book *Future Edge: Discovering The New Paradigm of Success*, links the successful search for innovative approaches to problem solving with a tolerance and openness to new ways of thinking. He suggests that failures of old paradigms to address significant problems, followed by the creation and introduction of substitute ones, cause turbulence. This turbulence, in turn, generates a receptiveness to paradigm shifts toward approaches with explanatory power. The affected community with much invested in the old paradigm generates initial resistance and conflict while the new paradigm is tested and applied.

The following are two illustrative examples.

The first is the notion of the traditional American family: breadwinning husband, homemaking wife, 2½ children (statistically), and maybe a grandma or grandpa. While clear to many, some still ignore the profound impact of changed family life-styles (including the growing number of families with single parents, two breadwinners, no children, or unmarried partners) on society. Could it be that some element of society still hopes for the past structure and so invests in it an inherently greater value than other forms?

The second example is the notion of the typical commute made from the suburbs to the city. Studies have shown that the dominant commuting pattern in many areas is suburb to suburb. This has become an accepted fact in transportation planning, but vestiges of resistance are found in attempts to push land use decisions toward the historic urban forms that the transportation community is more comfortable serving.

Major paradigm shifts underpin transportation investment decisions today. As one rather simplistic example, consider the following: future strategic investments in surface transportation will be based on specific knowledge of customers and not on broadly defined highways-for-land-access motives. The implications of this simple shift for the way we position ourselves in the future to provide the public component of transportation are profound. In the words of Professor Boulding, of the University of Colorado, "The future will always surprise us, but we needn't be dumbfounded."

Another shift, this one in private business, might also be useful here. It occurred in business management after World War II and is known as the marketing concept. Now a prevalent business philosophy, the marketing concept advocates direction of all activities and

functions of the organization toward the identification and satisfaction of consumer wants.

This is a marked paradigm shift from the earlier, dominant production management philosophy that was focused on the development of a product, followed by efforts to sell it to customers. Concentration on the user shifted strategic decisions to the beginning of the process and required considerable understanding of markets and consequently emphasized the importance of market research.

Looking back, one sees abundant evidence of transportation investment driven by a historic policy to open up the country and thus provide access and interregional movement within politically tolerable variances. To a remarkable degree, we have continued to do what we did, as a nation, through the canal era, the railroad era, and the early highway era. For example, railroad service was perceived as so crucial to providing access to western lands that private enterprises were given 9.3 percent of total land area and large cash contributions to build the rail lines. Motivated in part by the need to make rural delivery of mail feasible, the chief purpose of the Office of Public Roads in the early 1900s was to bring about a general and uniform improvement of the roads throughout the United States. The mail had to be delivered to all parts of the country.

Investigating the path to the old paradigm can help anticipate the new one. During the early debates on the design of what was to become the Federal-aid system, a preference was expressed for a general system of roads radiating from the towns and railway stations as a means to integrate the business class of travel with the general transportation system of the country. In the selection and approval of what was later to become the Federal-aid primary system, each state designated a state highway system, including not more than 7 percent of all roads in the state, on which all the federal funds must be spent. Incorporation of land area in the formulas for distribution of the majority of Federal-aid categories reflected the perceived correlation between highway needs and space. Embodied in these actions was the old paradigm. The concept of coverage, that a good highway network design minimized the distance between the people and a high-quality road, treated all users alike. As early as 1923, estimates that at least 90 percent of the population resided not more than 10 miles from a Federal-aid road and at least 94 percent of the cities of 5,000 or more population were directly on the system were acknowledged as measures of success.

The Interstate system, following that perspective, wrought a revolution in the United States. At its inception, few people, transportation experts included, could anticipate the degree to which that national highway system would transform the country, providing a unifying force for commerce and making intercity travel easy for all citizens. The Interstate has shaped the economic and temporal geography of the nation via the transportation function. The unprecedented mobility it provides has altered life-styles and personal economies. Critics have pointed out some of the more unfortunate trends in society to which the Interstate system has contributed, such as overdependence on the automobile, suburban sprawl, and extravagant energy dependence. One outspoken critic, a U.S. Senator from New York, stated in his epic 1960 paper entitled *New Roads and Urban Chaos*, "The Interstate program is bringing about changes for the worse in efficiency of our transportation system and the character of our cities." Such criticism notwithstanding, the Interstate established a standard for transportation, an expectation by American industry and the general public for moving goods and people with speed and efficiency. Basic business decisions are now predicated on this speed and efficiency.

Clearly, the old paradigm-driven definition of one transportation goal, to complete the Interstate system, influenced perceptions in many ways. The focus on the engineering challenge of putting such an immense set of facilities in place contributed to the dominance of civil engineers in investment decisions. Once the products were defined in terms of construction, the opportunity for feedback on the social, economic, and environmental contribution of the facilities was limited. Assessment of alternative investments was limited to traditional engineering criteria. The focus on issues related to the facilities themselves distanced the designers and planners from the multiplicity of what are now considered relevant interests, even as the system matured. The highway community continued to follow the old paradigm, pursuing the provision of an even more pervasive system, providing facilities for the majority of vehicles (in most cases, personal automobiles) and assuming this was in the best public interest. Since transportation professionals tended to think in terms of facilities to accommodate vehicle miles traveled, there was little motivation to think of individual customers. Personal and commercial interests adapted to the system in place, worked to change the rules in their favor, and then made the best of it.

It should be clear that this paradigm and the highway community have served the nation well. However, concern has been accelerating that the priorities of transportation providers are increasingly non-responsive to their customers. Sometimes this has led to open public rebellion. In other cases, if disgruntled elements had the political clout to do so, they staged an end run of traditional federal and state transportation departments and went directly to their state legislatures or Congress. The result was pork barrel projects. Could it be that the system of project development and selection as it has functioned is inadequately attuned to or nonresponsive to an increasing set of legitimate transportation needs? Against what criteria should the public sector, embodied in transportation agencies, rank transportation demands? Cost-benefit analyses based on reduced direct transport costs clearly do not provide enough information for an assessment vital to the future of businesses and communities. On the economic side, companies with great market power may be able to make a convincing case and leverage their access through the local, state, or even national political system. However, for every influential business giant, how many smaller companies may be losing efficiency and thus productivity and market share?

With the maturity of highway systems and the many changes in demographics, land use, and economic geography, the singular goal of achieving widespread access through a network of upgraded roadways is no longer rational or attainable. Since the Interstate system was envisioned, interstate commercial activity, measured in terms of passenger and freight movement, has more than doubled. Since 1956, the nation's gross domestic product (GDP) has grown by more than 150 percent. Even with a declining growth rate in the GDP, the combined travel of personal vehicles and trucks with six or more tires is forecast to nearly double over current levels by the year 2020. The demand for mobility is reflected in the reliance on the highway mode for trips between 100 and 1,000 mi. The highway mode now accounts for 75 percent of freight expenditures and 75 percent of passenger miles. With truck travel forecast to more than double during the next 3 decades, the reliance of the economy on highway transport will continue to grow.

The challenge to meet this burgeoning transport demand must be considered in an increasingly complex national context of financial, institutional, and societal considerations. The sharpened competition for financial resources at all levels of government places a premium on cost-effectiveness. U.S. annual investment in highways, at \$22 billion,

although greater as a proportion of GDP than that of most European Community countries, is about half its real 1970s percentage. Although we believe that public support will permit raising this level, we must capitalize on the enormous investment in existing infrastructure. This implies a priority for maintaining the physical integrity of these systems and facilities, operating them at maximum efficiency, and searching for new technologies and approaches to improve their effectiveness. Even after all this is accomplished, the new and implacable reality is that transportation service will be evaluated against a set of standards that goes well beyond the transport function and includes many other societal concerns, such as wetlands, clean air, congestion, energy, damage to urban space, and much more.

Adequacy was mentioned previously in connection with an efficient private sector. Private transport users are not homogeneous—their needs and expectations are as diverse and competitive with one another as are those in the public sector. How do we tackle the job of keeping the transportation physical plant working while meeting such goals with shrinking resources and deteriorating assets? We could adopt a businesslike approach and assess investments by their contribution to society's bottom line: the ability to transport raw materials, people, and products in a timely and efficient manner, while not generating unacceptable side effects. A new paradigm is needed.

Is there a model for the new paradigm in the business community? The modern, deregulated telecommunications industry offers strong parallels with transportation infrastructure. This utility builds and operates for the public a pervasive infrastructure network at a large initial cost that is shared by a wide variety of customers for pleasure and private productivity enhancement. It is known for its user friendliness.

The basic characteristics of telecommunications, too often in complimentary contrast with transportation, include ready adoption of high technology, healthy competitiveness, and customer responsiveness within the profit-driven market. Pricing mechanisms maximize use of the communications network to moderate the peaks and valleys of demand. Part of the success of the industry is based on extensive market research and its application in product design, operations, and marketing. This customer orientation enables the industry to develop quality products that users want and believe they need. It also provides companies with the ability to adjust their entire network in response to the demand on it. This cuts costs in the long run and allows them to be competitive. Line overload is an unacceptable system failure in this

model. Customers rely on timely access and are willing to pay for it because they understand the dollars and cents consequences of poor performance.

The transportation industry is beginning to get the message: the new paradigm is focused on customers. A new focus is needed on how to address their specific needs. Looking to the future, a variety of organizational entities might function as the local transportation infrastructure company with this customer focus. Perhaps a private entity, as a public utility, will be responsible. Perhaps individual metropolitan planning organizations (MPOs) or departments of transportation will be responsible. Perhaps a combination of all the providers will be responsible, making the organizational lines invisible to the customer. Once such a company has taken the telecommunications model to heart, investments would be made to cost-effectively serve the full array of customers. The investments would be made not only in physical plants but also in high-tech devices to monitor and provide feedback for the system, in market research, and in the development of techniques to maximize system efficiency. Beyond the base equity case, service would be provided if the customers are willing to pay for the net result. Customer willingness would be based on understanding the risk of poor service; the infrastructure company or utility must make the trade-offs clear. Clients can assess for themselves the value of a higher class of service, at each price, and choose service levels accordingly. The average service is likely to be unacceptable to many customers because it could mean being less competitive in the market.

Back to today—what can be done to make this vision a reality? The place to start is with institutions. ISTEA leads in the new directions discussed here, but current organizational capacity is not up to the task of providing customer responsiveness at a level comparable with the telecommunications industry. The challenges that will come in putting aside the traditions and practices of both customer and deliverer that citizens have come to settle for should not be underestimated.

At the Federal Highway Administration (FHWA), that's what FHWA 2000 is about, that is, developing the attitude and the capabilities for a rechartered agency for the next century. The vision statement, developed by a broad-based agency task force working in plenary session, sets the tone: "Meet the Nation's need for the safe, efficient and environmentally sound movement of people and goods, and be renowned in surface transportation expertise and innovation."

FHWA divisions have been charged with developing creative state partnerships to address issues specific to their localities and to do it on a real-time basis. The increased flexibility in ISTEA allows state and local governments to customize federal programs to meet local needs and priorities. FHWA will be a cheerleader and facilitator, not a dictator.

The National Highway System illustrates the new paradigm at work on a national scale. Selected cost-effective capacity increases to a subset of principal arterials, identified by the states, targets federal funds on higher-volume routes serving interstate and interregional commerce needs. In this way, the national system can reach beyond the Interstate system and reflect the changes in the shape of transportation demand since the design of the Interstate system in the 1940s. In fact, several states have already discarded the Federal-aid primary system as an integrated system for planning their investment priorities and are concentrating their investment on a reduced portion of that system.

The newly formed Business Transportation Council illustrates how FHWA will work with the Federal Transit Administration to energize the business community and tap its creativity and resources to help address the nation's transportation challenges. An independent business forum, the council is a group of senior business and private association executives interested in strengthening the government-industry dialogue on surface transportation issues. We can take advantage of that interest and use this group as a sounding board to get business reactions and basic input into programs and policies. I am committed to using every opportunity to bring new partners into the process.

Many of the same things stated here about the economic and leveraging effects of highway investments could be said about other modes of transport, such as ports, airports, transit, and rail. While we are expanding our view of customers, we should take the opportunity to incorporate the transportation suppliers and operators of other modes in our deliberations and outreach. The failure of institutions to provide seamless transportation performance in the view of the customer is the rationale for the intermodal emphasis of ISTEA.

David Osborne called states "laboratories of democracy." It is not surprising that many states are following the new paradigm and applying a new vision of meeting specific customer needs in assessing transportation investments. There are many good examples. Pennsylvania has launched a series of economic development projects that fulfill specific commercial needs. Illustrating this approach is one project

programmed to provide improved access to the new Wal-Mart Distribution Center at PA 270 near I-80.

Another illustration of new-paradigm thinking can be found in the assessment of the Highway 29/45/10 Corridor in Wisconsin. Analyses of the impacts were based on extensive interviews of a comprehensive set of customers including residents, local business people, and travelers in determining (among other things) the benefits in terms of business competitive position and attraction of new business and tourism. State officials carefully examined the trade-off between maximizing total statewide benefits and the benefits to specific localities.

At the local level, ISTEA places new responsibility on MPOs. The capabilities of these organizations vary greatly, and many will have to make significant improvements to function as envisioned in the act. The planning process can act as a facilitating mechanism or a stumbling block. It can bring new partners into the process early enough to be constructive rather than so late that public participation becomes an exercise in salesmanship. This may be uncomfortable for those who have enjoyed historically defined working relationships. However, if transportation planners rethink paradigms and subsequently the institutional arrangements that bring political, industry, and government leaders together within a socially and environmentally responsible community, mutual understanding and trust will be developed and the results will be the better for it. Planners must consider, where such is not now the case, strong business participation in MPO policy boards or advisory committees. Their transport needs vary across time and space differently from personal pleasure and commuting demands. ISTEA requires that transportation improvement programs be consistent with known or expected financing. Consequently, it is imperative to involve the private sector in assessing priorities within the financial and all other constraints early in the process. Good timing will help the community at large to buy into the costs and benefits of transportation decisions.

Without a doubt, the technical competencies of all planners and analysts will be put to the test. The questions they face are tough. A fresh perspective is likely to target areas of ignorance and demand more information than the planning community has ever before been asked to provide. A thorough understanding of the interrelationships between environmental goals and investment choices, for example, is assumed by the Clean Air Act Amendments of 1990. Are we up to the challenge? A review of interactive transportation and land use models

identifies, at a technical level, one of the areas on which the metropolitan transportation planning community should concentrate if we are to forecast urban travel demand, let alone judge the impacts of alternative mixes of projects. Land use forecasting procedures have essentially remained unchanged in most major metropolitan areas for nearly 20 years, regardless of how inaccurate their predictions have been. Our understanding of the interaction between congestion and land use patterns has not been incorporated adequately. We all must work to rank new infrastructure investments against criteria that matter to our customers, with full knowledge that infrastructure is a scarce resource.

Transportation plays a pivotal role in serving new and old demands. It allows society and its economy to respond to emerging opportunities. These may come from changes in demographics, consumer tastes, the advent of new technologies, or changes in the international marketplace, just to name a few. Beyond any question, the nation's economy, demographics, geography, institutions, political agenda, infrastructure, and transportation problems have fundamentally changed and continue to change at an accelerated rate. Highway usage has seen enormous long-term growth. However, as that spiral of growth has continued to a point at which 90 percent of all person-trips are by automobile, countercyclical forces, often in the form of new players in what has been our arena, have gained strength and visibility. So do we put up barricades or adopt more pliable paradigms?

The choice is clear. Using just the paradigm of a service-oriented infrastructure company, we can reach out to and understand the full range of customers. Then we must work to meet specific needs. Our customers, citizens of this great country, expect nothing less of us.