Intelligent Transportation Systems: A Multilevel Policy Network

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(Abstract)

This dissertation is a descriptive study of a policy network designed for U.S. government and global cooperation to promote Intelligent Transportation Systems (ITS). It is aimed at exploring the historical and structural features of the ITS policy network, and evaluating its roles in the policy process.

Until now, the network literature has barely examined the full arrays of networks, catching just part of their full pictures. First, this study draws attention to transnational networks and their organic or systematic relationships with lower levels of networks. Second, it examines the individual properties and synergy of three core elements of the ITS policy network: public-private partnerships, professional networks, and intergovernmental networks. Third, it takes a close look at the pattern of stability change and power relations of the policy network from within the net. Finally, this study discusses what difference networks make, compared to hierarchies and markets.

This dissertation employed multiple sources of evidence: unstandardized elite interviews, government documents, and archival records. Through a networking strategy to find the best experts, face-to-face, telephone, and e-mail interviews were conducted with twenty-two public officials and ITS professionals.

It was found that the U.S. ITS policy network was a well-designed strategic governance structure at the planning level, but an experimental learning-focused one at the implementation level. It was initially designed by a new, timely, cross-sectional coalition, which brought together field leaders from both the public and the private sectors under the slogan of global competitiveness. Yet, day-to-day managers within the net often
experience much more complex power relationships and internal dynamics as well as legal obstacles; also, they confront external uncertainty in political support and market.

For better results, policy networks should be designed in flexible ways that will handle their disadvantages such as ambiguous roles, exclusiveness, and increased staff time. In this respect, it is inevitable for the networks to include some components of a wide range of conventional structures, ranging from highly bureaucratic to highly entrepreneurial, on the one hand, and ranging between issue networks (grounded in American pluralism) and policy communities (based on European corporatism), on the other hand.
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For my wife, Young Sun, my daughter, Min, and my parents.
# TABLE OF CONTENTS

LIST OF FIGURES ............................................................................................................. ix  
LIST OF ACRONYMS ......................................................................................................... x  

CHAPTER I. INTRODUCTION .......................................................................................... 1  
   Intelligent Transportation Systems ........................................................................... 1  
   Policy Networks ........................................................................................................... 3  
   Literature Gap and Guiding Propositions .................................................................. 5  

CHAPTER II. LITERATURE REVIEW .................................................................................. 8  
   Networks in Organization Theory .............................................................................. 8  
   Networks in Public Administration and Policy .......................................................... 10  
   Globalization and State Theory .................................................................................. 15  

CHAPTER III. RESEARCH DESIGN AND METHOD .......................................................... 22  
   Aims of the Study ........................................................................................................ 22  
   Foci of the Study .......................................................................................................... 24  
   Data Collection and Analysis ...................................................................................... 30  

CHAPTER IV. INTELLIGENT TRANSPORTATION SYSTEMS ........................................... 36  
   Concept of Intelligent Transportation Systems ....................................................... 36  
   Structure of the U.S. ITS program ............................................................................ 43  
   Program Directions .................................................................................................... 43  
   Federal Funding under TEA-21 of 1998 .................................................................. 46  
   Federal Leadership in the ITS Program .................................................................... 48  
   Federal Funding Scale ............................................................................................... 48  
   Organizational Structure for Promoting ITS ............................................................. 50  
   Federal Roles and Policy Tools .................................................................................. 54  
   Functional Integration and Task Delegation .............................................................. 58  

CHAPTER V. CONTEXT AND HISTORY ............................................................................ 60  
   Contexts of National Concerns .................................................................................. 60  
   Economic Downfall and National Integration ............................................................. 61  
   Troubled Electronics and Automotive Industries ...................................................... 64  
   Defense Conversion .................................................................................................... 66  
   Completing the Interstate System and Emerging Transportation Issues .................. 69  
   Shared Needs for Change and Legitimacy of the National Program ....................... 72  
   Creating a Sectoral Coalition ..................................................................................... 72  
   Congressional Support ............................................................................................... 75  
   Expanding the Network to the Implementation and Global Levels ............................. 77  
   Public-Private Cooperation in the National Planning Process ................................. 77  
   Federal Support for Interjurisdictional Networks ...................................................... 79  
   Renovating a Professional Network .......................................................................... 82  
   Dealing with Global Neo-liberalism .......................................................................... 84  
   Conclusion ................................................................................................................ 89
CHAPTER VI. INTERNAL DYNAMICS: AN OVERALL APPRAISAL .......... 92
Competition for Global Standards ................................................. 92
The Federal Agencies’ Network ..................................................... 96
    Spending Decisions of Congress and States ............................. 96
    Coordinative Roles of ITS JPO .............................................. 100
    Advisory Roles of ITS America .............................................. 102
Private Sector Partners in Implementation Networks .................... 104
Defense Conversion in Trouble .................................................... 105
Emergence of Information/Telecommunication Companies .......... 107
Political Support for Automobile Manufactures ......................... 112

CHAPTER VII. INTERNAL DYNAMICS: PARTNERS IN MOTION .......... 115
Project Overview ........................................................................ 115
Shared Resources and Risks ....................................................... 118
Legal Issues ............................................................................. 126
    Procurement ...................................................................... 126
    Intellectual Property Rights ................................................. 129
Institutional Issues .................................................................... 131
    Free Rider Problems and Value Conflict ............................... 132
    The Lack of a Business Model ............................................ 134
Reprise: a Picture of the ITS Policy Network .............................. 137

CHAPTER VIII. OVERVIEW, EVALUATION, AND CONCLUSIONS .... 142
Globalization, Public Policy, and Networks ................................. 142
Public/Private Partnerships vs. Contracts/Privatization ............... 148
Partnerships vs. Entrepreneurship .............................................. 157
The Professional Network’s Missing Links ................................... 161
    Political Support .............................................................. 161
    Social Construction of Knowledge ...................................... 165
    Businesses and the Public Interest ...................................... 168
Conclusion .............................................................................. 170

REFERENCE LIST ..................................................................... 176
LIST OF FIGURES

Figure III-1. A Net Thrower Plan View of the ITS Policy Network ..............................25
Figure III-2. External Relationships of Net Riders ..........................................................27
Figure III-3. Units of Analysis of the ITS Policy Networks .............................................29
Figure III-4. Information on Conducted Interviews .......................................................33

Figure IV-1. ITS Development and Society .....................................................................37
Figure IV-2. ITS User Services as Standardized by ISO ..................................................38
Figure IV-3. U.S. ITS Program Direction ........................................................................44
Figure IV-4. ITS Program Funding in TEA-21 (in $millions) .........................................47
Figure IV-5. Federal Budget Size for the ITS Program ...................................................48
Figure IV-6. U.S. Organizational Structure for Promoting ITS .......................................51
Figure IV-7. Japanese Organizational Structure for Promoting ITS ...............................52
Figure IV-8. European Organizational Structure for Promoting ITS .............................53

Figure V-1. GDP Growth Trends ......................................................................................62
Figure V-2. U.S. Trade Deficit with Major Trading Partners .........................................62
Figure V-3. Trade Deficit in Electronic Products and Motor Vehicles .............................65
Figure V-4. National Defense as Percentage of Federal Outlays ...................................67
Figure V-5. U.S. Participation in ITS Standardization of ISO ........................................88
Figure V-6. Major Events related to the ITS Policy Network .........................................90

Figure VI-1. Typical Standardization Process .................................................................94
Figure VI-2. Flows of the Federal Fund for ITS Projects .................................................98

Figure VII-1. System Architecture for Partners In Motion .............................................116
Figure VII-2. Financial Commitment of Partners In Motion ...........................................120
Figure VII-3. The Implementation Network of Partners In Motion ................................125
Figure VII-4. The ITS Policy Network ...........................................................................138
Figure VII-5. External Relationships of U.S. DOT .........................................................141
Figure VII-6. External Relationships of State Transportation Agencies .......................141

Figure VIII-1. Development of the ITS Policy Network ................................................143
Figure VIII-2. Comparing Public-Private Relationships .................................................156
Figure VIII-3. Policy Network as Alternative Governance ............................................173
# LIST OF ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
</tr>
<tr>
<td>ADUS</td>
<td>Archived Data User Services</td>
</tr>
<tr>
<td>AHS</td>
<td>Automated Highway Systems</td>
</tr>
<tr>
<td>APTS</td>
<td>Advanced Public Transportation System</td>
</tr>
<tr>
<td>ARTS</td>
<td>Advanced Rural Transportation System</td>
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<tr>
<td>ATIS</td>
<td>Advanced Traveler Information System</td>
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<td>ATMS</td>
<td>Advanced Traffic Management System</td>
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<tr>
<td>AVCS</td>
<td>Advanced Vehicle Control System</td>
</tr>
<tr>
<td>BTS</td>
<td>Bureau of Transportation</td>
</tr>
<tr>
<td>CBO</td>
<td>Congressional Budget Office</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed Circuit Television</td>
</tr>
<tr>
<td>CEN/TC278</td>
<td>Comite Europeen de Normalisation/Technical Committee 278</td>
</tr>
<tr>
<td>CVISN</td>
<td>Commercial Vehicle Information Systems and Networks</td>
</tr>
<tr>
<td>CVO</td>
<td>Commercial Vehicle Operations</td>
</tr>
<tr>
<td>DOT</td>
<td>Department of Transportation</td>
</tr>
<tr>
<td>DSRC</td>
<td>Dedicated Short Range Communication</td>
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<tr>
<td>ECMT</td>
<td>European Conference of Minister of Transports</td>
</tr>
<tr>
<td>EMS</td>
<td>Emergency Management Systems</td>
</tr>
<tr>
<td>EP</td>
<td>Electronic Payment</td>
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<tr>
<td>ERGS</td>
<td>Electronic Route Guidance System</td>
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<tr>
<td>ERTICO</td>
<td>European Road Transport Telematics Implementation Coordination Organizations</td>
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<tr>
<td>EDL</td>
<td>Electronic Document Library</td>
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<tr>
<td>ETC</td>
<td>Electronic Toll Collection</td>
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<tr>
<td>FCC</td>
<td>Federal Communications Commission</td>
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<td>FHWA</td>
<td>Federal Highway Administration</td>
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<td>FRA</td>
<td>Federal Railroad Administration</td>
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</table>
FTA Federal Transit Administration
GAO General Accounting Office
ICDN ITS Cooperative Deployment Network
IEEE Institute of Electrical and Electronics Engineers
IM Incident Management
ISO International Organization for Standardization
ISO/TC204 ISO/Technical Committee 204
ISP Information Service Provider
ISTEA Intermodal Surface Transportation Efficiency Act of 1991
ITE Institute of Transportation Engineers
ITS Intelligent Transportation Systems
ITS/CVO Intelligent Transportation Systems for Commercial Vehicle Operations
ITS JPO ITS Joint Program Office (= JPO for ITS)
ITS America Intelligent Transportation Society of America
ITU International Telecommunication Union
ITU-R ITU Radiocommunication Sector
IVHS Intelligent Vehicle-Highway Systems (old name of ITS)
IVI Intelligent Vehicle Initiative
JPO for ITS Joint Program Office for ITS (= ITS JPO)
MDI Model Deployment Initiative
MPO Metropolitan Planning Organization
MARAD Maritime Administration
MSHA Maryland State Highway Administration
NAWG National Associations Working Group for ITS
NCPWI National Council on Public Works Improvement
NHTSA National Highway Traffic Safety Administration
OECD Organization for Economic Cooperation and Development
PCB Professional Capacity Building
PIARC World Road Association Committee
PiM Partners In Motion
ROW Rights-of-Way
SAE Society of Automotive Engineers
SDO Standards Development Organization
TEA-21 Transportation Equity Act for the 21st Century
TICS Transport Information and Control Systems
U.S. DOC ITA U.S. Department of Commerce International Trade Administration
U.S. DOT United States Department of Transportation
VDOT Virginia Department of Transportation
VERTIS Vehicle, Road, and Traffic Intelligence Society
VTTI Virginia Tech Transportation Institute
CHAPTER I. INTRODUCTION

The dissertation is a descriptive study of a policy network designed by the U.S. government with global cooperation to promote Intelligent Transportation Systems (ITS). It is aimed at exploring the historical and structural features of the ITS policy network, and evaluating its roles in the policy process. Hence, it discusses three research questions: why and how the network developed; how policy actors are interconnected in the network; and how well the network is working. In doing so, the dissertation draws structural implications for more effective and accountable public administration and policy. In this dissertation, the policy network is proposed as a new governance form that is expected to compensate for the structural defects of both bureaucratic and entrepreneurial forms of government.

Intelligent Transportation Systems

Intelligent Transportation Systems (ITS), formerly called Intelligent Vehicle-Highway Systems (IVHS), are “groups of technologies that use sensors, computers, and related information/communications systems to improve the management and control of roadways, vehicles, and driving capabilities” (Rothberg, Ducca and Trullinger, 1997: 1). The concept can be applied to a vast transportation infrastructure of highways, streets, and bridges, as well as all kinds of vehicles. According to the U.S. Department of Transportation’s web site, ITS is expected to serve as “the next step in the evolution of the nation’s entire transportation system” in the United States. All over the world, it has been increasingly expected to hold the answer to traffic congestion, travel safety, economic development, and air pollution.

A study by the Texas Transportation Institute estimates that the number of urban areas experiencing unacceptable congestion rose from 10 in 1982 to 39 in 1996, with the average roadway congestion index—measured by travel volume per road lane—rising about 25 percent from 0.91 to 1.14, with 1.00 or greater being the threshold for
unacceptable congestion. The study also indicates that the total annual costs of congestion in the 70 urban areas reached $74 billion, ranging from $333 per driver in smaller cities to $936 in large cities and averaging about $629 overall (US DOT BTS, 1999: 55-56). During 1997, 42,013 Americans were killed, and 3.35 million were injured in traffic crashes on highway (US DOT BTS, 1999: 85).

Originally established under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) as the IVHS program, the ITS program is meant to achieve a set of multiple objectives—including reducing congestion, improving travel safety, increasing productivity, and protecting the environment. To meet these goals, the U.S. Department of Transportation (DOT) is sponsoring several hundred projects to research, develop, test, and deploy new advanced technologies. Over 200 companies and many state and local governments have also participated in more than 240 ITS projects and partnerships. A set of these activities is referred to as the National ITS program in the U.S. (Rothberg, Ducca and Trullinger, 1997: 1-2).

ISTEA and annual appropriation laws provided more than $ 1.27 billion between fiscal years 1991 and 1997 for the initiative. In 1998, the Transportation Equity Act for the 21st Century (TEA-21) was passed as a successor to ISTEA, authorizing $ 1.28 billion in federal transportation spending for ITS between fiscal years 1998 and 2003. With the passage of the Act, the ITS program has fundamentally shifted away “from a program of research and development to one primarily focused on infrastructure deployment” (US DOT FHWA, 1999: 3).

ITS promotion is an excellent case for network research. The multilevel efforts to promote ITS is made through the structure of typical networks, where the multiple policy actors involved are interdependently connected to the extent that no organization is pervasive. In the structure, public agencies no longer have pervasive control and authority over other actors, and policy is made and carried out together by network actors rather than one specific public agency. Policy actors often realize that it is very important to develop a culture of trust and coordination strategies from the long-term perspective.
A first step toward coordination is that countries or regions designing ITS programs commonly adopt public/private partnerships. In the application of high technologies like ITS, the resources and expertise required are often beyond the capacity of the public sector; hence, they have increased dependence on the private sector. Second, the success of ITS programs also depends on intergovernmental/interagency coordination, which is required to make ITS technologies interoperable across multiple jurisdictions and to meet the different needs of previously independent agencies. Third, the policy network includes basically three professional communities, civil engineering, the information/communication world, and the automotive industry.

Consequently, the overall ITS policy network is highly complex and includes public/private partnerships, interagency/intergovernmental networks, and professional networks. Furthermore, these networks often span multiple countries as economic globalization and transnational cooperation expands. As one ITS consultant states, the study of ITS programs is a “fascinating field,” enabling students of public administration to have an unconventional way of thinking about governmental structure and operation (Worrall, interview, April 25, 1999).

To date, the United States, Europe, and Japan have made better ITS progress than other parts of the world, but the three are quite different from each other in terms of approaches, strategies, and organizational structures, as well as the technological areas of emphases. The U.S. government got involved in ITS development later than the other two, but it is known that the speed of ITS diffusion is relatively greater, largely due to its well-designed policy network (Shibata and French, 1997: 160-165).

Policy Networks

In the field of public administration, an emerging argument is that today the context of public organizations increasingly resembles webs, or networks, characterized by complex interconnectedness and interdependence among business, not-for-profits, interest groups, and multiple levels and units of government. Especially, the dispersion of
the perspective has been activated by the increasing reliance of the public sector on the private sector for the delivery of public goods and services. Now, the emergence of what Milward termed the “hollow state” (1996) has been conceived as the new context of public administration in the United States, European countries, and some Asian countries.

Since Max Weber first described the nature of bureaucracy systematically to explain its emergence in Western society, the term “bureaucracy” has often been used in a negative sense to mean organizations characterized by red tape, inflexibility, and unity. In particular, this usage is noteworthy to the students of public administration because bureaucracy still remains the dominant form of organization in the public sector. In fact, perceived negative consequences of “bureaupathology” have worked as major driving forces of emerging anti-governmental sentiment all over the world. It is widely accepted that government often insists to be a closed system isolated from society, particularly attempting to reign over the people rather than to be accountable to them, and that walls of sectionalism placed across units of government impede intergovernmental or interagency cooperation.

Like the bureaucratic model of government, the entrepreneurial model of organizations also falls short of conceptualizing desirable relationships between government and society or among governmental units. Critical of the bureaucratic form of government, the New Public Management (NPM) movement has swept the world of the 1990s. It calls for the transfer of business-like technologies, such as “customer service, performance-based contracting, competition, market incentives, and deregulation,” into the public sector (Kaboolian, 1998: 190). Hence, it calls for the application of a market mentality to government-society relations and intergovernmental relations. The perspective replaces the concept of citizens with that of customers and substitutes society as a larger social and political community for a market place pervaded by utility maximizers. This approach downplays the public interest and civic virtue in favor of self-interest, threatening democratic governance (Frederickson, 1996; Terry, 1998; Kelly, 1998; Cook, 1998). Furthermore, units of government view each other as
competitors rather than interdependent cooperators who may contribute to each other and together to higher goals.

The rationale for the network perspective can be found in the emerging discontent with the conventional governance models. Networks are more than pure rational exchanges and authority relationships. In particular, they are institutionalized social relationships grounded in trust and shared meaning. They differ from other organizational forms in their major notions (stable interdependence) and core mechanisms (institutional glue such as trust). Yet, this does not mean that the concept of networks is wholly apart from the conventional forms. Rather, the old and new models have overlapping areas in both conceptual and practical terms (Frances et al., 1991). Also, networks include a very wide range of structures, ranging from highly bureaucratic to highly entrepreneurial (Williamson, 1985; O’Toole, 1997a: 45).

In line with the network concept, this dissertation defines policy networks as the structures and patterns of more or less stable social relations among multiple interdependent organizations, whose activities are centered on policy problems or policy programs. Policy network studies focus on interorganizational relations in a structural dimension and on public policy in a functional dimension; hence the research area may serve as a nexus between organization studies and public policy studies.

Literature Gap and Guiding Propositions

For the field of public administration and policy, network research leaves much to be desired and must be advanced along the following three lines. First, it is imperative that they describe the properties of individual network ties and explain the driving forces of those properties. This will help us find the patterns of stability, change, and power in networks. Second, little attention is given to the theoretical question of what difference networks make, compared with other structural arrangements. As La Porte precisely points out, “there is little systematic evidence to support good-hearted enthusiasm or vindictive hopes in promoting one type of structural reform over others in public
organizations” (1994: 11). Finally, most studies avoid global-level networks and their organic or systematic relationships with lower levels of networks, in spite of increasingly blurred boundaries between global and national networks.

The last literature gap identifies an important issue to place on the research agenda: the emerging role of the nation-state in dealing with globalization. National and global networks glowingly act as a seamless, organic whole, without clear boundaries between them. Interdependency among national policy actions and free transnational flows of capital and products rapidly grow under the global system. Despite growing challenges to its internal sovereignty from both global economic interests and various international institutions, many state theorists still champion the continuing capacity and autonomy of nation-states to preserve their internal and external sovereignty in ways amenable to the sea change of globalization and interdependency. Today, states perform as rational actors that deliberately seek national economic interests, governed simultaneously by two economic ideologies: global neo-liberalism and economic nationalism. Thus, outward and inward perspectives prevail simultaneously. Successful states in dealing with globalization have the considerable challenge of harmonizing contention between international pressures from global liberalism and domestic demands for economic nationalism.

Based on network studies and state theory, this dissertation examines the following questions and is guided by the following expectations for a network analysis of ITS promotion:

**Question 1. Why and how did the ITS policy network develop?**

It is anticipated that the structural features of the ITS policy network do not arise only from implementation problems such as resources, experts, and coordination. They also emerge from national needs to cope with macro-level challenges from global liberalism and competitiveness. This need creates network forms appropriate for industrial policy.
Question 2. How are policy actors interconnected in the ITS policy network?

The interconnections can be assessed in terms of cooperativeness and interdependence. The degree of cooperativeness depends on goal conflict, on the one hand, and the degree of interdependency relies on power asymmetry, on the other. These are the two main variables that classify interorganizational dyadic relations, and they indicate the extent of network stability and the pattern of power distribution, respectively.

Question 3. How well is the ITS policy network working?

Because of the unique structural features of the ITS policy network, assessing it will require reference to other effects than economic outcomes that concern conventional governmental structures, such as effectiveness and efficiency. Especially important will be normative outcomes, such as accountability and responsiveness, whose character will be influenced by an unusual degree of loose and unpredictable relationship between actors.
CHAPTER II. LITERATURE REVIEW

From its beginning, the ITS program has been designed and carried out through the structure of networks. Interdependent multiple actors get involved in the policy process, but public agencies no longer have pervasive control and authority over other actors; in fact, all policy actors together make and carry out decisions through formal and informal institutions. To those actors, important tasks include building a culture of trust and forming coordination strategies from the long-term perspective. Hence, it is difficult to explain the past and present of ITS promotion without giving attention to network structure.

Globalization may be conceived of as a context of the ITS program, but it is quite difficult to draw a clear boundary between global and national networks with transnational cooperation and competition growing substantial. Hence, two kinds of networks often act as a seamless, organic whole. The growth of interdependency among national policy actions and free transnational flows of capital and products under the global system are unprecedented. If one excludes the global level, research on the ITS policy network cannot draw a full picture of the policy area. It is also imperative that such research conceives of the global level as a central element rather than a peripheral, contextual one.

In short, network relationships are a notable structural feature of the American ITS program, and the global political economy is its main driving force. Hence, to prepare for our study of this subject we must review the literature on interorganizational networks in organization studies, policy networks in public administration and policy, and the political economy of state roles in the settings of globalization and global interdependency.

Networks in Organization Theory

Organization theorists, especially those with sociological backgrounds, have extensively examined networks. They describe networks as the structures of social relations at the interpersonal, intergroup, or interorganizational levels. They examine relationships between networks and a variety of variables such as performance, survival,
technology, and learning. Their theoretical work is sufficiently solid and extensive that they can provide numerous implications for network research in public administration and policy. This literature focuses on two functions of networks: resource exchange, on one hand, and learning or isomorphism in organizational fields, on the other (see Mizruchi and Galaskiewicz, 1994).

Much research focuses on the patterns of inter-firm interaction in resource exchanges and flows aimed at developing managerial strategies for inter-firm relationships. This stream is traced back to the resource dependence school developed by Benson (1975), Pfeffer and Salancik (1978), and Aldrich (1979). Recently, many scholarly works emphasize social dimensions of transactions, such as reputation, trust, reciprocity and mutual interdependence (Granovetter, 1985; Baum and Oliver 1992; Larson, 1992; Moorman, Zaltman, and Deshpande, 1992; Provan, 1993; Podolny, 1994; Uzzi, 1996). Specifically, the “embedded networks” have comparative advantages over “arm’s-length networks” in spite of the risk of over-embeddedness (Uzzi, 1997), and over markets and hierarchies in coordination and uncertainty reduction (Jones et al. 1997).

The second stream of interorganizational network studies relates to learning and isomorphism in organizational fields (DiMaggio and Powell, 1983). Some argue that existing, similar organizations in the environment of new organizations may enable the new ones to undertake resource acquisition, legitimization, and domain definition and that this advantage may outweigh the negative effect of competition (Wiewel and Hunter, 1985; Rice and Aydin, 1991; Stuart, 1998). While early adopters of managerial programs tend to implement strategic objects in pursuit of efficiency gains, later adopters show isomorphic behaviors, a network effect, in pursuit of legitimacy (Westphal et al., 1997; Kraatz, 1998). In the field of rapid technology development, such as the biotechnology industry, organizational learning is conducted through networks rather than within individual firms and a positive relationship between network of learning and performance is perceived (Powell and Brantley, 1992; Powell, Koput, and Smith-Doerr, 1996).
Taken together, networks are treated by organization theorists as interconnected channels for resource exchanges or information flows. At the same time, networks fit into the sociological argument that successful organizations have a greater concern with social and institutional relationships based on long-term views than with rational behaviors based on short-term views.

Networks in Public Administration and Policy

Despite its conceptual variety (Dowding, 1995; Börzel, 1998), the term “(policy) networks” is clearly defined by several scholars in public administration and policy. First, O’Toole (1997a: 45) views networks as “structures of interdependence involving multiple organizations or parts,” exhibiting “some structural stability” and including “networked ties congealed by institutional glue.” Second, according to Kickert et al. (1997: 6), policy networks are “more or less stable patterns of social relations between interdependent actors, which take shape around policy problems and/or policy programs.” Third, Kenis and Schneider (1991: 36) define policy networks as “webs of relatively stable and ongoing relationships which mobilize and pool dispersed resources so that collective (or parallel) action can be orchestrated towards the solution of a common policy.” More comprehensively, Börzel (1998, 254) sees policy networks as “a set of relatively stable relationships which are of non-hierarchical and interdependent nature linking a variety of actors, who share common interests with regard to a policy and who exchange resources to pursue these shared interest acknowledging that co-operation is the best way to achieve common goals.”

While those definitions commonly stress the “stability” of interdependent relations, Helco’s (1978) “issue networks” emphasize the openness and unpredictability of policy-making processes. He argues that issue networks are open and complex sets of participants with varying degrees of mutual commitment or of dependence on others. Participants constantly move in and out.
However, Heclo’s concept is not widely accepted by network researchers, especially in Europe. According to Klijn, a Dutch scholar, many scholars have criticized the issue network for “contributing nothing new in comparison with the classical ideas of pluralism” (1997: 34). Marsh and Rhodes, the editors of *Policy Networks in British Government* (1992), synthesize the network studies of eight U.K. policy areas and conclude that “policy networks” is a generic term encompassing all types of interest group intermediation between policy communities (characterized by stability, restricted membership and closeness) and issue networks (characterized by instability, large number of members and open access) (1992: 249-268). However, the case studies commonly hold that “issue networks exist, but they are the exception rather than the rule, at the periphery rather than the core of the policy agenda” (254).

On the basis of definitions above, I define policy networks as the structures and more or less stable patterns of social relations between and among multiple interdependent organizations, whose activities are centered on policy problems or policy programs. In this sense, the concept of policy networks is congruent with Wamsley’s (1985) notion of “policy subsystems,” whose members are interdependent and interrelated vertically and horizontally in order to influence authoritative allocation of values. His model is also grounded in the framework of internal and external political economy including power exertion and rational actions.

Furthermore, scholarly works describe networks as an alternative to conventional organizational forms or governance models. To some of them, the network approach is an alternative to both the pluralist and the corporatist models (Rhodes and Marsh, 1992: 4). Networks are also presented as an alternative to governance that is built on both top-down control and bottom-up criticism (Kickert, Klijn, & Koppenjan, 1997: 7-13; Kenis & Schneider, 1991: 40-43). More importantly, some organization theorists view networks as a distinct structural form that excludes markets and hierarchies (Powell, 1990; Frances et al., 1991). Among many aspects, a primary difference relates to the coordination mechanism: price in markets, authority in hierarchies, and trust in networks. Another important difference is the mode of actor preferences and choices: independence in
markets, dependence in hierarchies, and interdependence in networks. Hence, networks are distinguished from traditional governance models in terms of their major notions (stable interdependence) and core mechanisms (institutional glue such as trust). Miller (1994) also defines policy network as “an arena for the process of argument” and points to its implication for the social-constructivist model, as contrast to the economic exchange model as well as traditional progressivism, which is characterized by hierarchical control, scientific management and neutral competence. Policy networks are meaning structures that involve recurring social relations and allow diverse voices to influence policy.

However, this does not mean that the concept of networks is wholly separated from those of hierarchies and markets. Rather, the three models have overlapping areas conceptually and practically (Frances et al., 1991), and networks include a very wide range of structures between the others with excluding their pure forms (Williamson, 1985; O’Toole, 1997a: 45).

Kenis and Schneider (1991) present the history of network research in policy making. Although the observation of network configurations can be traced back to pluralist theory (Bentley, 1967; Truman, 1971) and its counterparts, neo-corporatist and neo-institutionalist theory (Rokkan, 1969), the real take-off of network studies did not occur until after the early 1970s. The foundation of network concepts was laid by the notions of “policy community” (Heclo and Wildavsky, 1974) and “decision network” (Friend, Power and Yewlett, 1974). A further development of the concept was Heclo’s (1978) “issue networks” in contrast to the smallness and exclusiveness of the “iron triangle.” Of importance also is Hanf and Scharpf’s (1977) organizational analyst view that interdependence among multiple and various actors structure the behavior of the individual organizations in policy making. This historical trace conforms to Klijn’s (1997) theoretical roots of policy networks, which synthesizes three disciplines: organizational science, policy science, and political science.

Katzenstein (1978) portrays the policy network as a “political meta-structure integrating different forms of interest intermediation and governance, forming a symbiotic
relationship between state and society in policy making” (Kenis and Shneider, 1991: 31). During the 1980s and 1990s, many descriptive analyses of various policy domains were written, grounded in Kantzenstein’s portrayal. Quantitative analyses focused on structure mapping or exchange relations in various policy domains, for instance the U.S. agriculture, health, energy, labor policies (Laumann and Knoke, 1987; Lauman et al, 1991), U.S.-Germany comparison of labor policy (Pappi and Knoke, 1991), and German telecommunications policy (Schneider and Werle, 1991). Yet, most studies of the period were based on qualitative case studies.

A principal stream of qualitative empirical studies, similar to quantitative ones, is cross-national comparison of policy networks. Kenis (1991) argues that the development of policy networks depends on historical and institutional structures of the nation-state in his longitudinal comparison of industrial restructuring policy domains among Britain, Italy, and West Germany. Coleman (1991) conducts an U.S.-Canada comparison of how macropolitical institutions shape networks in the monetary policy domain. Dohler (1991) compares Britain, the U.S., and West Germany in the health policy network, and Daugbjeg (1998) does so for Denmark and Sweden in the environmental policy network. Both of the studies present the same conclusion that structural properties, such as network stability and ties, determines the political strategies and policy instrument. To some (Wilks and Wright 1987; Wright, 1988), policy networks are analytical tools to compare government-industry relations across countries.

The American literature has rarely described the full array of policy domains that fit into the European concept of policy networks, but it has focused on what can be called the sub-units of policy networks: implementation networks or intergovernmental networks.¹ This includes the implementation networks of a highway project (Mandell, 1984) or local wastewater treatment (O’Toole, 1990), the network of Federal regional councils (Gage, 1984), an intergovernmental network involved in local human crises

¹ An early study of these networks by Hanf, Hjern, and Porter (1978) compares Federal Republic of Germany and Sweden in the local networks of manpower training. Like other European studies, this is more a structural approach than a behavioral or normative one.
(Agranoff, 1990), and local government-community networks in community development (Agranoff and McGuire, 1999; Mandell, 1999). Most of those case studies contend that public administrators, in network settings, change not only ways of thinking about their roles, but also management styles and policy instruments that are used in bureaucratic structures. Among those studies, the most recent two listed above treat trust as the most important value and social capital for network management.

Another explicit trend is growing attention to the strategies of network management. This theme is found in some American studies (Mandell, 1990; O’Toole, 1997a), but more comprehensive attention is given to it in Managing Complex Networks (1997), a collection of Dutch studies. Kickert and others conclude that most strategies for network management can be divided into the game level (e.g., bargaining, conflict resolution, or persuasion) and the network level (e.g., changes in network-wide rules, structure, or incentives) (168-169).

All in all, policy networks are generally used as an analytical tool for analyzing the meso-level of non-hierarchical relationships between government and interest groups in various policy fields or domains. This structural approach is especially popular in Europe. The term “policy network” has been used in the U.S., but at lower levels of relationship. Most of the U.S. literature views network structures as a new context that stimulates the role and mind-set change of public managers, with foci on behavioral or normative aspects at the micro-level.

To summarize to this point, both organization theory and public administration and policy share a common concern with social and institutional aspects in network concepts: the institutionalization of social relationships grounded in trust and shared meaning. Networking is more than pure rational exchanges\(^2\) and authority relationships. However, the term “policy network” is a comprehensive concept that encompasses different types of networks. In terms of network memberships, policy networks include public-private

\(^2\) Game theory explains rational actions in networks (see Scharpf, 1993).
partnerships, professional networks, and intergovernmental networks. Stability is another dimension that classifies policy networks into policy communities and issue networks. Most empirical studies examine each of the above types, but they do not make a systematic analysis of a full array of all elements. A goal of the present dissertation is to make progress in this area.

As mentioned, little attention has been paid to networks at a global level and their organic or systematic relationships with lower levels of networks. Many studies have been made on European regional networks, but this is really a regional perspective rather a global one. Luke (1992) proposes general policy/management strategies suitable for the context of globalization, but his work is more an administrative prescription than the description of network structures. To fill out this research gap, the present dissertation pays particular attention to the description and analysis of policy networks at the global level.

Globalization and State Theory

This section reviews the literature on how the nation-state deals with the growth of economic globalization and interdependence. International cooperation for ITS promotion is seemingly intended to handle simultaneous problems shared by many countries: traffic congestion, safety, energy saving, and air pollution. However, global competitiveness is indeed a fundamental driving force that stimulates states’ engagement in global ITS promotion, as well as nationalistic motives. It is expected that ITS will provide gigantic economic benefits to both states and their ITS industries. The transportation infrastructure will not only improve efficiency of logistics but also establish attractive business conditions by reducing traffic congestion, traffic accidents, and air pollution.

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3 This includes the adoption of the pan-European network for transport policy at the municipal level (Wells and Grieco, 1993), the analysis of overall Euregional collaboration (Soeters, 1993), and public-private relations at the EC level in technology policy (Peterson, 1992).
Many point out that the growing influence of international institutions and global economic forces have led to the decline of the nation-state. For instance, Albrow (1996) identifies the decline of the nation-state, which he regards as one of the pivotal institutions of the Modern Era. He argues that the nation-state, in the Global Age, can no longer be sustained because social and economic forces are not bound within its boundaries. He also envisions the gradual replacement of the nation-state with “the global state”: the nation-state is coming to “terms with a position of modest subsidiary” (183).

However, such an argument overlooks the continuing importance and autonomy of nation-states in addressing global problems. Despite widespread global forces, the influence of national politics and identities widely varies according to policy domains or industrial sectors (Humphreys and Simpson, 1996: Moran and Wood, 1996: Gummert, 1996). According to Opello and Rosow (1999), the contemporary state can be most characterized by its deterritoriality in the evolution of the state, but this does not indicate the decline of the managerial state. Rather, the neoliberal agenda has widened and increased state power beyond the territory of the state. From the chaos theorist perspective, Veseth (1998) argues that, based on his case studies of four “global firms,” globalization is a myth and that the rumors of the death of the state are exaggerated. He concludes that this misunderstanding exists because political and intellectual entrepreneurs tend to oversimplify the complexity of “globalization” in ways that suit their agendas.

An emerging role of the contemporary state is grounded in the idea of the “competitiveness” school, which views the state as an economic competitor (Porter, 1990; Reich, 1992). Cerny (1996) identifies the problem of a “residual-state,” which is vulnerable to crises of legitimacy, and he calls for the “competition state” as a way of overcoming the problem. He argues that the main task or function of the contemporary state is to promote economic activities, either at home or abroad:

By increasingly both promoting the transnational expansion and competitiveness of its industries and services abroad, and competing for inward investment, the state becomes a critical agent, perhaps the most critical agent, in the process of globalization itself (133).
Gönenç (1994) explains the contemporary state as an active facilitator of global competition on the basis of the model proposed by Douglas North, a co-winner of the Nobel Prize in Economics in 1993. According to Gönenç, North identifies political, legal and institutional environments as very important parameters underlying firms’ competitive investment. Hence, North’s idea indicates that policies must move away from trying to remedy market failures by altering the signals from domestic markets (product prices via tariffs, and capital costs via subsidies) to initiatives aimed at strengthening the capacity of national enterprises and agents to react to these signals. Gönenç concludes that globalization itself has gradually weakened the effectiveness of old-style industrial policy such as import tariffs, sectoral subsidies, and regional subsidies.

However, the role of the state as a global competitor is indeed more than the shift from a heavy-handed protectionist to a referee to ensure successful global competition. Growing needs for entrepreneurial state roles are reflected by writings that defend more proactive and effective industrial policy to improve U.S. global competitiveness and proclaim a gradual retreat of laissez-faire in the U.S. economy. Most of them call for the further extension of public-private partnerships within U.S. industries, bringing out successful cases in defense policy and others. (Kash, 1989; Porter, 1990; Kuttner, 1991; Phillips, 1992; Tolchin, 1996). To great extent, these proposals have been realized through proactive industrial policy under the name of “economic security” in the Clinton Administration.

However, it has been pointed out that the notion of “competition state” is a “sophisticated instrument” to protect its national interests in the global economic system. Higgott (1996), a British scholar, criticizes the international trade regime for the re-emergence of U.S. economic nationalism. He argues that the ideology of international relations has shifted from “embedded liberalism” to “subversive and/or predatory liberalism.” It is predatory because the major players, especially the U.S., privilege outcome over process and interfere in markets to ensure desirable outcomes when they can.
It is subversive in the sense that this behavior is hidden behind rhetoric, while the practice becomes more strategic and discriminatory.

In line with Higgott’s critique, Louise White (1991) proposes a process-oriented state behavior, as opposed to outcome-oriented one. She makes a comprehensive list of the four types of state role in the global system. First, the nation-state may play as a hindrance to a global economy and interdependence, erecting protectionist barriers. Second, the state may become an actor irrelevant to global economy, as global economic integration and interdependence enable global economic interests to pervade any other forces. Third, the state may take autonomous initiatives to stimulate its economy by promoting a neoliberal global economy.

A fourth view, which is emphasized by White, is that the nation-state is a custodian of multiple policy values, not a monolithic player with a clear economic national self-interest to protect or promote. That is, the goals of state intervention in the global system evolve and change as interested parties interact with each other and institutions promote learning in open and indeterminate political and communication processes. It is noteworthy that her “institutionalist” perspective illuminates the role of the nation-state as an autonomous and process-oriented entity aimed at ambiguous and changing goals.

Such institutionalist perspectives treat the behavior of states as a product of human intervention, or intersubjectivity, as opposed to the rationalist view of global competitiveness (Wendt, 1994; Axford, 1995: 126-127). Some writers in this view call for global policy studies, which refers to “the study of international interactions designed to deal with shared public policy problems” including three categories: trans-boundary problems, common property problems, and simultaneous problems (Nagel, 1991: xiii). Global-policy values include “social and humanitarian matters of concern to all nations and people” as well as “materialistic goals of global businesses” (Goodsell, 1990: 503).

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4 In this sense, global policy differs from international relations, which focuses on “relations among countries that relate to diplomacy, alliances, and the resolution of disputes that might otherwise result in war” (Nagel, 1991: xiii).
Others advocate the process perspective in order to limit the ongoing influence of states in the global public policy process. In his book *Global Public Policy* (1998), Reinecke proposes “governance without government,” which indeed reflects the ideological “Right” even in the spectrum of neo-liberalism. He argues that policymakers may rely on two traditional ways to cope with the challenge to internal sovereignty: “defensive intervention” from the protectionist perspective and “offensive intervention” from the “global competitor” perspective. However, he points out that both of those strategies are costly and politically unsustainable as countries retaliate.

By “global public policy,” Reinecke means a third alternative of state intervention: it redraws political and economic geographic lines through global “networks of governance” that include not only governments and international institutions but also businesses and not-for-profits—a global system of public-private partnerships. He argues that policy makers also delegate the implementation of global public policy to international institutions and non-state actors: their compliance would be realized through “subsidiarity,” a legally nonbonding international instrument. The author points out that forming a global government rather than a global system of public-private partnerships is unrealistic both from the perspective of administrative efficiency and effectiveness and the perspective of political legitimacy and accountability, since it requires states to abandon both their internal and external sovereignty.

However, his proposal for “global public policy” must be tested further for several reasons. The proposal is vulnerable to anti-liberal critiques by placing public and private interests under one institution, thereby undermining the public interest. In this respect, its damage to accountability may not be less than global government,’ despite Reinecke’s argument. Furthermore, efficiency and effectiveness may not easily come out in the “global public policy” process, as it becomes extremely complex by the involvement of the

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5 A notable credit of his book is its clear differentiation of two interchangeably used terms, interdependence and globalization. Interdependence refers to inter-state negotiations for lowering trade barriers, relevant to external sovereignty. Globalization is the deterritorializaton of public-private relationships, as a challenge to internal sovereignty.
three types of actors with fundamentally different values: public agencies representing national interests, nonprofits emphasizing the global-wide public interest, and businesses seeking for profits. In the worst case, the policy process may provide some states with better opportunities to reassert their considerable power over global economic activities, as their businesses become dominant (Salley, 1996).

In sum, much literature reminds us that the nation-state is in the face of the growing challenges to its internal sovereignty from both global economic interests and various international institutions. However, in the literature, the future of the nation-state is not so negative as the image portrayed by Albrow for his “global age.” Still, many studies identify the continuing capacity and autonomy of nation-states to preserve their internal and external sovereignty in ways amenable to the sea change of globalization and interdependency.

The literature reviewed above identifies dominant two driving forces that motivate states’ global engagement and that explain their behavior in the global system: the economic-outcome perspective and the process perspective. From the economic-outcome perspective, states perform as rational actors that deliberately seek national economic interests. These articles are governed simultaneously by two economic ideologies: global neo-liberalism and economic nationalism. States compete with each other for global businesses and capital by lowering trade barriers and by developing an attractive business environment. At the same time, states conduct “bloody competition” and are blamed for what some call “new protectionism.” They exert their economic or political power over the global economy so that global policies can best reflect the economic benefits of their domestic and global businesses; and they adopt proactive industrial policy for those businesses at the national level. Consequently, globalization is a self-limited process accompanied by economic nationalism. States that are successful in dealing with globalization possesses the capacity to harmonize international pressures (from global liberalism) and domestic demands (for economic nationalism).
By contrast, the process-oriented perspective visualizes the state as the custodian of multiple policy values, able to adapt to contextual change and goal change by interactive learning. The global policy process is not a battlefield for a few powerful economic interests who deliberately seek global market share, but rather an open forum of promoting the public interest and humanism beyond territorial boundaries. Hence, the perspective denounces the overwhelming materialism implicit in contemporary global policy. Most observers, however, views the actual global system as more dominated by hard economics than soft humanism.

Two tentative propositions for ITS studies emerge from this literature review on state roles with regard to globalization and global interdependence. First, state involvement in global ITS promotion will be caused by two forces: external pressures from global liberalism and internal demands for global competitiveness. Second, influenced by the two forces, the state will more likely have economic-outcome-oriented behavior than process-oriented behavior. This will in turn shape the mindset of institutional arrangements for ITS policy as well as ITS policy tools.
CHAPTER III. RESEARCH DESIGN AND METHOD

Organization theorists, in their social network analyses, draw snapshot pictures without attention to contexts and histories. While the European studies of policy networks discount the micro-level or implementation processes, American studies overlook higher levels of networks. This dissertation will examine the ITS policy network from a more comprehensive and systematic perspective.

Aims of the Study

The study aims at contributing to the literature in four ways. First, this study will draw attention to transnational networks and their organic or systematic relationships with lower levels of networks. This study is an early attempt to apply globalization and state theory to network studies. It will foster a better understanding of ideological driving forces, global liberalism and global competitiveness, that bring forth the varying characteristics of contemporary policy networks at a national level. In the case of ITS promotion, the picture of the global level may be best described as a battlefield where global economic forces attempt to expand their ITS market share all over the world. Simultaneously, ITS may be another battlefield, where the U.S., European, and Japanese governments struggle to improve global competitiveness with a new type of industrial policy focusing on public/private partnerships.

Second, this study will examine the individual properties and synergy of three core elements of the ITS policy network: public-private partnerships, professional networks, and intergovernmental networks. It is almost impossible to explain the ITS policy network without the full array of all the elements because most actors in the network view them and their synergy as essential forces in promoting, designing, and carrying out ITS programs. To push forward ITS programs, countries or regions commonly adopt public/private partnerships, since the resources and expertise required are often beyond the capacity of the public sector. The success of the programs also relies on intergovernmental/interagency
coordination, which will make ITS technologies interoperable across multiple jurisdictions and meet the different needs of previously independent agencies. Furthermore, the policy network needs the cooperative relationship among basically three professional communities, civil engineering, the information/communication world, and the automotive industry.

Third, this study will take a close look at the pattern of stability change and power relations of the policy network from within the net. La Porte (1996) labels this perspective the view of a “net rider,” which refers to “an organization centric view, as seen by a major network actor looking out/up/across/down at other actors with whom it/he/she must deal” (53). This is a great contrast to the view of a “net thrower,” who is “positioned above the net looking down upon it as in an Olympian or plan view” (54). Representing the research tradition of resource dependency/contingency perspectives, the view of a “net rider” has pervaded the network literature in organization studies (55). However, it is not a mainstream view in the policy network literature. Rather, the literature has more widely accepted the view of a net thrower, thereby underestimating network dynamics and uncertainty. To fill this gap, this dissertation will discuss the dynamic process of networking from a network rider view.

Finally, this study will discuss what difference networks make, compared to hierarchies and markets. Despite their broad concept, networks have distinctive features that cannot be covered by conventional organizational forms or governance models. In general, organization theorists have made an extensive contribution to theory building by examining the effects of network structure on the variables of managerial or sociological concerns. However, there is little doubt that inter-firm network theory has limited applicability to the studies of policy networks. In particular, this is true with performance-related discussions because policy networks are intended to meet much more complex policy values than inter-firm networks. In addition to economic performance, normative values such as accountability and responsiveness should emerge as an important agenda of network effects to be discussed by policy network studies (Marsh and Rhodes, 1992: 265;
O’Toole, 1997a; O’Toole, 1997b). This study will evaluate the performance and normative implications of networks as a new governmental form.

In sum, this dissertation will identify the vertically and horizontally connected subsystems of the ITS policy network and their interrelationships from two perspectives. The view of a “net thrower,” or a plan view, will focus on the national configuration of network components that is designed to cope with emerging challenges from global networks. In this view, the dissertation will attempt to achieve the first and the second aims described above. On the other hand, the view of a “net rider” will shed light on a more dynamic dimension with which focal agencies deal in the actual implementation process. Finally, this study will make evaluative comments on the utility of the ITS policy network both from the plan view of a “net thrower” and from the implementation view of a “net rider.” Even if an open question is whether the conclusions of this study are generalizable to other policy areas, it will have valuable theoretical implications for the historical or structural studies of fully arrayed policy networks.

Foci of the Study

In qualitative research or case study, guiding propositions (Yin, 1994: 20-21) and conceptual frameworks (Miles and Huberman, 1994: 18) are useful tools to specify who and what will and will not be studied. Hence, we begin discussion of research design by making our propositions and framework explicit. Based on the above directions of contribution, this section describes which variables and relations are most meaningful and important and what data should be collected. It does so in terms of three research foci—the net thrower, the net rider, and system evaluation.

From the plan view of a net thrower, the first research question of this dissertation focuses on the historical issue of why and how the ITS policy network developed. The structural features of the ITS policy network vary by needs for solving implementation problems related to resources, experts, and coordination. Furthermore, the features rely on
national needs to cope with macro-level challenges from global liberalism and competitiveness. This need creates network forms appropriate for industrial policy.

The view of a “net thrower” can be analyzed through the conceptual frameworks shown in Figure III-1. The nature of network memberships is a dimension that classifies ITS policy networks into three kinds of networks: public/private partnerships, professional networks, and intergovernmental networks. The implementation problems expected serve as a driving force that directly provokes varying structural arrangements of the elements. For instance, ISTEA of 1991 encouraged public/private partnerships so that the private sector could supplement the lack of resources and expertise to be experienced by the public sector at implementation phases. The U.S Congress also requested U.S. DOT to develop the standards of ITS products and a national ITS architecture, intending to promote intergovernmental/interagency coordination in the implementation processes of state or local ITS projects. Furthermore, Congress mandated ITS America, a professional network of a public/private partnership form, in order to promote national ITS plans that meet the needs of previously independent professional communities such civil engineering, the

![Figure III-1. A Net Thrower Plan View of the ITS Policy Network](image-url)
information/communication world, and the automotive industry.

However, the relationship between implementation problems and network arrangements may be indirect in a way that the nation-state initiates the arrangements to improve global competitiveness, which otherwise may be decreased by social and economic costs associated with implementation problems. For instance, U.S. DOT and other ITS planners regard legitimacy of ITS as not only facilitating logistics but also reducing the social costs of traffic congestion, traffic accidents, and air pollution, thereby improving global competitiveness. Hence, when the U.S. Congress created the ITS policy network, its micro-scale intent to prevent predicted implementation problems was intermingled with its macro-scale intent to improve global competitiveness.

Furthermore, macro-level forces, global liberalism and competitiveness, directly affect the arrangements of the network components. The U.S. Congress totally quit support for advanced highway technology programs in the 1970s and early 1980s, while Japan and European countries continued. As an international context shifts away from the Cold War to economic competition, the U.S. government began to push ahead with ITS industrial policy and national plans that have heavy foci on public/private partnerships, intergovernmental coordination, and inter-industrial cooperation.

To explore this area, this dissertation will do an in-depth analysis of the qualitative and quantitative data regarding several concerns. The first set of data describes economic and political contexts that brought together multiple policy areas and formerly independent professional groups, thereby creating their new coalition for the ITS area. The second body of data is the legislative histories of ISTEA of 1991 and TEA-21 of 1999, focusing on who was involved and why, and on how the acts reflected stakeholders’ needs. The third group of data informs our understanding of the U.S. industrial policy that is designed to expand an ITS-related market share over the world and that includes national efforts to influence the outcomes of global standardization activities of ITS products.
Second, from a perspective of a “net rider,” this study examines the issue of how policy actors are interconnected in the ITS policy network. In the study, two main variables classify each interorganizational relationship: degrees of cooperativeness and interdependency. The former depends on goal conflict, on the one hand, and the latter relies on power asymmetry, on the other. When looked at by a “net rider” from within a net, policy networks are the structural collective outcomes of purposive actions, which multiple policy actors take to attain different goals or to affect policy processes and outcomes. Hence, the shape of a network depends on the interorganizational compatibility of goals and the distribution of power.

Focal agencies, U.S. DOT and state DOTs, have their own external relationships. From the view of boundary spanners in the focal agencies, this study will fill the blanks of the analytical framework presented in Figure III-2. Cooperation is an ideal action in network structure, but its degree may actually vary by dyadic relationship (Marin, 1990). Whereas some ties are cooperative, some others conflictual. Network links are sometimes inconsistent, shifting to either cooperative or conflictual over time. Furthermore, interdependence is a core concept of networks, but dyadic relationships may reveal varying degrees of interdependency due to the asymmetry of power. Hence, some network ties are less interdependent and more or less “dependent” or “independent” (Thompson, 1967: 54-55). When two parties confront each other, they may create “indifferent” ties to a third party that has no stake in the result of a dispute and thus is appropriate to reconsider decisions made. To analyze degrees of cooperativeness, this study will examine interorganizational differences in goals, values, professionalism, and structural openness.

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<th>Cooperativeness</th>
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<td>Inconsistent</td>
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Figure III-2. External Relationships of Net Riders
To measure degrees of interdependency, the study will analyze who has resources, information, authority, or political supports how much, and it will explore uncertainty of their distribution. The various possibilities for those multiple ties will be explored using the matrix shown in Figure III-2 as a framework.

Third, this dissertation evaluates performance of the ITS policy network. Because the ITS policy network has the unique structural features, it will have other effects than will conventional governmental structure. Accepting this assumption, the study will evaluate economic outcomes, such as effectiveness and efficiency, and normative outcomes, such as accountability and responsiveness. The benefits of early networks may not be large because they raise high coordination costs, but matured networks may significantly improve efficiency, since they are expected to reduce transaction costs that otherwise will be high (Williamson, 1985). Within networks, public administrators have more opportunities to communicate with more different actors, but accountability may be challenged by role ambiguity within networks (O’Toole, 1997b; Milward 1996).

Neither single-goal attainment nor single-problem solving is appropriate to evaluate networks because “goals are not given, but sought” in networks (Kickert et al., 1997: 172). A particular goal cannot be dominant and used as a single yardstick for network evaluation. In this sense, a more desirable criterion is the extent to which network actors perceive the ITS policy network satisfactory in their “ex post satisficing judgments.” For instance, this study will examine how actors perceive benefits of the network weighed against coordination costs, its contribution to the public interest, and obstacles to success and better strategies.

Also, network success will be evaluated with the growth trends of the ITS budget and market size. As Kenis and Schneider state, “policy networks are mechanisms of political resource mobilization” (1991, 41). Because resources for ITS programs come from both the budget and the market, this study will focus on how network building and management is related to the federal and state ITS budget and the ITS market size in the U.S.
In addition to propositions and conceptual frameworks, unit of analysis is another dimension specifying the scope of case study (Yin, 1994: 21-25). A merit of this dissertation is multiple levels of analysis spanning global, national, and regional levels—the second level focuses on the United States, and the third level on the Washington, D.C. metropolitan area. In this respect, the dissertation includes both a descriptive analysis of global networks for ITS promotion and an “embedded, single-case study” (Yin, 1994, 41-44) that examines the U.S. case of the ITS policy network and its embedded sub-cases.

The three objects of study are shown in Figure III-3. Global ITS promotion activities refer to the endeavors of international institutions and meetings to promote ITS market and projects, standardize ITS products, and conduct research on ITS programs. The U.S. ITS program refers to all federal-level projects and efforts for ITS promotion made by the U.S. Department of Transportation (DOT) and ITS America. U.S. DOT is committed to funding, standardization, national architecture design, and education and training, supported by ITS America’s advice. The regional case to be examined is Partners in Motion (PiM), a public/private partnership comprised of 37 agencies and businesses whose purpose is to create a state-of-art traveler information network to the Washington metropolitan area.

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<th>Global ITS Promotion</th>
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<td>Overseas ITS Programs</td>
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<tr>
<td>U.S. ITS Program</td>
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<tr>
<td>Non-Partners In Motion</td>
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<td>Partners In Motion (D.C. metropolitan area)</td>
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Figure III-3. Units of Analysis of the ITS Policy Networks

The rationale for selecting those cases is based on their importance. The U.S. case is selected because of the reputation that America has developed more successful organizational arrangements than have other advanced countries (Shibata and French, 1997). Partners In Motion is the regional project selected because its lesson is both
informative and applicable to other projects. Through December 1998, a total of 324 ITS projects, except for R&D activities, were in progress or completed, funded partially or totally finance from Federal ITS funds (U.S DOT ITS JPO, 2000). Among them, Partners In Motion includes the greatest number of organizations, 39 public agencies and businesses, as partnering members. Hence, it will be one of the most information-rich cases that manifest a public/private partnership and a public/public partnership, alike. At the same time, it is not an extreme and deviant case whose lessons cannot be applicable or generalizable to other ITS projects (Kuzel, 1992; Patton, 1990, cited in Miles and Huberman, 1994: 28). Many other projects have been, or will be, carried out in similar partnership structures, although at a smaller scale.

Data Collection and Analysis

In general, the use of methodological strategies depends on the types of research questions. According to Yin (1994: 4-9), a case study is useful to those who are interested in “how” and “why” questions about the processes or strategies that result in contemporary events, with the investigators having little or no control over the events. In this sense, the case study is a suitable approach to this dissertation because its questions include the structural and chronological features of the ITS policy network, and its roles in the policy process. Through case study, this dissertation will also help a better understanding of the real-life contexts of the new policy area and contribute to theory building rather than theory testing (Bailey, 1992).

This dissertation does not include social network analysis, which is a quantitative methodology popular in sociology and organization studies. The analysis utilizes a mapping technique that describes network structure and its features, such as centrality and density. However, as Milward and Wamsley point out (1984), it overlooks the larger

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6 I-95 Northeast Corridor is the ITS regional project that includes the second largest number of organizations. It includes 28 transportation agencies as coalition members, and it aims to test, showcase, and deploy a variety of ITS services on I-95. However, no public/private partnership is a component of the project.
context in which the network operates. Because networks change over time, the problem cannot be other than historical case studies. Dowding (1995: 158) also argues that social network analysis is a map of the policy process rather than a process of why the maps are different from one another.\footnote{Milward and Provan (1995), in their article “A Preliminary History of Interorganizational Network Effectiveness,” combine quantitative and qualitative approaches to overcome the deficiency of social network analysis.} In order to incorporate the contextual and perceptual factors required to explain network development and change, this dissertation will use a framework of a qualitative network analysis as shown in Figure III-2.

A frequent complaint about the case study is that the investigator’s subjective judgment enters into the conduct of the approach. To reduce the author’s bias, this dissertation employed multiple sources of evidence: elite interviews, government documents, and archival records. The documents and records included the following:

- Publications from U.S. DOT and its sponsored organizations on institutional, legal, and other non-technical issues of ITS\footnote{Most of the publications are stored in U.S. Department of Transportation’s ITS Electronic Document Library On-Line Catalog (http://www.its.dot.gov/itsweb/welcome.htm).}
- Publications from ITS America (e.g., ITS Quarterly and ITS America News) and its committee minutes
- Federal Registers and Congressional hearings on ITS
- Newsletters of the ITS Cooperative Deployment Network (ICDN)\footnote{ICDN is a shared Internet resource containing up-to-date news, insight, and resources for transportation professionals and agencies, facilitated by the National Associations Working Group for ITS (http://www.nawgits.com/icdn).}
- Proceedings of ITS World Congresses and ITS America annual meetings
- Overseas publications on ITS programs—Japan, Europe, Korea, Canada, Australia, and so on
- Publications from VDOT and the Virginia Transportation Research Council
- VDOT’s internal documents and contractual agreements for PiM.

The author visited the 6\textsuperscript{th} World Congress on Intelligent Transportation Systems held by Toronto, Canada in November 1999. At the conference, the author had spontaneous interviews with four people from all the countries of the world and attended
two executive and five panel sessions from November 8 to 11. The author distributed a letter of a research introduction to session speakers and emailed them to ask interview questions after the Congress. The author received useful replies from five speakers, who were deeply involved in international ITS promotion. Many research inquiries came out of the initial interviews and extensive reviews of publications.

At the World Congress, a speaker was Christine Johnson, Director of ITS Joint Program Office (JPO), U.S. DOT, which is responsible for all coordination and policy-making affairs related to the national ITS program. On September 17, 2000, the author requested in writing her permission to interview her subordinates and create a network for further interviews. The letter explained the research’s purposes and asked who would be the best people for about 25 interview questions on various topics (also an Informed Consent form was enclosed). She then recommended five federal employees and professionals, and notified me that the interview questions had been sent to those experts and that she had requested their cooperation. The author then attempted to have contacts with those five people. Among them, just one person could not be reached, but four others readily consented to interviews. Furthermore, two more federal employees were later added to the list of respondents. Through this networking strategy, a total of seven federal employees and ITS professionals consented to interviews.

For Partners In Motion, the author used the same networking strategy. James Robinson, Director of ITS Programs, VDOT, was first contacted with research questions on September 6, 2000, and he introduced me to Todd Kell, the VDOT manager of the project. Mr. Kell then introduced me to two other appropriate informants outside VDOT. Hence, interviews on Partners In Motion were conducted with one federal and three state employees. Finally, there were further interview sessions on general program conditions with two ITS professionals, Richard Worrall and Ray Pethtel.

Altogether, interview subjects totaled twenty-two public officials and ITS professionals, with sixteen face-to-face interviews, five email interviews, and one telephone interview. Across all levels and cases, respondents include eight professionals at
the global level, seven U.S federal employees, three state employees, and two U.S. professionals. Although all global-level interviews and two interviews with federal employees were relatively short, all others took at least one hour with their average being about one and quarter hours. Figure III-4 describes detailed information on conducted interviews.

<table>
<thead>
<tr>
<th>Places</th>
<th>Dates</th>
<th>Interviewees</th>
<th>Topics/Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toronto, Canada</td>
<td>11/8/99-11/11/99</td>
<td>Four spontaneous respondents</td>
<td>International promotion and cooperation for ITS</td>
</tr>
<tr>
<td>Emails</td>
<td>11/18/99-11/26/99</td>
<td>Hasson, Rumbaugh</td>
<td>International promotion and cooperation for ITS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Satoyama, Coste, and Broady</td>
<td></td>
</tr>
<tr>
<td>Blacksburg, VA</td>
<td>9/31/00</td>
<td>Worrall</td>
<td>Institutional and legal issues/ITS program history</td>
</tr>
<tr>
<td></td>
<td>10/11/00</td>
<td>Pethtel</td>
<td>ITS R&amp;D</td>
</tr>
<tr>
<td>College Park, MD</td>
<td>10/05/00-10/06/00</td>
<td>Tarnoff</td>
<td>Institutional and legal issues/ITS program history</td>
</tr>
<tr>
<td>and Hanover, MD</td>
<td></td>
<td>McLaughlin</td>
<td>Partners In Motion</td>
</tr>
<tr>
<td>Richmond, VA</td>
<td>10/13/00</td>
<td>Jennings, Kell, and Robinson</td>
<td>Partners In Motion</td>
</tr>
<tr>
<td>Telephone</td>
<td>10/24/00</td>
<td>DeBlasio</td>
<td>Institutional and legal issues across the U.S.</td>
</tr>
<tr>
<td>Washington</td>
<td>10/25/00-10/26/00</td>
<td>Paniati, Row, Kerli and Obenberger</td>
<td>National ITS program</td>
</tr>
<tr>
<td>D.C.</td>
<td></td>
<td>Schagrin</td>
<td>Global and national standardization</td>
</tr>
</tbody>
</table>

Figure III-4. Information on Conducted Interviews

The encounters can be characterized as unstandardized elite interviews, appropriate for exploratory research that does not test hypotheses, and less concerned about quantifiable and comparable data than with widely varying and unexpected forms of information. Hence, the author asked different respondents different unstandardized questions rather than attempting to gain the same or comparable information from all subjects, and asked open-ended questions instead of closed-ended questions. Essentially, I interviewed ITS experts on specific technical issues. Despite limitations to electronic
interactive communication, emails were excellent tools supplementing face-to-face interviews.

In order to improve the efficiency of interviews and help respondents avoid memory problems, the inverted funnel sequence of asking questions was employed. According to a funnel sequence, general questions are asked first, with more specific successive question following the previous question. By contrast, an inverted funnel sequence begins with the most specific questions and ends with the most general (Singleton and Straits, 1999: 302-303). Starting out with specific questions can help respondents think through certain aspects of a complex issue and recall forgotten information or events. By contrast, “having once committed themselves to some generalization, people are likely to answer specific and related questions in light of that generalization” (Jones, 1985: 157). This might result in unnecessary information that is not related to the propositions and conceptual frameworks of this dissertation.

In the questions of network histories, respondents needed to be encouraged to recall complex events that are distant in time. To this end, the questioning plan included reason analysis, which refers to “the development of an ‘accounting scheme’ outlining the general categories of reasons, or dimensions of the decision, which, in turn, provides a model or structure for formulating a comprehensive series of questions” (Singleton and Straits, 1999: 303). For instance, the question of how the U.S. Congress formally adopted public/private partnerships for the ITS program might be categorized into three behavioral dimensions: the perceived attributes of the partnerships (e.g., effects and costs), the motives or needs of Congress to be satisfied by the partnerships (e.g., successful cases in the semiconductor industry), and the factors affecting the adoption decision (e.g., emerging global challenges or implementation problems expected). Through accounting schemes, reason analysis was useful for the analysis of what Sabatier and Jenkins-Smith (1998: 135-140) label a “belief system.” In explaining the advocacy coalition model, they argue that policy change is the function of change in actors’ beliefs generated by exogenous shocks, but they also contend that a set of belief, named core beliefs, remains unchallenged.
For effective and efficient data analysis, coding was used in the content analysis of all publications and interview transcripts. Codes refer to “tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study” (Miles and Huberman, 1994: 56). A set of relevant codes was transformed into a variable, and a primary outcome of this study was the graphical displays of relationships among variables.
CHAPTER IV. INTELLIGENT TRANSPORTATION SYSTEMS

The ITS program is a new noteworthy area for public administration and policy studies, and it is a large-scale national program that requires comprehensive perspectives of practitioners at state and local levels. To provide background knowledge of the U.S. national ITS program, this chapter begins with the conceptual discussion of ITS technology that includes its components and interrelationships. They are the smallest units comprising structure of the program. Following is discussion of the goals, basic concepts and structure of the U.S. ITS program as adopted by U.S. DOT and Congress. This chapter ends with an examination of more specific strategies such as funding, federal roles and policy tools, and policymaking institutions.

Concept of Intelligent Transportation Systems

Intelligent Transportation Systems (ITS), formerly known Intelligent Vehicle-Highway Systems (IVHS), refer to “groups of technologies that use sensors, computers, and related information/communications systems to improve the management and control of roadways, vehicles, and driving capabilities” (Rothberg, Ducca and Trullinger, 1997: 1). Figure IV-1 presents the conceptual model of full-scale ITS deployment, with its elements compared with what is formed in the mobile society and information society. Human society and life have been greatly changed by the development of automobiles and roads, as well as the development of high-performance computers and information networks. Likewise, the development of intelligent vehicles and intelligent roads, or their synergy, generates a new society featuring a full-scale deployment of ITS services, which is characterized by the combination of mobile society and information society.

There are different ways that illustrate the widely ranged applications of information technologies to transportation systems. Among them, transportation system designers generally use conceptual frameworks known as “user services” in order to incorporate multiple technological elements and functions into several groups. Each user
service represents particular users’ needs and conditions under which these needs arise, and several interrelated user services are grouped into a “user service bundle” around common technical functionality or institutional perspectives of organizations. The combination of user services may vary depending on jurisdictional needs and market structure, but a general form of the taxonomy is standardized by the International

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10 As of the end of 1999, the U.S. has 31 user services and 7 bundles. The bundles include Travel and Transportation Management, Public Transportation Operations, Electronic Payment, Commercial Vehicle Operations, Emergency Management, and Advanced Vehicle Control and Safety Systems, and Information Management (Lockheed Martin Federal Systems & Odetics Intelligent Transportation Systems Division, 1999: 2-3). According ITS handbook of Japan, the country has 21 user services and 9 bundles (Japan HIDO, 1999: 55-61). They may vary with geographical areas and time, but ISO’s taxonomy is so general and comprehensive as to cover a wide variety of user services.
<table>
<thead>
<tr>
<th>User Service Bundles</th>
<th>User Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic management (ATMS)</td>
<td>1. Transportation planning support</td>
</tr>
<tr>
<td></td>
<td>2. Traffic control</td>
</tr>
<tr>
<td></td>
<td>3. Incident management</td>
</tr>
<tr>
<td></td>
<td>4. Demand management</td>
</tr>
<tr>
<td></td>
<td>5. Policing/enforcing traffic regulations</td>
</tr>
<tr>
<td></td>
<td>6. Infrastructure maintenance management</td>
</tr>
<tr>
<td>Traveler information (ATIS)</td>
<td>7. Pre-trip information</td>
</tr>
<tr>
<td></td>
<td>8. On-trip driver information</td>
</tr>
<tr>
<td></td>
<td>9. On-trip public transport information</td>
</tr>
<tr>
<td></td>
<td>10. Personal information services</td>
</tr>
<tr>
<td></td>
<td>11. Route guidance and navigation</td>
</tr>
<tr>
<td>Vehicle systems (AVCS)</td>
<td>12. Vision enhancement</td>
</tr>
<tr>
<td></td>
<td>13. Automated vehicle operation</td>
</tr>
<tr>
<td></td>
<td>14. Longitudinal collision avoidance</td>
</tr>
<tr>
<td></td>
<td>15. Lateral collision avoidance</td>
</tr>
<tr>
<td></td>
<td>16. Safety readiness</td>
</tr>
<tr>
<td></td>
<td>17. Pre-crash restraint deployment</td>
</tr>
<tr>
<td>Commercial vehicles (CVO)</td>
<td>18. Commercial vehicle pre-clearance</td>
</tr>
<tr>
<td></td>
<td>19. Commercial vehicle administrative processes</td>
</tr>
<tr>
<td></td>
<td>20. Automated roadside safety inspection</td>
</tr>
<tr>
<td></td>
<td>21. Commercial vehicle on-board safety monitoring</td>
</tr>
<tr>
<td></td>
<td>22. Commercial vehicle fleet management</td>
</tr>
<tr>
<td>Public transport (APTS)</td>
<td>23. Public transport management</td>
</tr>
<tr>
<td></td>
<td>24. Demand responsive transport management</td>
</tr>
<tr>
<td></td>
<td>25. Shared transport management</td>
</tr>
<tr>
<td>Emergency management (EMS)</td>
<td>26. Emergency notification and personal security</td>
</tr>
<tr>
<td></td>
<td>27. Emergency vehicle management</td>
</tr>
<tr>
<td></td>
<td>28. Hazardous materials and incident notification</td>
</tr>
<tr>
<td>Electronic payment (EP)</td>
<td>29. Electronic financial transactions</td>
</tr>
<tr>
<td>Safety</td>
<td>30. Public travel security</td>
</tr>
<tr>
<td></td>
<td>31. Safety enhancement for vulnerable road users</td>
</tr>
<tr>
<td></td>
<td>32. Intelligent junctions</td>
</tr>
</tbody>
</table>

Figure IV-2. ITS User Services as Standardized by ISO
Organization for Standardization (ISO). As shown in Figure IV-2, it comprises 32 user services and 8 bundles, and the following lines describe the features of the bundles.\textsuperscript{11}

The first bundle is advanced traffic management systems (ATMS), which are managed by traffic control centers. The centers monitor traffic conditions and automatically collect information about traffic flow or incidents, using cameras and electronic sensors or detectors. On the basis of the information, they attempt to change traffic patterns by controlling traffic signals or by providing drivers with the information through electronic signs or other simple means.

Second, advanced traveler information systems (ATIS) focus on sharing traffic and travel information with travelers and the public, transforming raw information collected by ATMS or other means into a timely and user-friendly fashion. The systems help travelers have access to real-time information on travel conditions and other transportation data through radio, cellular phones, Internet, and TV, as well as electronic signs. Vehicle navigation systems, part of ATIS, display the optimum route direction to driver’s destination on electronic maps installed in vehicles.

Third, advanced vehicle control systems (AVCS) include any vehicle or road-based systems designed by vehicle manufactures and suppliers to provide drivers with improved safety and control that use sensors and control systems. For instance, when a vehicle is following another vehicle ahead too closely, intelligent cruise controls warn the driver or automatically slows down the vehicle to maintain a safe headway. More advanced forms of AVCS include longitudinal and lateral collision avoidance systems. They eventually will be major components of automated highway systems (AHS), which will realize hands-off and feet-off driving.

\textsuperscript{11} For the description of user services, see PIARC Committee on Intelligent Transport. 1999: 9-38; Congress of the U.S. CBO, 1995: 19-38; Rothberg, Ducca, and Trullinger, 1997: 4-7.
Fourth, commercial vehicle operation (CVO) systems utilize technologies that minimize goods delivery and freight operation costs by improving the flow of commercial vehicles. They substitute electronic filing for paperwork related to weight control, licensing, and permits of commercial vehicles so that they can allow truckers with permits to bypass checkpoints at weigh stations without stopping. Furthermore, the systems monitor vehicles carrying hazardous materials and alert control centers and drivers of emergencies.

Fifth, advanced public transportation systems (APTS) enable public transportation services to operate in an efficient and user-friendly way. They disseminate timetable, fare, and ridesharing information to users through the Internet and other media. Automatic vehicle location systems (AVL), a part of APTS, allow operators to track vehicles via sensors or electronic detectors and passengers to know the exact arrival time of the next bus.

Sixth, Emergency Management Systems (EMS), in case of accidents, breakdowns, or other emergencies, automatically alert authorities of the need for police, fire, and rescue services and reduce their response time. They include not only automatic emergency notification to emergency personnel but also route guidance, signal priority, and/or preemption for emergency vehicles.

Seventh, Electronic Payment (EP) Systems allow travelers to pay for transportation services electronically and eliminate cash handling. Electronic toll collection (ETC) systems enable drivers to pay tolls automatically without stopping at toll stations. Electronic sensors, by reading vehicle identification tags, collect data that are used for automatic debiting against accounts at each pass of the toll plaza of vehicles. A smart card, known as an electronic “purse,” has huge memory and processing capabilities. It is purchased at newspaper kiosks or convenience stores and can be used in payments for park-and-ride facilities, parking, and tolls.
Finally, safety systems include technologies designed to improve the safety of pedestrians and drivers. For instance, pedestrians can extend the time allocated to cross the road by the use of a small portable communication device. For electronic enforcement of traffic regulations, automatic videos or cameras capture the vehicles that violate signal lights or speed limits.

To summarize this point, ITS technological elements comprise a user service, and several interrelated user services are grouped into a user service bundle. However, this is not enough to fully describe how ITS works because well designated intelligent transportation systems are much more complex in a practical world. ITS users will have increasingly more needs for interrelated bundles. For instance, on truckers’ request for route information, CVO administration should receive the information from Traveler Information centers in charge of ATIS. And the centers will have a bill paid from the truckers’ account in financial institutions charged with Electronic Payment Services. Furthermore, the needs for extensive services are often beyond a jurisdiction. To maximize technical interoperability among bundles and jurisdictions, transportation system designers develop a more comprehensive conceptual framework labeled “ITS architecture” in which user service bundles are arranged and interrelated.

ITS architecture generally includes logical architecture, physical architecture, and the interconnection between them. Logical architecture defines the functions of user service bundles and, more importantly, their interrelationships and processes via data exchanges. Physical architecture partitions the functions defined by logical architecture into four categories of systems including traveler, center, vehicle, and roadside, and other subsystems. In general, a national ITS architecture in a country includes logical architecture and physical architecture, and it is designed to maximize nationwide interoperability of regional architectures and user services.\footnote{For a more detail description of the architecture, see Lockheed Martin Federal Systems & Odetics Intelligent Transportation Systems Division, 1999: 3-5.} It is a national framework designed to give “process specifications that define the input, output, and functional...
requirements of several hundred individual processes for implementing ITS” (Shibata and French, 1997: 110).

All in all, ITS includes different layers of concepts depending on their degrees of functional integration. In an ascending order, they are technological elements, user services, user service bundles, logical architecture, and physical architecture. This ITS structure has general characteristics of modern high technology that Perrow points out in his book “Normal Accidents” (1984). It is inherently complex, since it includes a multitude and a variety of different elements. The elements are also interdependent in that changes in the state of an element affect the state of the others. By making it difficult to oversee and control the elements, complexity and interdependence increases the degree of uncertainty and unpredictability in ITS operation and outputs.

Some organization theorists regard departmentalization and delegation as two of many coordination mechanisms that will lessen technological complexity, interdependence, and uncertainty. Departmentalization, which groups homogeneous organizations, is expected to reduce coordination or transaction costs that otherwise may arise from interactions among organizational units in the use of technology. Due to the shortage of technology-related expertise or resources, organizations may delegate particular tasks to professionals, specialists, or other trustworthy entities (Scott, 1998: 232-233). Likewise, policy-makers may attempt to minimize the negative technological impacts on policy processes and outcomes by both integrating similar small-scale programs and delegating particular autonomy to different entities.

Those two different approaches to coordination are found in the U.S. government’s efforts to push forward the ITS program. The next two consecutive sections identify these approaches and discuss various aspects such as program plans, legislation, resource allocation, and organizations.
Structure of the U.S. ITS program

ITS itself is a set of technologies, but they remain just commercial products until deployed for the actual transportation use in different jurisdictions. Hence, the implementation process of national ITS programs begins with the R&D of ITS products and services, and ends with their nation-wide deployment and interoperable uses. In the process, small and increasingly homogeneous ITS programs tend to be integrated over time because integration is a requisite process to produce maximum synergy of an ITS national program. With a focus on the program integration, this section examines the structural changes of the U.S. ITS program that can be found in the implementation directions of U.S. DOT and the budget allocation of U.S. Congress.

Program Directions

In TEA-21 of 1998, the U.S. Congress clearly describes the goals of the U.S. national ITS program. It is intended to enhance surface transportation efficiency and to achieve national transportation safety goals. It also aims at protecting the environment, accommodating the needs of all users of surface transportation systems, and improving the nation’s ability to respond to emergencies, natural disasters and national defense mobility.\textsuperscript{13} The goals have not been changed, since the program was launched with the passage of ISTEA of 1991.

Despite this goal stability, the direction of program implementation has been continuously updated. Implementation of National ITS Program is a series of two consecutive reports that U.S. DOT submitted to Congress in 1996 and 1997. Figure IV-3 illustrates the changes described by the reports. Until 1996, the program had focused on the research activities of eight technical areas that correspond with major ITS user services. Around 1997, DOT reoriented the program direction toward technological consolidation to be applicable to the real transportation conditions.

\textsuperscript{13} Transportation Equity Act for the 21\textsuperscript{st} Century, Sec. 5203, 23 USC 502.
So far, three ITS infrastructure program areas have been launched: metropolitan, rural, and commercial-vehicle. The first two are developed on the technological bases of ATMS, ATIS, and APTS. The Rural Infrastructure includes an additional technical area, ARTS (Advanced Rural Transportation Systems), which applies technologies tailored to meet specific needs of rural communities such as Road Weather Information Systems or Automated Mayday Systems. In addition, the Commercial Vehicle Infrastructure draws on the research activities of the CVO program. In a long-term view, DOT intends to incorporate the three infrastructure program areas into a more comprehensive area labeled “intelligent infrastructure.”
The intelligent infrastructure includes “the application of a unified set of electronics, communications, hardware and software technologies that address transportation needs of the traveling public in metropolitan and rural areas.” The infrastructure is also designed to ensure the safety and efficient operation of commercial vehicles as well as streamline regulatory processes (U.S. DOT JPO for ITS, 1997a: xiv). Hence, the intelligent infrastructure, as an ultimate ITS program structure, will include three kinds of transportation infrastructure: metropolitan, rural, and commercial vehicle infrastructures.

Differentiated from the infrastructure programs, the Intelligent Vehicle Initiative is designed to support the development and supply of intelligent vehicles. Various kinds of vehicles apply not only driver assistance and control intervention systems to reduce motor vehicle crashes but also motorist information functions to support driving decisions (U.S. DOT JPO for ITS, 1997a: xiv). The program has been carried out based on the research outcomes of AVCS and AHS. Besides, the Enabling Research and Technology program area continues to provide crosscutting support to each of other program areas.

Over the last few years, U.S. DOT’s approach to the ITS program shows a clear tendency. As time passes, separated small research programs have been systematically incorporated into fewer, larger deployment programs. This systematic integration approach is quite reasonable in terms of the concept of ITS itself. ITS is not a simple collection of independent technologies, but a complex technological system that comprises various levels of interdependent technologies and their subsystems. Of course, each subsystem has its own functional capacity to meet specific transportation needs, say APTS for public transportation services and CVO for commercial vehicle operation. However, significant synergy is realized once the subsystems are integrated into a higher level of system. This is a major reason why U.S. DOT has ongoing needs to incorporate separated technical systems to build a full-scale deployment of ITS. Consequently, the final structure of the program will merge all ITS functions into two primary frameworks: intelligent infrastructure and intelligent vehicles.
Federal Funding under TEA-21 of 1998

DOT reoriented the ITS national program around 1997. A great emphasis was gradually shifted away from research activities on major technical areas to full deployment integrating the technical areas. With the passage of TEA-21 of 1998, Congress confirmed the change and provided DOT with an implementation framework of the new direction.

Hence, the ITS program has entered a new phase in its evolution with the passage of TEA-21. It includes the Intelligent Transportation Systems Act of 1998 as Subtitle C. Christine Johnson, Director of ITS Joint Program Office (ITS JPO), describes the new step as follows (U.S. DOT FHWA, 1999: 2):

With the passage of TEA-21, the ITS program has fundamentally shifted from a program of research and development to one primarily focused on infrastructure deployment. More importantly, the direction from Congress is clear: technology will underpin the surface transportation of tomorrow—and today. ITS has arrived!

As Johnson argues, the new act provides the resources and policy tools necessary for integrated ITS deployment that will further the actual uses of ITS as a integral part of surface transportation systems. Through TEA-21, Congress proclaims that investments in ITS can reduce surface transportation problems in a cost-effective way and that seems to promise continued financial support for the program.\textsuperscript{14} As shown in Figure IV-4, Congress has authorized $1,282.2 million in federal spending for ITS between 1998 and 2003 fiscal years.

The amount is allocated by two major areas: ITS infrastructure deployment and ITS research and development. The first is aimed at not only accelerating the integration and interoperability of ITS infrastructure in metropolitan and rural areas, but also implementing the Commercial Vehicle ITS infrastructure. The second, ITS R&D,

\textsuperscript{14} Transportation Equity Act for the 21\textsuperscript{st} Century, Sec. 5202, 23 USC 502.
<table>
<thead>
<tr>
<th>Year</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployment</td>
<td>101</td>
<td>105</td>
<td>113</td>
<td>118</td>
<td>120</td>
<td>122</td>
<td>679</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>95</td>
<td>95</td>
<td>98.2</td>
<td>100</td>
<td>105</td>
<td>110</td>
<td>603</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>200</td>
<td>211</td>
<td>218</td>
<td>225</td>
<td>232</td>
<td>1,282</td>
</tr>
</tbody>
</table>

- Metropolitan
- Rural
- Commercial Vehicle

- Intelligent Vehicle Initiative
- Enabling Research & Technology

Figure IV-4. ITS Program Funding in TEA-21 (in $millions)

Source: Modified from U.S. DOT FHWA, 1999: 5.

Note: These funds are subject to an annual obligation limitation; therefore actual funding availability may be less.

includes all other ITS program activities, such as the Intelligent Vehicle Initiative, architecture, standards, and technical assistance and training. The amount of $679 million is allocated for the infrastructure deployment of six years and $603 million for R&D. This equivalent allocation between the two areas indicates a legislative intention to promote a balance between the two areas.

However, it is important to know that the ITS program fund of $1,282 billion is not only for direct federal spending on ITS projects. States and local governments are also eligible to access over $70 billion in Federal-aid funding for ITS projects. This includes the funds from the National Highway System, State Transportation Planning, and Congestion Mitigation and Air Quality programs, as well as from other infrastructure programs. Through the use of the traditional funds, TEA-21 is expected gradually to incorporate ITS planning and funding into mainstream Federal-aid transportation planning processes, rather than drastically replace conventional transportation systems with ITS.
Federal Leadership in the ITS Program

Toward the program direction of integration, U.S. DOT is making good use of a variety of resources, coordination mechanisms, and policy tools. However, federal roles in the ITS program are limited to the specific areas that will support and coordinate the implementation activities of state and local governments and the business activities of private sector entities. By discussing the coordination roles of U.S. DOT, this section attempts to provide a structural profile of the ITS policy network.

Federal Funding Scale

Figure IV-5 shows the annual federal funds allocated for ITS and their percentages of total federal funds for ground transportation from FY 1992 through FY 1997. During this period of time, DOT invested total $1,247 million, which constitutes just 0.8% of total federal funds for ground transportation. DOT’s ITS budget represented below is 1% of the funds for every year except FY 1992, and it has no visible growth trend over time. However, it is important to know that the percentage is not the only indicator of the total funding scale of the ITS program in the U.S. In fact, the state and local shares are much more than federal shares.

<table>
<thead>
<tr>
<th>Year</th>
<th>ITS ($M)*</th>
<th>Ground** Transportation ($M)</th>
<th>Ground Transportation /Ground Transportation (%)</th>
<th>Federal-Aid for ITS*** Deployment ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 1992</td>
<td>246</td>
<td>23,290</td>
<td>1.06%</td>
<td>471</td>
</tr>
<tr>
<td>FY 1993</td>
<td>153</td>
<td>26,446</td>
<td>0.58%</td>
<td>749.4</td>
</tr>
<tr>
<td>FY 1994</td>
<td>214</td>
<td>28,081</td>
<td>0.76%</td>
<td>860.9</td>
</tr>
<tr>
<td>FY 1995</td>
<td>197</td>
<td>27,112</td>
<td>0.73%</td>
<td>997.6</td>
</tr>
<tr>
<td>FY 1996</td>
<td>204</td>
<td>23,346</td>
<td>0.87%</td>
<td>N/A</td>
</tr>
<tr>
<td>FY 1997</td>
<td>233</td>
<td>27,402</td>
<td>0.85%</td>
<td>N/A</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,247</td>
<td>155,677</td>
<td>0.80%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Figure IV-5. Federal Budget Size for the ITS Program

** Historical Tables, The Budget of the United States, Fiscal Year 2001: 81.
*** Shibata and French, 1997: 93.
“In addition to participating in model deployments and operational tests with U.S. DOT, state and local governments also pay the majority of the cost of deployment, operations, and maintenance of other ITS projects, not originated by the U.S. DOT” (Rothberg, Ducca and Trullinger, 1997: 16). A majority of state and local costs came from “federal-aid funds,” which refer to several categories of funding for state and metropolitan areas under the ISTEA of 1991. However, “DOT has no absolute control over the use of the money, since they are really state moneys once they leave the fund” (Rothberg, Ducca and Trullinger, 1997: 16). Figure IV-5 shows that the federal-aid funds were increasingly used to support ITS deployment, representing approximately a 112-percent increase from FY 1992 to FY1995. Nearly $ 1 billion of federal-aid funds were obligated in FY 1995 for ITS deployment, taking five times $197 million of the ITS funds.

ITS deployment will continue to request heavy financial burdens from state and local governments. Even with the passage of TEA-21, they are eligible to gain access to over $70 billion in Federal-aid funding for ITS projects. Furthermore, TEA-21 defines a limited federal share of the cost of a selected project. The federal share payable from the ITS fund made available only under TEA-21 should not exceed 50 percent, and the total federal share of the cost of the project payable from all eligible sources must not exceed 80 percent.\(^\text{15}\)

Furthermore, it is obvious that the financial share of the private sector will grow rapidly over the next few years. TEA-21 emphasizes cooperation among governmental, private, and educational entities and encourages public-private partnerships or private sector investment in operational tests and deployment projects.\(^\text{16}\) According to a market analysis, the private market represented a smaller share initially, but it will eventually grow to represent approximately 80 percent of all sales in the market through the year 2015. The public sector was leading investors in initial ITS systems, but its contribution is projected to decline over time. More specifically, while public infrastructure-driven

\(^{15}\) Transportation Equity Act for the 21\textsuperscript{st} Century, Sec. 5208 (f), 23 USC 502.

\(^{16}\) Transportation Equity Act for the 21\textsuperscript{st} Century, Sec. 5204 (c), 23 USC 502.
markets in U.S. metropolitan areas are estimated to exceed total $80 billion 1996 through 2015, private markets for ITS products and services are estimated to exceed $340 billion (ITS America, 1997: 2-3).

Organizational Structure for Promoting ITS

In the U.S., the ITS organizational structure is highly coordinative. In their cross-national comparative study, Shibata and French (1997) conclude that the U.S. organizational structure is stronger for coordination and collaboration than are its counterparts of Japan and Europe. Furthermore, Klein (1996: iii) argues that “despite the decentralized nature of U.S. political institutions, the centralized governance structure of the transport sector allowed the ITS developers in the U.S. to initially design the most centralized system architecture of any program.”

Figure IV-6 briefly illustrates U.S. organizational structure for promoting ITS. U.S. DOT receives funds from Congress and then provides funds, training and information to businesses, universities, and state and local governments. In addition to these entities, foreign governments, interest groups, and any others with a stake in ITS can participate in ITS America (Intelligent Transportation Society of America), a Federal Advisory Committee to U.S. DOT.

Within U.S. DOT, the ITS Joint Program Office (ITS JPO) takes a leading role in coordination of the national ITS program. It provides strategic leadership for ITS research, development, testing, and deployment, as well as ensuring resource accountability. It receives policy guidance from the ITS Management Council chaired by Deputy Secretary of Transportation and planning guidance from the ITS Strategic Planning Group consisting of Federal Highway Administration, National Highway Traffic Safety Administration, Federal Transit Administration, Federal Railroad Administration, and Maritime Administration.
The U.S. has two organizational advantages that Japan does not, as can be seen in Figure IV-7. First, while ITS Joint Program Office (ITS JPO) is a primary coordination agency in the U.S., Japan has no standing national agency that coordinates ITS-related agencies. Instead, five-ministry liaison conferences are held jointly by Ministry of Construction, National Police Agency, Ministry of International Trade and Industry, Ministry of Transport, and Ministry of Posts and Telecommunications. Second, ITS America is a congressionally mandated public/private partnership. VERTIS (Vehicle, Road, and Traffic Intelligence Society) acts as its Japanese counterpart. But it is an industry/academia partnership, not a public/private partnership. Hence, VERTIS collaborates with the five public agencies to promote ITS market expansion and deployment in Japan, but it is separated from them in structural arrangement.
The European structure is even more fragmented than is the Japanese one. As shown in Figure IV-8, European countries also have no public agency in charge of a pan-European ITS architecture and intermodal coordination (Shibata and French, 1997: 162). The European Community includes three R&D-specialized agencies, the Directorate General VII (DGVII), the Directorate General III (DGIII), and the Directorate General (DG), each of which covers different R&D areas and supports various organizations in Europe. The European Road Transport Telematics Implementation Coordination Organization (ERTICO) is the European counterpart of ITS America in the U.S. and VERTIS in Japan, and it is a transnational public/private partnership that develops overall ITS implementation strategies for European countries. Actual implementation is proceeded by actor interaction at national or local levels, but national sovereignty issues still hamper the deployment of widespread interoperable European ITS (Shibata and French, 1997: 96). Each of the most European countries has its own national programs.
and public/private partnership forum such as ITS Focus of UK, ITS Germany, ITS France, and ITS Netherlands.

A cross-national comparison of ITS organizational structures shows that three ITS leaders including the U.S., Japan, and Europe all use public/private collaboration to promote ITS. However, the U.S. system is most helpful for coordination and cooperation because it does not face problems of dispersed authority as in Japan and separate national sovereignties as in Europe. This organizational strength would seem to be a great advantage for the U.S. ITS community, although I have not actually compared coordination levels across the countries.

In addition to these countries, Canada, Korea, and Australia have a great emphasis on public/private collaborative structure, such as ITS Canada, ITS Korea, and ITS Australia, in pushing forward national ITS programs.
Federal Roles and Policy Tools

As stated above, U.S. DOT is primarily committed to promote state, local, and the private-sector participation in the National ITS program and to coordinate a full spectrum of ITS users and stakeholders. The Department’s responsibility can be categorized into three areas: (1) developing frameworks including architecture and standards; (2) providing implementers with funding incentives that will encourage their plan profiles to be consistent with the federal frameworks; and (3) helping ITS implementers improve their technical and institutional capacity.

TEA-21 directs the Secretary of Transportation to develop, implement, and maintain a national architecture and standards to promote the interoperability and widespread use of ITS technology. These regulatory tools are meant to prevent consumers and state and local government from buying products that do not necessarily work together and to increase producer competition that will lower consumer prices of ITS products. To support the efforts, TEA-21 provides the Secretary with authority to use standards development organizations in order to report and adopt critical standards in line with specified timelines. As well, the Secretary has authority to use provisional, or temporary, standards in case of the possible failure of the adoption. All ITS projects using the Highway Trust Fund are required to conform to the national architecture, standards, and protocols with exceptions of research projects and the upgrade or expansion of existing ITS.

The National ITS Architecture continues to be updated as it incorporates ITS standards and input from deployment programs throughout the country. After the first version of the Architecture in 1996, its third version is available in 1999. To encourage other entities’ conformity to the Architecture, U.S. DOT provides training courses and

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18 Transportation Equity Act for the 21st Century, Sec. 5206 (a)(1) and (2), 23 USC 502.
20 Transportation Equity Act for 21st Century, Sec. 5205 (c), 23 USC 502.
21 Transportation Equity Act for 21st Century, Sec. 5206 (e), 23 USC 502.
technical support to transportation professionals from both public and private sectors as well as outreach to deployment programs across the country. To incorporate ITS standards into the Architecture, the Architecture Team in U.S. DOT works with the Standard Development Organizations (SDOs).\(^\text{22}\) They include professional organizations that U.S. DOT arranges with to develop ITS standards. Also, U.S. DOT disseminates information on SDOs’ standards through training, outreach, the World Wide Web, and other various sources. As of July 1999, 17 standards are identified as critical and 31 standards are published or approved.\(^\text{23}\)

DOT provides funding incentives to foster technical integration and institutional coordination and capacity as well as R&D. TEA-21 clarifies funding criteria for ITS deployment projects under the subtitle of “ITS integration program” and “Commercial Vehicle ITS Infrastructure Deployment,” as well as R&D activities under “Research and Development.” The incentives are used for the projects that accelerate the integration and interoperability of ITS infrastructure in metropolitan and rural areas.

Specifically, funding priority for the ITS integration program emphasizes three main aspects: intergovernmental coordination, constituent involvement, and agency capacity.\(^\text{24}\) First, prospective projects should contribute to national deployment goals and objectives, and conform to the national architecture, standards and protocols. They also should be part of statewide or metropolitan transportation plans. Second, priority areas include projects that demonstrate strong commitment to cooperation among stakeholders and that maximize private sector involvement. Finally, grantees are required to ensure continued, long-term operations and maintenance, and to demonstrate technical capacity or commitment to the activities.

\(^{22}\) The American Society for Testing and Materials, the Institute for Electrical and Electronics Engineers, the Institute of Navigation, the Telecommunications Industry Association, and the Society of Automotive Engineers.


\(^{24}\) Transportation Equity Act for 21st Century, Sec. 5208 (b), 23 USC 502.
For commercial vehicles, TEA-21 gives funding priority to CVO systems that improve the safety and productivity of commercial vehicles and drivers, and that reduce costs associated with operating and regulating commercial vehicles. As well, priority areas include projects that encourage multi-state cooperation and corridor development and that enhance the safe passage of commercial vehicles across international borders.25

Consistent with the provisions of TEA-21, a total $211.2 million was allocated for ITS in FY 2000. Of this allocation, $113 million was assigned to the ITS deployment program and $98.2 million for ITS research and development. Of the total, $112.5 million (53%) was designated for 75 earmarked projects. In FY 1999, 67 geographical areas were identified to participate in the ITS integration program. In terms of the CVO area, 42 states in FY 2000 either completed or were in the process of completing ITS CVO Business Plans to reinvent their motor carrier safety and administrative processes. In particular, Maryland and Virginia completed CVISN Level 1 deployment capabilities in the areas of interstate credentials administration, safety information exchange, and electronic screening.26

In order to accelerate market availability of ITS technologies, TEA-21 directs DOT to provide the ITS funds that will promote high-risk research and lead the development, testing, and evaluation of ITS technologies. Its priority areas encompass R&D activities related to all technical areas or user services. In particular, it emphasizes the R&D area of intelligent vehicles that includes the components of AVCS and AHS such as crash-avoidance systems, magnetic guidance control system, and human factors.27

In 1998, total $12.7 million were awarded to four public/private partnerships that conduct IVI operational tests, and these funds, matched with $7.7 million in funding from

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25 Transportation Equity Act for 21st Century, Sec. 5206 (c), 23 USC 502.
the partners, support operational tests of advanced safety systems dealing with four
different technological areas. Furthermore, the Infrastructure Consortium, a group of
states and local government agencies, sponsors and directs research programs to address
the IVI problem areas that may require vehicle-infrastructure cooperation.28

DOT provides technical assistance, training, and information to assist state and
local governments, as provided by TEA-21.29 Since ITS operation requires skills and
knowledge in systems engineering, electronics and communications, it is necessary for
transportation-related public employees at state and local levels to acquire professional
knowledge of the technologies. To meet the new needs, DOT has established and carried
out a Professional Capacity Building Plan for ITS-relevant education and training. In
addition, various outreach and communication programs have been used to showcase the
benefits of ITS, to promote awareness of the capabilities of ITS technologies, and to
encourage local officials to embrace and build locally applied ITS infrastructure (U.S.
DOT, January 13, 2000).

Furthermore, the Secretary is required to issue guidelines and requirements for the
project evaluation of state and local governments with a special focus on evaluation
funding levels as well as objectivity and independence of the evaluations.30 Since 1999,
the guidelines have been available via online.31 The Secretary also should provide
procurement guidance to help state and local agencies in evaluating and selecting
appropriate methods of procurement for ITS projects.32 Whereas the 1991 ISTEA
includes no provision concerning procurement methods, TEA-21 requires the
procurement guidance to focus on “innovative and nontraditional methods.” U.S. DOT
delivers workshops and publishes a series of case studies to implement the mandate.

27 Transportation Equity Act for 21st Century, Sec. 5207 (b), 23 USC 502.
28 “Federal Report to the ITS America Board of Directors Meeting: January 13, 2000,”
29 Transportation Equity Act for 21st Century, Sec. 5204 (e), 23 USC 502.
31 For the detailed evaluation guidelines, see “Program Assessment/Evaluation,”
Finally, the Secretary is required to maintain an information clearinghouse to store data collected from federally sponsored projects and to make that information readily available to all users.\textsuperscript{33} U.S. DOT has developed three major information sources. The ITS Benefits Web Site\textsuperscript{34} is a web-based version of the ITS benefits database and cost information, and the ITS Electronic Document Library (EDL)\textsuperscript{35} is an online database that contains more than 900 ITS documents. The ITS Cooperative Deployment Network (ICDN)\textsuperscript{36} is an Internet resource housing up-to-date news, insight, and resources for transportation professional and agencies.

Functional Integration and Task Delegation

As identified in the previous sections, the U.S. national ITS program is grounded in two strategies: functional integration and task delegation. The federal government attempts not only to integrate previously independent administrative functions but also to delegate ITS-related tasks to the private sector, professional organizations, and state and local governments.

In the U.S., the National ITS Architecture is a major framework confining the functional integration of ITS technologies. However, with rapid technological advances, the Architecture has continuously been expanding to broader technological areas. As ITS addresses multiple domains of the human experience such as congestion, safety, environment, and productivity, it has been emerging as a centerpiece for the integration of previously independent administrative functions under an umbrella of new transportation systems. ITS is also expected to be a future mode of intermodal systems including railway transport, air traffic, and marine transport.

\textsuperscript{33} Transportation Equity Act for 21\textsuperscript{st} Century, Sec. 5204 (g), 23 USC 502.

\textsuperscript{34} “Program Assessment/Evaluation,” \url{http://www.its.dot.gov/eval/eval.htm}.

\textsuperscript{35} “Intelligent Transportation Systems Electronic Document Library,” \url{http://www.its.dot.gov/itsweb/welcome.htm}.

\textsuperscript{36} “Newsletter of the ITS Cooperative Deployment Network,” \url{http://www.nawgits.com/icdn}.
As integration goes on further, ITS will be not only a final product but also the material basis of technical revolution. ITS will be able to merge with the National Information Infrastructure in the near future. The convergence may be an ultimate task to be done by every country or region in the future. For instance, Japanese ITS promotion is carried out as a part of the Advanced Information and Telecommunication Society Program headed by the Prime Minister. In the U.S., an important emerging issue is to converge ITS and the national information infrastructure, but concrete and detailed plans for the convergence are not yet established (see Branscomb and Keller, 1996).

Another distinct strategy for the U.S. ITS program is the drastic delegation of ITS-related tasks to the private sector, professional organizations, and state and local governments. In fact, the considerable role of the non-federal governments is not surprising because there has been a traditional fundamental view that states should own, maintain, and operate roads and that the federal government should conduct financial assistance to assure a high quality system (Pisarski, 1987: 70).

However, the participation of the private sector is noteworthy in that Congress mandated it in the form of legislation. A 1994 report of U.S. DOT to Congress justifies the legislative decision (U.S. DOT, June 1994: 1-1-1-3). It points out that the private sector is superior to the public sector in technical and marketing expertise, revenue generation, ITS data collection, and market expansion. Under the mandate and assumption, public/private partnerships will continue to be a major organizational form in ITS decision-making and implementation.

This chapter attempted to provide readers with background knowledge of the U.S. ITS program. It has covered technological concepts, program structure, a funding scale, organizational arrangement, and federal roles. As we have seen, two major themes exist in the program: functional integration and task delegation. The next chapter examines in more detail how those approaches are related to the contextual changes of the U.S. ITS community, as well as the development and evolution of the ITS policy networks.
CHAPTER V. CONTEXT AND HISTORY

How the policy network looks depends on the vantage point of the viewer. La Porte (1996) identifies two different vantage points, that of the “net thrower” and that of the “net rider.” The view of a “net rider” refers to “an organization centric view, as seen by a major network actor looking out/up/across/down at other actors with whom it/he/she must deal” (53). In contrast, a “net thrower” is “positioned above the net looking down upon it as in an Olympian or plan view” (54). In the plan view of a “net thrower,” this chapter is devoted to the historical issue of why and how the ITS policy network developed.

Contexts of National Concerns

The early history of the U.S. ITS program traces back to a research and development initiative undertaken in the 1960s by the Bureau of Public Roads (BPR) of the Department of Commerce, the predecessor to the Federal Highway Administration. The best-known project was the Electronic Route Guidance System (ERGS), which provided drivers with routing guidance based on the best physical route and real time traffic conditions. It was actually tested in two Washington, D.C. area intersections.37

However, the lack of policy and financial support stopped the early research efforts from maturing into a full-blown national program during the 1970s. ERGS was terminated when a congressional appropriations committee did not approve its budget request in 1971. Most other projects did not proceed beyond the early concept evaluation phase. In particular, ITS research activities were minimally supported during the Reagan administration of the early 1980s, like any other advanced research activities in the administration. ITS did not emerge as a national concern until the mid 1980s (Saxton, 1993: 11-14; Tarnoff, interview, 37 Other projects developed and tested advanced electronics technology to enhance highway and motorist performance. The Urban Traffic Control System (UTCS), a traffic signal control network, was operated on approximately 300 intersections in Washington, D.C. The Passing Aid System (PAS), a signal system to indicate oncoming traffic, was tested along 15 miles of rural area in Maine. Furthermore, AHS projects were carried out on test tracks and unopened Interstate lanes (Saxton, 1993: 13).
October 6, 2000). This section discusses the national concerns for ITS that began to emerge in the mid 1980s. It covers the contexts that motivated the concerns

Economic Downfall and National Integration

Much decline and uncertainty prevailed in the U.S. economy throughout the late 1980s. In his book *The Age of Diminished Expectations*, Paul Kruman (1990) asked, “Will the American economy prosper despite the lack of strong policy direction, run into crises that force action, or simply drift along?” (5). Figure V-1 shows that, throughout the 1980s, the year-to-year changes of real GDP fluctuated more sharply in the U.S. than in OECD-Europe and Japan. In particular, after 1988, the U.S. GDP marked the sharpest decrease among the three. By contrast, the chart shows that Japan experienced relatively higher GDP growth rates and that Europe sustained relatively stable growth rates. However, economic statistics was not the only source explaining the hardship of the U.S. economy. According to the Gallup poll, economic problems were considered the Nation’s most urgent concerns facing the U.S., cited by 54 percent of total respondents. The level far exceeded the second-ranked “fear of war” cited by 22 percent and “drug abuse” by 8 percent.

During the 1980s, the U.S. was losing large shares of what were once its primary markets. Unlike merchandise trade deficits in the 1970s, those in 1980 were huge and relentlessly transformed the nation’s accounts. Figure V-2 illustrates the U.S. trade deficit with four major trading partners, including Japan, Western Europe, NICs (Newly Industrialized Countries), and Canada. From 1985 to 1990, the U.S. had a serious trade imbalance with its partners, especially with Japan and NICs.

Furthermore, many other statistics indicated the troublesome decline in global competitiveness of the U.S. Japanese GNP per capita reached 76 percent of the U.S. level by 1989. The share of world trade of NICs rose from 1.9 percent in 1963 to 7.7 percent in 1988 (Destler, 1995: 52). Cohen (1993) analyzed the U.S. productivity and investment over the time period of 1960-1990 as compared with those of other G-7 nations. He found that the U.S. had marked the world’s highest productivity, but its productivity growth lagged behind
Figure V-1. GDP Growth Trends

Note: GDP growth rates are year-to-year percentage changes.

Figure V-2. U.S. Trade Deficit with Major Trading Partners

Note: NICs = Newly Industrialized Countries (South Korea, Taiwan, Singapore, and Hong Kong)
all of the other G-7 nations. The author also observed that the U.S. continued to lag in investment indicators such as non-defense R&D expenditure and private industry expenditure as percentages of GDP (117-118). All of the trends indicated that the U.S. faced a troubling condition in national economic performance and thus global competitiveness.

Against a traditional American value, the 1980s was a turning point when deeper governmental intervention into particular industrial sectors began to have solid legitimacy for economic reasons. Following “unprecedented protectionism” that imposed tariffs as high as 300 percent on a range of Japanese imports, the Reagan administration established a government-industry consortium called Sematech to save the American semiconductor industry. Furthermore, the Bush administration established a larger scale of government-industry partnerships to revive the entire American consumer electronics industry and semiconductor industry. DARPA (Defense Advanced Research Project Agency), as “America’s answer to Japan’s MITI,” took a lead not only in the Sematech consortium but also in efforts to spur American progress in high-definition television (HDTV), superconductors, and other advanced electronic technologies (Graham, 1992: 228). As Graham precisely puts it, the 1980s ended as “former doubters of governmental intervention were beginning to swing around to a more pragmatic, activist policy stance, whatever their differences on how and where to act” (233).

The influence of industrial policy reached the ITS industry. The 1990 Department of Defense (DOD) Critical Technologies Plan selected 20 key technologies for the military reason. Likewise, the Department of Commerce (DOC), in its 1990 report entitled Emerging Technologies: A Survey of Technical and Economic Opportunities, identified emerging technologies that were expected to contribute to competitiveness over a ten year time period. In 1991, a Critical Technologies Panel established by the Office of Science and Technology Policy reviewed those efforts made by DOD and DOC. Subsequently, the Panel completed an integrated list of 22 national critical technologies important to economy and national security. Because the list included surface transportation technologies, the ITS industry became an official beneficiary of the U.S. industry policy (Golden 173-174).
Troubled Electronics and Automotive Industries

ITS could not have reemerged without dramatic advances in performance and costs of computer, sensor, and communication technologies. Equally, very powerful and highly sophisticated devices in electronics and semiconductors were available for processing, storage, and display functions, especially allowing for the small packaging and affordable cost which is an essential market requirement (Saxton, 1993: 11). Of course, the availability of advanced technologies itself might be a contextual factor that stimulated concerns for ITS. However, a more significant impetus was a widespread recognition that ITS technologies could be commercialized.

There was a general perception that Europe, Japan, and the United States were racing to prepare for the international markets envisioned for ITS products. The motor vehicle and electronics industries would be two major producers or distributors of ITS-related products, but global competitiveness of the U.S. in the areas was too poor to recover without special support. As shown in Figure V-3, the trade deficit in both electrical products and motor vehicles rose constantly over time, except for the unusual sharp decline of the motor vehicle deficit in 1987. It was thought that European and Japanese ITS R&D initiatives might further limit the U.S. motor vehicle and electronics industries. While the U.S government barely supported ITS R&D during the 1970s and 1980s, the European and the Japanese governments provided strong and continuous help to the two ITS-related industries during the same period of time. Hence, global competitiveness considerations were a motivating factor for developing the U.S. program.

French et al. (1994) clearly explain the growing national concern for the role of ITS technology in improving global competitiveness. The authors argue that the markets for ITS-based products and services would be significant and fast growing for national infrastructures and mobile products. They also contend that mobile ITS products, such as route guidance systems, data communications equipment, and intelligent cruise control, are
especially important to international competitiveness in the electronics and automobile markets.

Figure V-3. Trade Deficit in Electronic Products and Motor Vehicles

Source: Calculated from OECD, 1991: 158-159.
Note: Electrical products include electrical machinery, electrical industrial machinery, radio, TV & communication equipment, electrical appliances & housewares and electrical apparatus.

Although many quotations of French et al. provide rich evidence of the growing economic interests in ITS, two statements especially clarify a main value that mobilized the development of the ITS network during the pre-ITS program era. The proceedings of a workshop held in 1989 describe the genesis of Mobility 2000: “the work of Mobility 2000 is also stimulated by the awareness that both Europe and Japan have major projects”; and “unless the United States establishes an active IVHS program, it will be entirely dependent on foreign developments” (French et al., 1994: 9). The U.S. Office of Technology Assessment (OTA) also expresses similar reaction: “The size of this potential market and the
strong priority given [IVHS] abroad raise concern that the United States will lose out in developing and producing transportation electronics products unless steps are taken soon....” (OTA, 1989: ii).

However, the U.S. was not alone in putting a great emphasis on the economic values of ITS products. As the Comprehensive Plan for ITS in Japan put it, “in light of Japan’s current low economic growth rate and recent business trends, it is necessary to promote new industries that can stimulate demand, create markets for their products, and revitalize the economy”…“amid this situation, ITS is often considered as playing a core role in the multimedia industry with enormous market potential.”

Defense Conversion

One of the most encouraging events for ITS was the post-Cold War trend. Defense companies would convert technologies to civilian or dual-use endeavors, especially motivated by the decline in defense spending actually started in 1986. As shown in Figure V-4, the national defense share of total federal outlays began to decrease in the 1980s. The share gradually increased and reached the highest point at 28.1 percent in 1987, but it continued to sharply fell off to the level as low as 20.6 percent in 1991. Except for one percent increase between 1991 and 1992, the downward trend continued and never resumed the heyday of the 1980s. In contrast, the lost share of the defense field transferred to two other areas: the human resource area including social security, education, social services, and health, and the physical resource area such as energy, natural resources, environment, and transportation. In particular, a sharp contrast was decrease in national defense and increase in human resources though 1990.

According to Gansler (1995), between fiscal years 1985 and 1990, Department of Defense (DOD) contract obligations fell 55 percent in armor, 49 percent in aircraft engines, 49 percent in ammunitions, 47 percent in aircraft, 39 percent in electronics, 34 percent in missiles, 32 percent in communications equipment, and 29 percent in ships. In early 1990s, the reduction increased. Gansler also argues that, under the pressure, defense contractors had five broad options to deal with the hardships: sticking with defense, selling overseas defense, selling to other government markets, diversify, or getting out of defense (52-54).

Among the five options, many defense contractors selected selling to other government markets or diversifying markets. ITS was one of the promising alternative areas. Initiated by the federal government, the defense conversion effort encouraged the defense industry to partake in the ITS market, simultaneously meeting military missions and the needs of commercial customers. A few professionals from defense companies participated in Mobility 2000, the first organization of ITS professionals, and they became involved in subsequent national programs. Many companies on the DOD list of the top 100 recipients of
prime defense contracts in 1991 were members in ITS America as of August 1992. Companies on both lists included seven contractors with a high percentage of DOD business, five large multi-industry companies, and three U.S. Automobile manufacturers (Whelan, 1995: 54-55). Among them, U.S. DOT selected four major defense contractors for National ITS Architecture development.

The early participation of defense contractors in the ITS program continued under the favorable technology policy of the Clinton administration. In 1993 President Clinton presented his initiative, “Technology for America’s Economic Growth: A New Direction to Build Economic Strength” (Clinton and Gore, 1993). The plan proclaimed that the ratio of civilian and dual-use R&D to purely military R&D would be significantly higher, and that this will be a first step toward balancing funding levels for these two categories. According to the plan, the civilian share of the total federal R&D budget would grow from 41% in 1993 to more than 50% by 1998 under President Clinton’s plan, and total spending for civilian R&D would grow from $27.9 billion to $36.6 billion during the period (8). The plan also embraced surface transportation technology as a major strategic target of technology policy, announcing “increasing research on new technologies that could lead to the development of smart highways” (18).

Furthermore, an economic context became more favorable to the private sector, which was endeavoring to expand its roles in governmental decision-makings. Kahin (1993) identifies three primary elements of technology policy: supply-side activities in pursuit of federal mission-driven technology, demand-side activities that encourage private investment in technology, and information and facilities infrastructure that enhances the linkages and cooperation between all economic sectors. According to the author, “the Bush and Reagan administrations largely confined themselves to the first of these activities,” but “the Clinton administration’s strategy embraces all three with apparently equal enthusiasm” (4). Hence, technology policy shifted away from federal-mission driven policy to industry-led policy.

Consistent with the plan, ITS technology became a main beneficiary of the $500 million Technology Reinvestment Program (TRP). Started in 1993, the program was the
first post-Cold War, dual-use initiative. The Defense Technology Conversion Council governed the program, and the Council consisted of DOT and other five agencies: the Advanced Research projects Agency of DOD, the Department of Energy, the National Institute of Science and Technology, the National Science Foundation, and National Aerospace Agency.

Completing the Interstate System and Emerging Transportation Issues

The Interstate highway system, started in the 1950s, was being completed as the 1990s was approaching. At this turning point, Federal Highway Administration (FHWA) was looking for a new program area in which the Administration would be involved, and its approach should be to resolve emerging transportation issues, including congestion, energy and environment, safety, and productivity. In March 1990, U.S. DOT published the National Transportation Strategic Planning Study, which was a long-range, multimodal forecast to the year 2015 for transportation facilities and services. This excellent document provides comprehensive, but detailed, information on the conditions and trends concerning those transportation-related issues. It described the contexts and needs of DOT and FHWA precisely, and for this reason, we now discuss the five transportation issues most heavily explored by the study: congestion, energy, environment, safety, and productivity

First, despite slower population growth, there were clear growth trends in some groups of population. The baby-boom generation, now middle-aged, was moving through its prime earning years. As this change leads to growth in personal travel and tourism, it put strong upward pressure on transportation demand. Furthermore, older people were projected to take an increasingly large part of the total population. Between 2010 and 2030, the 65 and over age group would grow eight times faster than the total population (1-7). It was expected to increase the importance of accessibility and convenience in transportation services.

More importantly, overall population tended to concentrate in metropolitan areas, resulting in a significant congestion problem in those areas. Between 1980 and 1987, metropolitan areas grew twice as fast as non-metropolitan areas, accounting for 86 percent
of the Nation’s population growth. In 1987, half the population lived in the 37 metropolitan areas with a population of 1 million or more, and 25 percent of the population lived in the seven largest metropolitan areas (1-11). In result, travel on major urban highways increased by nearly 30 percent between 1983 and 1987. In 1987, traffic congestion occurred in nearly 65.5 percent of urban interstate peak-hour travel, compared to 54.4 percent in 1983. In 1987, due to the congestion problem, drivers and passengers in the largest urban areas wasted from 1.5 to 2 billion hours (10-18).

Second, despite decreased use of oil in other sectors of the economy, oil use in transportation continued to grow without shift to alternative fuels. The transportation share of petroleum consumption expanded from 52 percent in 1970 to 62 percent in 1988 (3-3). In 1988, transportation demand, 10.4 million barrels per day, exceeded domestic production by 8 percent (S-4). Substantial imports were expected for transportation purpose alone. In particular, with decreasing non-OPEC oil production, OPEC output approached 85 percent of capacity. Hence, oil prices would increase sharply and fuel efficiency was urgently needed in the transportation area (3-5).

Third, transportation was a major contributor to air pollution and other pollution. It accounted for 70 percent of carbon monoxide (CO), 33 percent of ozone-producing hydrocarbons, about 50 percent of nitrogen oxides (NOx), and 21 percent of suspended particulate (4-1). Despite a 24-percent growth in vehicle travel, transportation emissions were reduced by 38 percent for CO, 36 percent for HC, and 15 percent for NOx (4-5). However, transportation was still responsible for nearly 25 percent of U.S. and 5 percent of worldwide emissions of CO₂, the greenhouse gas (4-9). Because the production of clean fuels was costly, conversion from conventional fuels would be slow (4-16). Furthermore, hazardous materials were transported with a continuing risk to the environment from accidental spills without adequate emergency response methods. All of these factor lead to growing needs for sustainable transportation.

Fourth, highway fatality rates had continued to decline, but the number of accidents and fatalities was still unacceptable in 1988, accounting for 20.6 million accidents and
49,850 fatalities (8-1). Furthermore, it was uncertain that governmental safety programs would sustain the declining trends. According to a DOT’s study, people generally tended to decide whether to accept a particular safety measures by weighing the safety benefits against the costs such as trip time, loss of a business opportunity, or missed opportunity to see family members. Drivers would be reluctant to accept safety measures if they perceive that their benefits do not outweigh their costs. This was a reason why safety measures might not effectively protect the drivers from unnecessary or preventable risk. Hence, DOT continued to look for “the broadest possible options for fast, efficient, convenient, and economical movement of people and goods” (8-2).

Finally, there was increasing criticism that infrastructure, including transportation infrastructure, was insufficient to meet the demands of future economic growth and development as well as current requirements (NCPWI, 1988: 1; Victor, 1992). According to the Congressional Budget Office, 5.5 per cent of all federal outlays was spent on public works in 1965 when construction on the interstate highway system was underway. However, it had steadily decreased since, falling down to 2.5 per cent in 1990 (Victor, 1992: 2717). Because the movement of people and goods was generally thought to be an integral part of economic activity, transportation might have a great impact on productivity in a national economy. Inactive investment in infrastructure might be a fundamental cause of the decline in the competitiveness of the United States in the international economy.

In sum, the emerging transportation issues of the 1980s, such as congestion, energy and environment, safety, and productivity, brought about more mounting demands for effective highway policy than had been the case in “the era of the Interstate system.” There was a widespread recognition that, without major solutions, the worsening trend would continue beyond 1990. While transportation professionals attempted to find better answers to the emerging multiple problems, many of them believed that ITS would be an effective and efficient alternative that could attack the problems all together. Hence, the completion of the Interstate highway system and the changes of transportation needs would be major factors that encouraged transportation professionals to conceive of the ITS policy network.
Although ITS was expected to cope with transportation problems as an alternative to the construction of new roads, it is important to know that the changing needs did not provide enough momentum to mobilize nationwide concerns for ITS. Some statistics could be used to counterattack arguments for the seriousness of transportation problems. Despite growing vehicle concentration in its metropolitan areas, the U.S. had relatively low vehicle densities, accounting for the 14 vehicles per square kilometer in 1987. Most developed nations exceeded this level. Japan, West Germany, and the United Kingdom were more than five times greater, and Hong Kong was most dense at 183 vehicles per square kilometer (6-4). Furthermore, the U.S. had the world’s lowest highway fatality rate with the rate decreasing over time: 2.6 fatalities per 100 million vehicle miles traveled in 1986, compared to 3.5 in 1980. In 1986, most western countries remained more than 3.0 fatalities even if they were decreasing year to year (6-4). In 1988, the number of people killed per million cars was 257 in the U.S., compared to 427 in Europe (ECMT).

Shared Needs for Change and Legitimacy of the National Program

Creating a Sectoral Coalition

ITS did not emerge as a national concern until the mid 1980s, when a series of large gatherings started with a California Department of Transportation (Caltrans)-sponsored conference in 1986. It would discuss the role of ITS in meeting growing California congestion. At a national level, efforts were beginning to develop a national consensus group to set goals, scope and a vision that would support the reemerging national interest. The effort attracted a core of 20-25 individuals from government, university and industry. Lyle Saxton, a then FHWA official and ITS activist, describes the efforts as follows:

Their common denominator was a current involvement in highway transportation and a sense that a major national window of opportunity was now opening for what was to become known as IVHS. Their mutual agenda recognized a need… most importantly, to move to some form of permanent program coordination arrangement. In retrospect, this core group has been amazing in that it is still essentially intact and remains as central principals in today’s IVHS program (1993: 5).
In 1988, the initiative of the core group established Mobility 2000 as an ad hoc committee of volunteers to plan and coordinate ITS activities and interests. The first Mobility 2000 National Workshop was held in San Antonio, Texas in February 1989, and the second workshop was held at the Highway Users Federation for Safety and Mobility Annual Meeting (HUFSAM) in Washington D.C. in November 1989. These were early national events to convene key decision-makers and planners across the U.S., and those workshops, their subsequent committee meetings, and many informal meetings developed the definitions, scope, and milestones that would be reflected by 1992 IVHS America Strategic Plan.

In May 1990, the National Leadership Conference was held with the Secretary of Transportation Sam Skinner and Alan Smith of General Motors as co-chairmen. It pulled together the top leaders from industry and government to discuss the potential of ITS and the establishment of a permanent national ITS organization. American Association of State Highway and Transportation Officials (ASSHTO), the Highway Users Federation for Safety and Mobility, the Institute of Transportation Engineers, and the Transportation Research Board, agreed that a new separate organization with a focused mission was needed (Costanino, 1995: 2).

Some industries in trouble throughout the 1980s heavily affected the creation of Mobility 2000. Philip Tarnoff, a participant in the gathering and now Director of the Center for Advanced Transportation Technology at the University of Maryland, states as follows:

Most members of Mobility 2000 were from universities or industries, and the Federal government, but very few from state and local governments, because a real interest was to try to see if they can develop business bases that would support this [ITS] industry…A common consensus was to like to see federal dollars to be spent. They were trying to find ways to encourage more research money to be spent and more implementation money to be spent (interview, October 6, 2000).

Tarnoff’s argument is substantially congruent with three points commented by Richard Worrall, another early participant and now a ITS consultant, in terms of the stimulus of initially bringing together people to the ITS area. First, the defense industry was
looking for new markets to sell their products and services, as the end of the Cold War began to switch the emphasis of federal funding to civilian uses. The federal government also actively encouraged the defense conversion, and “ITS was one of things strongly influenced by the efforts,” says Worrall. Second, there was an attempt to create much stronger relationships between the public and the private sectors. The manufacturers of vehicles were conceiving of putting intelligent technologies within vehicles, while the public sector would support them with relevant infrastructures and facilities. Finally, the efforts would be impossible without very rapid advances and high capacities in telecommunication and information technologies, as well as falling prices of computers. As Worrall puts it, “the ability to apply computer technology in a variety of transportation and traffic programs was rapidly accelerated, regardless of the involvement of the defense industry” (interview, September 31, 2000).

In the early process of network creation, it was public-private cooperation that was proposed as a structural frame to improve global competitiveness of ITS technology. The American selection for this frame was primarily stimulated by the governance structure of other overseas competitors. Advanced Vehicle and Highway Technologies, the 1991 report by the Transportation Research Board, observed that:

Well-funded and -organized public-private European and Japanese IVHS programs compared with the heretofore diffuse U.S. efforts have inevitably attracted the attention of policymakers to IVHS. Active foreign research and development programs have raised concern that the United States may be left behind in an international race to devise standards and technical guidelines, which could affect the competitive position of U.S. firms (quoted by French et al., 1994: 10).

In the 1990 Statement of National Transportation Policy entitled Moving America, DOT held, “in Europe and Japan, government agencies and private companies are working together to develop IVHS technologies” (quoted by French et al., 1994: 9). DOT emphasized substantial investment and major operational and institutional change to match the foreign initiatives. However, it is critical to know that the enthusiastic argument for public-private cooperation in the transportation community was possibly realized only under
the new social condition that Americans would more widely accept closer public-private relationships and even industrial policy.

Tarnoff (interview, October 6, 2000) points out that due to different agenda and culture among the groups, the early situation was more likely to be the story of “blind men on the elephant.” In addition, he stated that there was “very much unrealistic expectation, in a sense, on what would be funded and what could be funded.” For instance, the defense industry would take very long time to come into the ITS area because realistic assessments could not be made quickly. A shared consensus developed on making the industry more competitive internationally. As Tarnoff puts it, the “situation and timing was right,” since “the industry was looking for more governmental support, and FHWA understood their role was changing at the same time.”

Congressional Support

The U.S. Congress launched the National ITS program by passing ISTEA of 1991, an omnibus act including the IVHS Act. ISTEA of 1991 was served as the only legislation for ITS until TEA-21 was passed in 1998. ISTEA substantially increased funding for federal ITS programs and authorized the Secretary of Transportation to conduct a broad area of ITS program activities such as R&D, operation tests, and promotion of implementation. Also, the Act mandated an explicit set of organizational arrangements designed to promote the emergent ITS industry, addressing a sense of impending economic crisis that pervaded the late 1980s. In fact, many provisions were provided in response to professionals’ argument that the U.S. would entirely depend on foreign developments unless its ITS program would be established soon.

39 In the fall of 1994, the term “IVHS” was officially renamed “ITS.” ITS Joint Program Office (JPO) replaced Office of Traffic Management for Intelligent Vehicle-Highway Systems to promote unprecedented cooperation among U.S. DOT’s modal administrations. IVHS America also was renamed ITS America. The change was based on a consensus that all transportation needs and requirements should be viewed on a multi-modal and intermodal basis, not only on a highway and motor vehicle basis.
Program goals as delineated in IVHS Act of 1991 (23 USC 307) clearly reflected congressional concerns for the U.S. industrial and economic competitiveness, as well as the transportation capacity, efficiency, safety, and environment. The Act was designed for “the development and promotion of intelligent vehicle-highway systems and an intelligent vehicle-highway systems industry in the United States…” (Sec. 6052 (4)). It also aimed at “the enhancement of United States industrial and economic competitiveness and productivity by improving the free flow of people and commerce and by establishing a significant United States presence in an emerging field of technology” (Sec. 6052 (6)).

Under the goals, the Act encouraged cooperation among multiple agencies and social entities. The Secretary was directed to seek transfer of federally owned or patented technology to the states and the private sector. The Secretary was directed not only to consult with other federal agencies, but also to maximize the involvement of the United States private sector, colleges and universities, and state and local governments in all aspects of the program. DOT was allowed to utilize professional groups: existing standards-setting organizations in developing the standards of ITS technology and an advisory committee, ITS America, in helping DOT’s policymaking. Furthermore, many other strategies were intended to promote intergovernmental coordination in the implementation processes to be led by state and local governments: technical assistance and information provision to states and local governments, and federal support for operational testing projects and corridors program.

Some studies interpreted the legislation as aiming at a global competitiveness in the ITS area. In its 1991 study, the General Accounting Office (GAO) noted, “a current European effort called PROMETHEUS plans to devote $750 million to IVHS over an 8-year period” and “Japan has also initiated major IVHS efforts.” However, “in the United States, IVHS has only begun to emerge as an area for federal policy action...” (quoted by French et al., 1994: 10). In its 1992 report, the Congressional Research Service of the Library of Congress also commented that the new ITS funds will “provide a strong initial push for exploring the vision of IVHS, and also allow the United States to be a major player in the international IVHS arena...Various European nations as well as Japan have been heavily
investing in IVHS technologies since at least the mid-1980s” (quoted by French et al., 1994: 10).

The legislative passion for economic competitiveness became an umbrella mission throughout the implementation process of the National ITS program. In a 1994 hearing before the House Investigations and Oversight Subcommittee, Rodney E. Slater, the then Administrator of the Federal Highway Administration and the latter Secretary of DOT, stated that:

President Clinton and Secretary of Transportation Pena share a strong commitment in harnessing technology to improve our transportation system… One of the department’s highest priorities is to get our economy moving through strategic transportation investment. IVHS holds particular promise in helping to achieve renewed economic prosperity through the creation of new industries and consumer markets (3).

Expanding the Network to the Implementation and Global Levels

Public-Private Cooperation in the National Planning Process

Through ISTEA of 1991, Congress formally mandated the creation of ITS America. ITS America serves not only as a Federal Advisory Committee to the U.S. DOT, but also as a public-private forum on ITS issues. Its membership includes “federal, state, local and foreign government agencies; national and international companies involved in the development of ITS; universities, independent research organizations, public interest groups, and any others with a stake in ITS.” When ISTEA was in the legislative process, Congress expressed concern about the apparent lack of a national public-private coordinating organization that would guide a broad range of R&D activities encompassed by the ITS program. Hence, ITS America had congressional support from the beginning (Whelan, 1995: 44; Costantino, 1995: 2).
Following the enactment of ISTEA, ITS America and U.S. DOT each completed strategic plans for ITS in 1992, and then, in 1995, they jointly completed The National ITS Program Plan, which was a comprehensive summation of goals, deployment scenarios, user services, and other activities. U.S. DOT argued that the Plan was developed through a “consensus-building process” in consideration of the key roles that public and private organizations would play in ITS implementation. In its preface section, the Plan states that over 200 individuals and organizations commented and provided input, and more than 4,000 draft copies were distributed to ITS America members, U.S. DOT staff, and the general public through the Federal Register (Euler and Douglas, 1995: iii). Furthermore, the Plan distinguished the ITS program from other national programs as follows:

The deployment of ITS would not parallel the centralized, staged development of major national systems in the aviation, defense, and space programs. In contrast, ITS deployment and operation will unfold through a Federal, state and local partnerships for investment in ITS and the efforts of private companies to market ITS products and services (Euler and Douglas, 1995: 3).

It was wise that U.S. DOT encouraged the private sector to participate in the policy-making process, since the Department intended to promote the active involvement of the sector in the implementation process of ITS programs. Like Congress, the Department proposed that private-sector involvement be essential to realize the full potential and benefits of deploying ITS, and the Plan included many topics on how to minimize impediments to private-sector investment.

For instance, basic infrastructure to support private investment would be developed through public investment. The Plan also identified institutional and legal barriers to developing public-private partnerships at the program implementation phase—the obstacles included private sector access, intellectual property, procurement, and antitrust. State and local governments were recommended to enter into innovative partnering agreements, especially public-private partnerships, which differ from traditional highway construction contracts.
There was a set of good reasons why DOT (U.S. DOT, June 1994: 1-1–1-3) encouraged public/private partnerships to be a main organizational arrangement in carrying out ITS projects. It was expected that the private sector could supplement the lack of resources, expertise, and experience that the public sector would need at implementation phases.

First, the Department argued that the private sector had more experiences in developing and marketing new technologies and products than did the public sector. Because certain ITS technologies were beyond the current capability of many state and local transportation agencies, they might find it more cost-effective to enter into a cooperative relationships with businesses. Second, it was believed that the private sector had more ability to establish and dissolve agreements by using ad hoc business relationships with other firms. In contrast, the public sector was not flexible in such agreements because of complex, legal and regulatory requirements. Third, it was thought that the private sector was better able to respond quickly to new ITS product and service demands, tailoring products and services to different segments of the market.

Federal Support for Interjurisdictional Networks

In the ITS community, one of salient non-technical issues was on how to coordinate formerly fragmented jurisdictions and agencies under a united traffic information system. It was argued that ITS, with its technological nature, requires inter-jurisdictional interoperability and must bring together previously independent governmental functions. U.S. DOT attempted to deal with the issue of impeding obstacles by providing state and local agencies with various incentives including architecture, standards, guidelines, and funding, as identified in this subsection.

After the passage of ISTEA, the first large-scale project was the ITS Priority Corridors program, which was directed by Congress to encourage ITS operational tests. U.S. DOT selected four corridors: the I-95 Corridor spanning 12 eastern states and Washington D.C.; the Midwest Corridor linking Gary, Indiana to Milwaukee, Wisconsin; Houston,
Texas; and Southern California linking Los Angeles to San Diego. Started in 1993, each of
those areas developed business plans and attempted to integrate a wide range of ITS
technologies and services across jurisdictional boundaries. Another big event was the start of
the National Architecture development in September 1993. In the development process, four
industry teams each proposed four different architectures, and then two of those four teams
were selected and developed a final architecture together in an open, non-competitive
process.

The year 1996 was a very meaningful time when many major national projects were
launched under the umbrella goal of improving technical and institutional integration. In
January 1996, U.S. DOT initiated the ITS standard program by signing cooperative
agreements with five Standard Development Organizations (SDOs): the American Society
for Testing and Materials, the Institute for Electrical and Electronics Engineers, the Institute
of Navigation, the Telecommunications Industry Association, and the Society of
Automotive Engineers. The five professional associations continued to act independently,
but the ITS America’s Standards and Protocols Committee served as an oversight and
coordinating committee for all of their standards activities. ITS America created standards
only if there were no SDO available to do so (Euler and Douglas, 1995: 23).

Based on the lessons learned from the Priority Corridors program, U.S. DOT
continued larger projects to develop integrated metropolitan ITS infrastructure. In January
1996, DOT announced a major ITS deployment goal, called Operation Timesaver, to reduce
the travel time of Americans by at least 15 percent by 2005. The goal would be attained
through the deployment of a complete ITS infrastructure across the U.S. It focused on 75 of
the nation’s largest metropolitan areas. To support the effort, in October 1996 DOT
announced the Model Deployment Initiative (MDI) and selected four metropolitan areas to
carry out the operational tests of a fully integrated, metropolitan-area Intelligent
Transportation Infrastructure: Seattle, Washington, Phoenix, Arizona, San Antonio, Texas,
and NY/NJ/CT metropolitan.
In October 1996, U.S. DOT initiated the CVISN-Model Deployment program to showcase the effects of ITS infrastructure for CVO (Commercial Vehicle Operation) in eight states: California, Colorado, Connecticut, Kentucky, Michigan, Minnesota, Washington, and Oregon. The program was focused on safety information exchange, roadside electronic screening, and credentials administration. Operational tests for CVO were evaluated to be especially vulnerable to multi-jurisdictional impediments. CVO projects usually required cooperative participation of agencies involved in law enforcement, motor vehicle registration and inspection, revenue and tax collection, and utility regulation, as well as transportation. Furthermore, their cooperation should expand to other jurisdictions not to impede interstate movements of commercial vehicles (U.S. DOT JPO for ITS, 1997b: E-51).

Finally, the era of ISTEA ended with the completion of the National ITS Architecture in September 1997, followed by TEA-21 of 1998. The Intermodal Freight Program was one of new large-scale programs aiming at intermodal interoperability. In June 1998, the Intermodal Freight Identification Technology Workshop brought together leaders to outline a planning scheme that would address intermodal freight identification and tracking technologies. Through the Workshop, an Intermodal Freight Technology Working Group was formed and co-chaired by the U.S. DOT and the private sector to implement the workshop recommendations. In September 1999, the Archived Data User Service (ADUS) was incorporated into the National ITS Architecture. DOT completed Federal ADUS Five-Year Program Plan (2000-2004), which was designed to “improve transportation decisions through the archiving and sharing of ITS generated data.”

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40 A plan was needed to create intermodal standards for freight identification and location to evaluate the feasibility of a “universal reader” that could accommodate different modes and container types and developing readable security tags for containers.

41 Its primary and direct users would be transportation planners or decision-makers rather than travelers, transportation operation divisions, or other users. The Plan comprised three waves of implementation: the assessment of the state of technical issues, the overview of institutional and organizational issues, and outreach/awareness and the studies of evaluation issues.
Shelley Row, Director of FHWA Office of Transportation Operations, describes the current conditions of interjurisdictional coordination as of Fall 2000 (interview, October 26, 2000). Because TEA-21 requires states to conform to national architecture and standards, the FHWA is working on rule making right now. She states that there are three issues they are hoping to address with this rule. One is to facilitate, bringing different jurisdiction together. Row remarks, “We believe if you will successfully deal with transportation issues through ITS, then you must link all pieces together.” Second, she says, “Rather than integrate city builder systems, state builder systems, and law enforcement systems, we seek one system that gathers information officially and shares it with everyone who needs to know it, and then they are in good positions to have the tool to operate transportation systems in a way that optimize performance.” The third issue is to promote standards, some of which are “really nationally and some others regionally significant.”

In sum, various incentives were given to state and local governments so that their projects could be arranged along with U.S. DOT’s demand that focuses on integrating infrastructure components and coordinating institutional commitments. In this sense, the historical review of major federally funded projects verifies the two federal approaches to the National ITS Program identified in Chapter IV: task delegation to lower levels of government; and functional integration of formerly independent entities and components. What DOT really needed was integrated, region-wide systems rather than a project-oriented, agency-specific ITS activity.

Renovating a Professional Network

The ITS professional network is composed of previously independent professional networks, denoting a new network among networks. Since ITS advances are produced by applying information technologies to transportation systems, their successful development and deployment can be carried out through cooperative interactions between civil engineering and electric engineering groups. While the two groups are related to the infrastructure dimension of ITS, the automotive industry is also deeply involved in the vehicle dimension of ITS, such as navigation and collision avoidance systems. The defense
industry also has an interest in ITS as the part of the dual-use efforts of R&D. Since Congress, through ISTEA of 1991, mandated a nationwide network of ITS professionals centered on ITS America, the community of transportation professionals, as a host group of the program, has been attempting to deal adequately with the other guest groups.

Sussman (1995) argues that the “New Transportation Professional” needs to have a broader perspective on the field, including transportation fundamentals, transportation technology, and institutional issues, which are reshaping the field. He argues for the breadth necessary to cover these areas as well as in-depth knowledge of some important aspect of the transportation enterprise. Similarly, Orne (1995) asserts that the world of transportation rethink the entire educational and training process for the future ITS professional. The area requires synthesized new breeds from aerospace engineers, environmentalists, systems engineers, computer scientists, and communication engineers.

The National Associations Working Group for ITS (NAWG) is a good example of effective professional networks among transportation professionals interested in ITS. In partnership with the U.S. DOT, the organization brings together national associations of both state and local officials and transportation service providers with a common interest in ITS. It provides the ITS Cooperative Deployment Network (ICDN), a shared Internet resource that contains up-to-date news, insight, and resources for transportation professionals and agencies, altogether. Also, ITS America and ITS JPO provide electronic newsletters and the Electronic Document Library, respectively.

U.S. DOT has been attempting to renovate transportation professional networks though intensive education and training. A “Five Year Strategic Plan for Professional Capacity Building (PCB) for ITS Transportation Management and Traveler Information” was begun in September 1996. Since that time, the PCB Program has provided seminars, short courses and workshops to educate and train three groups of audience. They include 1) existing transportation professionals at all levels of government; 2) future transportation professionals at colleges and technical/vocational schools; and 3) elected and appointed officials as well as the general public. The program spans a wide variety of subject areas.
such as “ITS Awareness,” “ITS and the Transportation Planning Process,” “ITS Public/Private Partnerships,” “ITS and Telecommunications,” “ITS and Transit,” and “Applying the National ITS Architecture to Deployment” (US DOT ITS JPO, 1999: 393).

However, the PCB program is not necessarily based on DOT’s top-down scheme, but on active participation of a wide variety of organizations. From sub-fields such as safety, traffic and transit engineering, and transportation policy, a cross-section of university, government and private sector professionals are working together to develop courses, workshops, and university curriculum. Training locations also are varied: Washington, DC, FHWA and FTA Region and Division Offices, FTA Region Offices, and State and Local government agencies. As of 1999, a series of seven awareness seminars and four short courses were given to more than 5000 Federal, State and local participants in over 200 presentations of seminars and courses (US DOT ITS JPO, 1999: 393).

Dealing with Global Neo-liberalism

As countries over the world have paid growing attention to the benefit of ITS, two functional types of global networks have expanded in order to promote the global market of ITS products and services: information exchange forums and standard-setting organizations. In a way of excluding governmental influences, those institutions are aimed to lower trade walls and realize globally dominant neo-liberalism.

Information exchange forums regularly bring together ITS professionals from around the world to share information on a variety of ITS aspects. Since its first meeting was held in Paris in 1994, the ITS World Congress has been the largest annual meeting that discusses a wide variety of current issues such as technologies and applications, market conditions, national programs, and institutional issues. The Congress also provides the informal place

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42 The Congresses are held in the fall of each year and rotate among the three regions: North America, Europe, and the Asian-Pacific area. The second Congress was held in Yokohama, Japan in 1995, the third in Orlando, Florida in 1996, the fourth in Berlin, Germany in 1997, and the fifth in Seoul, Korea in 1998. The sixth was co-hosted by ITS America and ITS Canada in Toronto, Canada in 1999.
where ITS businesses gather and address business networks. According to Peterson and Olson (1996), participants’ motivators are classified into three categories called three C’s of exchange: “collaboration” in sharing insights gleaned from project experience and research, “connections” through forming teams or strategic alliance, and “conveyance” by disseminating marketing messages.

Three regional associations, as the Secretariats of the Congress, have organized the World Congress and other international outreach programs: ITS America for North America, ERTICO for Europe, and VERTIS for the Asian-Pacific area. They are also advisory groups and forums that assist national ITS policies. For instance, ITS America takes a linkage role between U.S. national and global activities. It is not only a nationwide network of ITS professionals mandated by U.S. Congress in ISTEA of 1991, but also a leading part of a global network involving ITS professionals. ITS America, first established in 1990, encouraged the formation of ERTICO in 1991 and VERTIS in 1994.

Information exchange has also been conducted through two international organizations committed to ITS research projects: the World Road Association (PIARC) and the Organization for Economic Cooperation and Development (OECD). PIARC is a worldwide forum to foster international communication on the subjects of road infrastructure planning, design, construction, maintenance and operation. In 1996, its Committee 16 on Intelligent Transport (C16) was formed to cover ITS-related issues and collected information on various areas: ITS requirements, services, and architectures, institutional issues, evaluation methods, successful cases and guidelines, and the application of ITS in developing countries. Since the first meeting in April 1997, the OECD’s Transport Systems Analysis 5 (TSA5) has been acting as an advisory group on the

43 ENTERPRISE is a multi-national consortium joined by the mechanism of the ENTERPRISE Program, which is a pooled-fund study with public agencies and private sector partners from all the countries of the world. The number of its members is still small, but it has a variety of memberships from VDOT to Dutch Ministry of Transport.

implementation issues of ITS, such as research consolidation and assessment, policy analysis and advice, emerging strategies, guidelines and best practices and technology transfer.

In October 1997, the expert groups from both PIARC and OECD met in Berlin to establish a cooperative network between them. Both groups identified similar issues to be studied and recognized that both efforts will be needed, but they recognized important differences. Whereas OECD focused on policy aspects, especially in developed countries, PIARC concentrated on more technical issues and economies in transition (MacGowan, 1999). The participants reached the agreement that sharing and cross-review of each other’s draft materials would be desirable to avoid overlap. Their major communication channel would be the chairmen of both sides, who could stay in close touch because of both being from the U.S. FHWA.45

In addition to information exchange fora, two standard-setting organizations expand the global ITS market by lowering trade walls: the International Organization for Standards (ISO)46 and the International Telecommunication Union (ITU).47 ITU is composed of governments and is committed to radio spectrum issues or telecommunication areas. In contrast, ISO is led by the private sector and charged with standardizing most ITS technologies to be installed between vehicles and infrastructure or within infrastructure,


46 ISO is the worldwide federation of national standards bodies designed to promote international standardization of industrial products and international cooperation regarding intellectual property, technological development, economic activities, and so on. There are 185 Technical Committees (TC).

47 ITU is an inter-governmental international organization for worldwide telecommunications. It adopts international conventions and treaties concerning frequency usage, develops various global standards, and provides technical support for developing countries. Its sections include the Radiocommunication Sector (ITU-R), the Telecommunication Standardization Sector (ITU-T) and the Telecommunication Development Sector (ITU-D). In 1995, ITU-R under ITU launched the studies on TICS (Transport Information and Control Systems) as a new subject. Working Party (WP) 8A of Study Group (SG) 8 within ITU-R is engaged in TICS research.
except for radio spectrum. While the American National Standards Institute (ANSI) heads the U.S. delegation for ISO, the U.S. Department of State leads the U.S. delegation for ITU. In the case of ISO, it is usual that the public and private sectors equally participate in, and equally influence, standardization processes. Also, private businesses can indirectly affect ITU through their national delegations.

However, “as with many international standardization groups, the membership is by country,” and “in any case, the national position must reflect the interest of the citizens of that nation,” says Michael Schagrin, ITS Standards Manager at ITS JPO. He states that “shadow groups” usually take a critical role in reflecting national interests in international standardization: “in all cases, the official delegate holds some kind of shadow group meetings to determine a national position based on input from national interest groups, which typically include many private businesses” (interview, October 26, 2000).

Since April 1993, within ISO, TC 204 has been engaged in standardization activities for Transport Information and Control Systems (TICS). As shown in Figure V-5, it has now 12 Working Groups (WG) by subjects, and each group includes lead countries—for instance, the United Kingdom leads WG 1 on system architecture, and the U.S. heads WG 16 on wide area communications/protocols and interfaces. Figure V-5 also shows that similar to other countries, in the U.S., there are “shadow groups.” They are called, officially, U.S. Working Advisory Groups (WAGs), and each participates in each WG to address U.S. concerns and positions. At the same time, a majority of the group members are involved in Standardization Development Organizations (SDOs) or ITS America, which are responsible for domestic standardization activities in the U.S. The WAGs are overseen and coordinated by the U.S. Technical Advisory Group (TAG), which also interacts with the TC 204 committee.

In the process of global standardization, the U.S government-industry relationship is “getting closer,” and “we make sure the public agency as well as private sector representatives sought good balance,” observes Schagrin. In the past, public agencies didn’t
Figure V-5. U.S. Participation in ITS Standardization of ISO
Source: Schagrin, interview, October 26, 2000; and Japan HIDO, 1999: 74.
have a say in standards because they did not have dollars to participate in the ISO standardization process. However, the process now brings the public agency into the committees that help develop standards.

According to Schagrin, the private sector is generally “happy with the lead role” the public sector has taken, but “the only complaint from the private sector is that the public sector isn’t doing enough to pay for their travel expenses to participate in standards.” In many other countries, governments pay the expenses of private sector parties, but the U.S. government does not usually do this except for “some special cases that they agree to represent a strong public sector interest.” Schagrin also remarks, “cooperation inside the U.S. generally works pretty well, but sometimes with multi-national companies there is some question of conflict of interest.” For example, a multi-national company headquartered in the U.S. may want to hold a position similar to that of its subsidiary in another country, against the interests of other U.S. manufacturers (interview, October 26, 2000).

Conclusion

As a result of exploring the ITS policy network in the plan view of a “net thrower,” this chapter found that it was a strategic output formed through a new cross-industrial coalition that brought together field leaders from both the public and the private sectors. Figure V-6 chronologically describes major events that had impacts on the network.

Time was right for the coalition conception: while reviving industries was a primary concern to the private sector, a new innovative transportation program to the public sector. In a great need of federal money, both of those interests took advantage of an umbrella political slogan, which was to enhance the U.S. position in the global market. As implied in the Figure V-6, ongoing governmental support in Europe and Japan was a strong stimulus for the U.S. public-private coalition and professional network, which led the early history of the program rather than federal government alone.
<table>
<thead>
<tr>
<th>Year</th>
<th>Global</th>
<th>U.S. Professional</th>
<th>U.S. Federal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>Mobility 2000 formed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>Two Mobility 2000 Workshops held.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>IVHS National Leadership Conference held; Mobility 2000 renamed to IVHS America.</td>
<td></td>
<td>DOT National Transportation Policy promotes IVHS.</td>
</tr>
<tr>
<td>1991</td>
<td>ERTICO established; Europe CEN/TC278 for standardization created.</td>
<td>IVHS America Information Clearinghouse launched.</td>
<td>ISTEA passed ($660M for FY92-97); IVHS America named as DOT Advisory Committee.</td>
</tr>
<tr>
<td>1992</td>
<td>ISO/TC204 created.</td>
<td>IVHS America Strategic Plan completed.</td>
<td>US DOT Strategic Plan completed; 16 operational tests selected.</td>
</tr>
<tr>
<td>1993</td>
<td>IVHS Priority Corridors selected; National ITS Architecture design started; 2nd round of operational tests selected.</td>
<td>IVHS renamed to ITS; ITS JPO created.</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>VERTIS established; 1st World Congress (Paris, France)</td>
<td>IVHS America renamed to ITS America.</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>ITU-R ITS study started; 2nd World Congress (Yokohama, Japan)</td>
<td>5-Year National ITS Program Plan completed.</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Comprehensive Plan for ITS in Japan completed; PIARC/C16 formed; 3rd World Congress (Orlando, Florida)</td>
<td>Professional Capacity Building program started.</td>
<td>ITS standard program started; Operation Timesaver goal announced; MDI programs started; CVISN-Model Deployment program started.</td>
</tr>
<tr>
<td>1997</td>
<td>OECD/TSA5 formed; 4th World Congress (Berlin, Germany)</td>
<td>National ITS Architecture completed.</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>5th World Congress (Seoul, Korea)</td>
<td>TEA-21 passed ($1.29B for FY98-02); IVI program started; Intermodal Freight program started.</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>6th World Congress (Toronto, Canada)</td>
<td>ADUS program started</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>ITU adopts 5.8 GHz-band for DSRC.</td>
<td>5-Year National ITS Program Plan completed.</td>
<td></td>
</tr>
</tbody>
</table>

Figure V-6. Major Events related to the ITS Policy Network
Supported by Congress, public-private joint planning set up well-organized strategies that would minimize impediments to implementation networks. In other words, most of the federal programs in Figure V-6 were designed to help state and local governments lower institutional barriers not only between the public and private sectors but also among multiple jurisdictions. Very importantly, it was expected that the newly designed professional network would be used for value and information diffusion as well as mutual learning. Furthermore, the domestic network across sectors played a critical role in lowering trade barriers to the free flow of ITS products at the global level.
CHAPTER VI. INTERNAL DYNAMICS: AN OVERALL APPRAISAL

The last chapter examined the ITS policy network from the plan view of a “net thrower.” In this chapter, a vantage point is switched to the view of “net riders,” who look out/up/across/down at other actors from within the network in organization centric view. Hence, network features are informed by the working-field actors who participate day-to-day in network management at the global level or at the multiple levels of government in the United States. From their perspectives, this chapter focuses on the structural issue of how policy actors are interconnected and interact in the network. To do so, it examines, one by one, different levels of the network: global, federal or national, and regional.

Competition for Global Standards

In the ITS area, those who advocate global neo-liberalism perceive an obstacle to greater trade and economic integration: this is the lack of worldwide standardization of ITS products. According to Broady Cash in ARINC Incorporated, there is “no clear indication from the buyers of DSRC [Dedicated Short Range Communication] equipment that only internationally standardized equipment is acceptable.” He also argues that this allows vendors to establish regional markets that they want to protect (email interview, November 19, 1999). Jean-Francois Coste, Secretary General in PIARC, comments, “Each region of the World is competing to get the leadership of the ITS market and ITS deployment through their own standards that entails a real protectionism. Only worldwide standards would facilitate co-operation” (email interview, November 26, 1999). Max Rumbaugh, Executive Vice President in Society of Automotive Engineers (SAE), also argues that:

Their [opponents to international standardization] lack of understanding of the process leads them to believe that standards and regulations are being developed for the purpose of creating a trade barrier…. My suggestion for developing better international cooperation would be to have increased support by American and European companies for the development of international standards on ITS. Few American companies are supporting their employees on the development of international ITS standards (email interview, November 18, 1999).
A primary underlying issue here is how multiple countries can reach an agreement through fair standard-setting processes without providing a competitive advantage to specific countries. In fact, someone may view the process as a battlefield where a few powerful economic interests deliberately seek global market shares. The U.S. and Europe are often on opposite sides in many standardization issues. Many Americans believe that Europe has more advantages in the process than the U.S.

It is true that Europeans initiated standardization efforts earlier than did other areas of the world. One of the standardization organizations in Europe is the Comité Européen de Normalisation (CEN). Its technical committee regarding Road Transport and Traffic Telematics (RTTT), or CEN/TC278, started activities in July 1991 prior to the establishment of ISO/TC204, which was formally approved by the ISO council in September 1992. European influences are attributed to the Vienna Agreement between the ISO and the CEN, under which joint conferences can be organized between Working Groups with the same activities. Both ISO and CEN can concurrently approve draft standards proposed by joint deliberations. Under that agreement, CEN is leading four out of sixteen Working Groups in ISO/TC204, as shown in Figure V-5.

Furthermore, some point out that one vote for each country gives Europeans an advantage. “Whether Europeans work like one country depends on issues,” but “standards are reflecting regional interests…because Europeans already accepted standards at the European level,” remarks Michael Schagrin, ITS Standards Manager at ITS JPO (interview, October 26, 2000). The U.S. brings its regional standards with two votes including Canada. Figure VI-1 illustrates the typical steps in standardization processes—the processes of national standardization and international standardization are substantially similar, allowing for generally an open process in which all interested parties may participate. In each case, committees of volunteers meet to discuss requirements for consensual technical standards, which go through several cycles of balloted drafts until eventually reaching final approval and publication.
Volunteer on standards committee proposes a new area for standardization

Committee discusses resources available, priority of proposed item versus other potential new work OR new committee formed to develop standard

Solicitation of additional subject matter by experts/volunteers

Work begins, typically led by initial proposers (Some committees assign tasks to subcommittees or task forces; others do not)

Initial draft ready for committee review

One or more rounds of committee comments and comment resolution

Initial ballot (committee level)

Comment resolution, possible reballot

Final ballot (division, joint committee, or review board level)

Comment resolution, possible reballot

Editorial review by standards organization staff

Publication

Figure VI-1. Typical Standardization Process

However, the U.S. and Japan have challenged the European initiative. Many experts from the U.S. are strategically dispatched to the international standardization organizations to develop the future ITS international market. Rumbaugh illustrates as follows:

When the Europeans began the development of ITS technology, they received government support under their Prometheus program. The reason this government support was provided was to expedite their development of ITS technology so that European companies would have a competitive advantage in the ITS area. While that government funding has been substantially reduced for the research, government funding continues for the standards development on ITS. Importantly, now both the U. S. Government and the European Government are providing funding support for the standards development efforts (email interview, November 18, 1999).

Cash points out that the problem with international cooperation is serious differences in the expected applications to be served and the requirements in the different regions. He also argues, “Japan and North America are the closest in requirements but market protectionism is keeping us from total harmony” (email interview, November 19, 1999).

Japan is also trying to become a main player in the field in cooperation with the U.S., Korea, Malaysia and other Asian-Pacific countries “in order to compete with the European” countries (Chon et al., 1999: 3). For instance, 23 experts from six Asian-pacific countries have frequent ad-hoc and official meetings to carry out ASTAP (Asia-Pacific Telecommunications Standardization Program), and they bring regional agreements to the meetings of ITU, one of two major international organizations (Oyama, 1999).

Under the severe competitive condition, some feel limitations in sharing information and experiences. Patrick Hasson from OECD and U.S. FHWA describes the problem as follows:

Many countries/businesses do not want to share information because they want to develop products that they can sell. On the other hand, this also motivates cooperation because most countries see that there must be standardization and compatibility if there is to be a global market for products. It is a double-edged sword (email interview, November 22, 1999).
Hasson implies that developing standards and compatibility for free trade, instead of sharing information and experiences for better human life, are wrongly understood as international cooperation. Coste from PIARC also points out that three information exchange forums, including ITS America, ERTICO, and VETIS, “do not cooperate very frankly” because each one has a separate Secretariat without a single coordinating organization (email interview, November 26, 1999).

Consequently, the standardization process presents a clear picture of national rivalries in the global network of ITS promotion, dominated by a few leading countries that deliberately seek global market share. At the global level, it is hard to find open forums that will promote the public interest and humanism beyond territorial boundaries. The network can be generally characterized by the overwhelming materialism and an economic-outcome perspective, which are commonly found in contemporary global policy.

The Federal Agencies’ Network

As indicated by resource dependence theory, where resources are available determines the shapes of power relationships and interdependency in a network. In addition, laws and authoritative rules are especially critical in explaining the network of the public sector because they usually define resource allocation in the sector. At a level in the network below the global level, the ITS Joint Program Office (ITS JPO) and the Federal Highway Administration (FHWA), the two most active federal agencies, have widely different relationships with other DOT agencies and levels of government. From the standpoints of the federal agencies and other experts, this section explores the flows of resources, authority, and information. By doing so, it attempts to uncover power relationships and dynamics across the U.S. ITS policy network.

Spending Decisions of Congress and States

A considerable amount of dollars for the ITS program is earmarked by Congress and thus allocated for whatever Congress wants. For instance, from FY 1991 to FY 1997, out of
$1,223.6 million made available to FHWA for the program, $473.6 million (38.7%) was congressionally earmarked; and $750 million (58.6%) was expended at the discretion of U.S. DOT (U.S. DOT JPO for ITS, 1997a: 33). Hence, there has been criticism on the inflexible funding. “Earmarking money has taken over control over the budget,” says Philip Tarnoff, Director of the Center for Advanced Transportation Technology at the University of Maryland (interview, October 6, 2000). As Allan DeBlasio at the Volpe National Transportation Systems Center puts it, “earmarking money hurts our program because it’s much better to have Departments receive money and let the Departments decide on how to distribute money or operate it though the competitive process of states” (interview, October 24, 2000).

Figure VI-2 indicates how ITS programs are funded from the Highway Trust Fund, which is the funding source for the Federal-Aid Highway Program and is collected through the national gas tax. The Fund is allocated to both states and internal FHWA programs. The Administration spends some of the dollars on R&D programs, one of which is the National ITS program. The program in turn includes two primary areas: research agenda and deployment programs. Research includes technical assistance and training, and dollars for the deployment program are allocated to states and cities to help foster integration of the systems. Congress earmarks all of them, and U.S. DOT has no discretion on where the money goes (Shelley Row, interview, October 26, 2000).

However, “the earmarking money is not a big influence because it is just hundreds million dollars a year, which is not big money,” says Shelley Row, Director of FHWA Office of Transportation Operations. Rather, she puts an emphasis on states’ influence in spending the federal fund by saying, “state DOTs have a lot of power in terms of how federal funds will be spent.” States are responsible for ultimately figuring out how they want to spend the funds, but the federal government does not set priority for the states. As identified in Figure IV-5 of Chapter IV, that type of federal-aid funds rapidly increased year by year and represented a 112-percent growth from FY 1992 to FY 1995. In FY 1995, the funds already reached nearly $1 billion, taking five times $197 million of the ITS special funds.
Figure VI-2. Flows of the Federal Fund for ITS Projects

Source: Shelley Row, interview, October 26, 2000.

Figure VI-2 also describes the flows of the Highway Trust Fund that is allocated to 50 states. Decisions on the allocation are made through the allocation formula of a relevant act, currently TEA-21. It should then fall into certain functional categories: National Highway System, Surface Transportation Program, Interstate Maintenance Program, Congestion Mitigation and Air Quality Improvement, Highway Bridge Replacement and
Rehabilitation Program, and other small transportation enhance programs. About 80 percent of the funding power in the federal aid remains in the hands of states.

Compared with states, local governments and Metropolitan Planning Organizations (MPOs)\(^{48}\) have relatively less authority to spend the federal dollars. In many cases, state DOTs are leaders and coordinators of ITS activities because of MPOs’ lack of technical and operational expertise on ITS and local governments’ narrow local outlook (U.S. DOT JPO for ITS, 1997b: E-50–E-55). According to a 1998 survey by the Association of Metropolitan Planning Organizations, only 27 percent of MPO respondents considered themselves as participants, 51 percent as facilitators, and 33 percent as observers.\(^{49}\)

Row also points out that “all the funding is going to states,” but it’s very difficult for cities and counties to deal with their spending authority; hence, “there is a real struggle in finding some funds allocated for the needs of cities and counties for ITS and other highway projects.” She states that U.S. DOT is concerned with relationships between cities, counties, and states in trying to be equitable, but it is often hard to draw a clear line about the responsibilities of states and those of local jurisdictions. She admits, “We don’t do a good job linking things to provide mobility to people” (interview, October 26, 2000).

Any project that uses federal funds has to be included in either the State Transportation Improvement Program or the Metropolitan Transportation Improvement Program. Hence, when included in the Programs, ITS projects have no difference from non-ITS projects. For this reason, ITS projects must compete with other funding needs for the state and metropolitan area. Row says, “It’s a big huddle in getting ITS projects built” (interview, October 26, 2000). Tarnoff also remarks, “The highway construction industry is still actively resisting ITS, and within states, the road builders’ lobby is against ITS projects

\(^{48}\) ISTEA of 1991 established MPO as the legitimate forum for regional metropolitan decision-making on transportation affairs.

because they view these as taking funding for building highway” (interview, October 6, 2000). Even from the higher level, Rep. James Oberstar (1997) takes the issue seriously:

There is no guarantee that ITS or other non-highway programs will remain…. Is it a required category, or just another way of manipulating money for the state, competing for dollars with conventional highways? How are we going to get the State Departments of Transportation, mayors, and county commissioners and communities to spend their highway dollars on the new, relatively untried, unfamiliar, technology, when they have potholes to fill, shoulders to expand, roadways to improve? (23)

Coordinative Roles of ITS JPO

At the federal level, the ITS Joint Program Office (ITS JPO) is contained in FHWA, but it is “unique and responsible for all ITS programs across U.S. DOT in planning, strategic directions, and budgeting” (Jeffrey Paniati, interview, October 25, 2000). The official objectives of the ITS JPO are to: (1) provide strategic leadership for ITS programs, (2) guide policy coordination, and (3) endure resource accountability. All modal administrators from FHWA, the National Highway Traffic Safety Administration (NHTSA), the Federal Transit Administration (FTA), the Federal Railroad Administration (FRA), and the Research and Special Programs Administration (RSPA), infrequently meet to consider the highest issues in the ITS Management Council chaired by the Deputy Secretary of Transportation. Below the Council, there is the ITS Strategic Planning Group, which represents senior leadership in each of the modal agencies. It is chaired by ITS JPO to monthly discuss policy issues or other problematic issues on decisions, budgeting, and strategic directions of the program.

JPO staff coordinates each program area and all area-wide partners. According to Jeffrey Paniati, Deputy Director of ITS JPO, “for example, the staff responsible for intelligent vehicle issues works with people from the NHTSA and FTA,” and “the staff is responsible for setting agenda of the program, for managing the budget, and for accounting

for the progress.” The Office also oversees the directions of that work. Paniati says, “We have a quarterly review process basically every three months in each program area. We get together all of the players across the Department to review the progress that has been made and what are plans for the next quarter” (interview, October 25, 2000).

However, actual program execution and implementation is conducted by other administrations than JPO. Mark Kerli, a FHWA employee, states that JPO, as an umbrella agency, formulates high levels of policy, and that funds are then transferred to modal agencies to implement projects. Hence, JPO coordinates agencies, establishes policy, manages the budget, and oversees programs, but the Office does not implement and enter into contracts generally. Modal agencies such as FHWA and FTA let contracts and work with localities identified by Congress (interview, October 26, 2000).

There is a good reason why JPO is housed in FHWA, although it is an independent and umbrella agency functionally. Paniati says, “It is primarily due to a lot of other resources we need to operate.” They needed FHWA legal council staff and federal highway legal contracting. As he puts it, “it was decided that the best place is FHWA because there is the best support there and large programs are actually carried out by FHWA.” Hence, JPO is both independent of FHWA and dependent on it. The Office reports to FHWA as well as Deputy Secretary of Transportation, although typical offices in FHWA report only through the executive director of FHWA (Paniati, interview, October 25, 2000).

Furthermore, Paniati identifies the particular way of performance assessment of his agency as follows:

The only way of being successful is to coordinate other agencies. That’s the whole purpose of JPO…. Sometimes we have to have discussion about making sure that we are considering the viewpoints of all the various agencies in the program rather than just a viewpoint of one or a couple. So, that is the challenge we have to handle, but general only way that my staff might succeed is to work with other agencies to carry out their work because they don’t produce the products that people determine are successful or not (interview, October 25, 2000).
Paniati also states that the work process is well known, expected, and institutionalized within the organization, although there are descriptions of JPO in a written document that establishes the Office—giving its missions, functions, basic responsibilities, and legitimacy. As he puts it, “the spirit of operation is there but operational procedures put in place are well-known, giving regular rhythm to the process of planning, budgeting, spending, and revising” (interview, October 25, 2000).

Advisory Roles of ITS America

Since the early history of the ITS program in the early 1990s, ITS America has acted as a formal advisory organization for U.S. DOT in the ITS area. Its JPO, a primary communication route between the two organizations, asks members of ITS America for input in a particular issue. For example, the JPO staff may ask to set up a traffic management research program to recognize what needs exist in a particular community. Then, the Traffic Management Committee in ITS America establishes a task force, from which JPO receives some immediate feedback in informal ways. ITS America subsequently develops a formal advisory committee on the basis of the task force, and the committee then formally submits its written formal advisory letter through its Board of Directors to U.S. DOT. ITS America just occasionally generates advice on a particular topic without being asked for it, but it goes through the same channels (Paniati, interview, October 25, 2000).

Paniati argues that there are no particular criteria that determine whether JPO would accept ITS America’s advice—decisions are made case by case. He observes, “The reason we ask for advice is to find outside viewpoints,” but “there are other input from political leadership within DOT and other levels of governments.” He also emphasizes, “I don’t know how well they think their advice represents all interests, but it is one viewpoint.”

\footnote{ITS America facilitates the development and deployment of ITS technologies through 20 technical committees, non-technical committees, and task forces. Its State Chapter Councils take an important role for ITS professionals at the local and state levels. Membership is about 50 percent private sector companies and 50 percent academia, government, associations. These organizations represent more than 60,000 individuals involved in ITS programs.}
Furthermore, he points out that “ITS America has to make some trade-off between the public and the private interests and hopefully find a middle ground because it is public and private, not just representing the private sector” (interview, October 25, 2000).

However, one may find that ITS America is acting beyond Paniati’s norm that it is just one source of viewpoints. According to DeBlasio, “I won’t say ITS America becomes a rubber stamp, but I’ve rarely seen the situation where ITS America has recommended something different from FHWA’s policy.” DeBlasio, who used to be engaged in ITS America, goes on say, “So, the Administration surely always takes their advice because reports are consistent in a lot of ways that they wanted to do anyway.” He points out that a high number of FHWA employees participate in ITS America for better cooperation.

Tarnoff, who used to be an activist in ITS America from its early history, identifies a more serious problem in policy input:

One of strange things in ITS America is a tremendous emphasis on Interstate travel, and not really enough on operation and local streets. For example, cities and counties spend more time with ITE [the Institute of Transportation Engineers] than with ITS America. ITS America is still dominated by defense contractors, who want to see big dollars and spend on fancy traffic control centers. They are not interested in traffic signal systems (interview, October 6, 2000).

Since the U.S. local governments are responsible for all public services related to traffic signals systems, and ITS America is not much involved with such systems, there is little representation of local governments and related businesses in the organization. Furthermore, Tarnoff identifies frequent staff turnover and the selection of Board Directors based on “big names” rather than familiarity with ITS as factors that put distance between ITS America and local concerns. As Tarnoff puts it, “a signal manufacturing association is not involved in ITS America at all, and that local governments have more relationships with ITE than ITS America” (interview, October 6, 2000).
However, the role of local governments in ITS programs has grown important over time, since TEA-21 of 1998 has shifted the program focus from R&D to deployment, which relates more fully to local government. According to Tarnoff, “more funding has recently been going to ITE as opposed to ITS America,” and “FHWA is relatively tending to use ITE more and more than in the past” (interview, October 6, 2000). Hence, it is not an exaggeration to say that ITE and ITS America are now competing with each other for federal funding and policy input.

To summarize U.S. DOT’s network, the Department is the source of regulation, resources, and information for states, but states are recognized as more powerful actors for two reasons: one, they are authorized to make spending decisions on whether the federal funds once received in a lump will be allocated to state or regional ITS projects, and two, the states, rather than local governments and MPOs, are heading most ITS projects across the country due to their greater capabilities of statewide and region-wide integration of ITS. Within U.S. DOT, ITS JPO is the coordination agency that is responsible for all ITS programs across U.S. DOT in planning, strategic directions, and budgeting. Although originally authorized as a formal advisory committee for U.S. DOT, ITS America is now recognized by ITS JPO as one source of input among various sources. Actually, FHWA is beginning to diversify informative input beyond the traditional source of input. One alternative source is ITE, which has more and better relationships with local governments.

Private Sector Partners in Implementation Networks

As stated above, defense contractors are still active in relationships with federal agencies by participating in ITS America and the development of the National ITS Architecture. However, they face totally new partners and environments at the implementation process, when they enter into partnering, or contracting, relationships with state and local governments. Furthermore, other private sector businesses in the information/telecommunication (IT) and automotive industries are emerging, or will emerge,
as main partners with lower levels of government. This section aims at drawing a picture of relationships between those three major industries and the lower levels of government at the implementation phase, and at exploring the internal dynamics of their interactions.

Defense Conversion in Trouble

As stated in Chapter V, Technology Reinvestment Program (TRP) was the first post-Cold War, dual-use initiative, but its effect quickly faded away over time. Applications for the program fund were very competitive. The first fiscal year of 1993 ended with 212 awards involving 1,631 organizations, for a total of $605 million. Only two awards, amounting to $21.4 million, could be clearly identified as ITS technology developments (Whelan, 1995: 43). Furthermore, the scope of TRP recipients began to be narrowly defined in its first few years. During the first year, the TRP selection criteria emphasized the reasonableness and specificity of the applicants’ commercialization plans as well as variety of commercial applications. However, in 1995, the original criteria were replaced by a new one: “direct, immediate benefits” to the DOD’s technology needs. While more than $500 million was awarded for 251 projects in 1993 and 1994, only $220 million of the original $400 million was conserved in the 1995 budget recession. “By the end of 1996, the TRP program no longer existed.” Dual use was narrowly defined by DOD (Kelley, 1997: 55-56). Consequently, the emerging realization was that the ITS community could no longer expect DOD funds to go to ITS program activities and that the community should develop its own strategy to stimulate the ITS market, as well as to meet changing transportation needs.

In addition to the drawback of the dual-use initiative, there were intractable managerial barriers that defense companies were experiencing in entering into the ITS market. Peterson and Olson (1995) describe four, based on interviews with 10 out of 100 defense prime contractors from the late 1993 to the early 1994. First, technology transfer to non-defense uses was slow, and valuable technologies still remained buried within their companies. Second, the defense culture was not tailored to the tendency of “their newfound dispersed customer base,” which includes state and local stakeholders as well as federal organizations, ITE is an organization of individuals.
officials. Third, federal programs to reduce market risks, such as standardization and architecture, were still under development. Fourth, there was a lack of financial flexibility in the defense divisions of their organizations. Overall, defense businesses were expecting DOT to have an important and appropriate role in reducing the market risk by helping to define the current and future ITS markets, rather than depending on the resources available within the company for an investment.

Richard Worrall, an ITS consultant, remarks, “I think essentially defense conversion is over, finished (in the ITS area).” He describes the reason of the failure as follows:

There was incredible arrogance in the (defense) industry. They were very capable technically, but they had assumptions…that they’re immediately going to be able to apply the same technology in totally different settings…. They exaggerated the capabilities relevant to the skills and underestimated the reality of problems. And the net results were that the most of the defense…got out of it because they found it is difficult. They found they couldn’t make money in the same way they were used to making money (interview, September 31, 2000).

Worrall argues that defense contractors were initially very well accepted by ITS clients because those “clients wanted to see new faces,” but the contractors largely didn’t understand their new clients, such as local governments, and their environments and insisted on acting like federal government contractors. As he concludes, “a real message is that when you try to get into a different area, you’d better focus and really understand that area” (interview, September 31, 2000). Tarnoff affirms that “there was much unrealistic expectation, in a sense, on what would be funded and what could be funded” in the early history of the ITS program. According to him, the defense industry would not come into the ITS area until it saw the results of realistic assessments, but even so expectations were too high because “there was a shared consensus on making the industry more competitive internationally” (interview, October 6, 2000).

Illustrating the difficulty is the NY/NJ/CT Metropolitan Deployment Initiative (MDI), which was designed to implement a traveler information system in the New York/New Jersey/Connecticut metropolitan area. A traditional defense contract was
negotiated between the public sector team and Lockheed Martin Federal Systems (LMFS). This made it difficult to resolve the issue of matching funds to be contributed by the private sector contract. The participants could not reach an agreement on what was considered an eligible match, and the contract resulted in a failure. Federal match requirements may apply to all government branches including DOD, but the way of interpreting the match varies by branches. DOT’s match requirements were “typically more stringent than DOD match requirements, and LMFS was more accustomed to the ‘soft’ match, such as in-kind services, used in DOD contracts” (vanderWilden and DeBlasio, 1998: 29). LMFS insisted on the soft match, pointing out “the public sector’s lack of understanding of the risk the private sector was assuming in investing real ‘hard’ match” (30).

Emergence of Information/Telecommunication Companies

Worrall and Tarnoff share the sentiment that “defense conversion now is dead duck” in the ITS area, and that the telecommunication and information technology industry today is now far more important players than the defense firms. According to Kassoff, state DOT’s Senior Manager, a problem for state transportation agencies is that they are today facing an array of complex telecommunications issues for which few are well prepared with adequate in-house expertise. Furthermore, the state DOTs are not sure of whether and how to partner with telecommunication companies or with other public agencies in meeting telecommunications needs. Kassoff goes on to argue that “telecommunications is not the core business of DOTs, yet the long term consequences of your telecommunications decisions and actions will have a significant impact on your core business and your capital and operating budgets” (Kassoff, 1997: 21).

The story of shared-resource projects illustrates the difficulties. The ITS community has considered such projects to be a favorable area for joint ventures between the public and the private sectors. In this particular type of partnership, state and local governments share their public rights-of-way (ROWs) with telecommunications companies. In exchange for the use of the ROW, the companies provide the governments with access to the telecommunications system and varying levels of communication service. U.S. DOT has
actively encouraged shared-resource projects as a way of saving millions dollar of tax money in the cost of deploying ITS technology throughout a state. However, a common problem to emerge is that because shared resource arrangements may limit access to ROWs to a single private sector partner, political opposition from excluded private competitors can arise (U.S. DOT ITS JPO, April 1996: 23-24).

This issue became salient in Minnesota’s petition to Federal Communications Commission (FCC) in December 1999. At that time, about 28 states had already revised or were in the process of revising their utilities accommodation policies to allow the installation of telecommunications on freeway rights-of-way, and states had been encouraged to follow the Minnesota model in developing the project agreements. Hence, the FCC’s decision on the petition was a critical turning point of shared resource projects and even public/private partnerships.

The State of Minnesota asked the Commission to find that its agreement with a private developer, ICS/UCN and Stone & Webster, concerning access to certain rights-of-way is consistent with sections of the Telecommunications Act of 1996. The agreement provided the developer with exclusive physical access, for at least ten years, to longitudinal rights-of-way along Minnesota’s interstate freeway system. In exchange for exclusive physical access to the ROW, the developer committed to constructing fiber optic transport capacity throughout the state and provided the state with a portion of that capacity. More than twenty states and state agencies submitted letters that generally support Minnesota’s positions, and the AASHTO Board of Directors, as well as ITS America, adopted a resolution of support. However, seventeen carriers opposed the petition and asked the Commission to preempt the agreement. In December 1999, FCC declined to grant a petition for Declaratory Ruling filed by the State of Minnesota.


According to the section 253(a) of the Telecommunications Act of 1996, “no State or local statute or regulation, or other State or local legal requirement, may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecommunications service.” Minnesota argued that firms wishing to provide telecommunications services could install their own fiber optic facilities using alternative rights-of-way such as gas pipelines, oil pipelines, and electric power lines. However, the FCC accepted the opposing argument that there were distinctive cost advantages to constructing a telecommunications network over freeway rights-of-way and that the cost differential is substantial enough to make it infeasible for a competitor to use alternative rights-of-way.

Minnesota also argued that the agreement is “functionally non-exclusive” because it requires the developer to install collocated fiber for third parties and lease or sell network capacity to telecommunications providers on a nondiscriminatory basis. In response, FCC decided that the opportunity to collocate fiber, however, was very limited because once a competitor could not enter into a “user agreement” with the developer, the competitor could have no opportunity to be involved for at least ten years. The Commission also argued that the developer might charge rates, terms, and conditions that are unreasonable so long as they are not discriminatory. The nondiscrimination provisions, therefore, are seen as insufficient to protect collocators and entities reselling or purchasing the developer’s capacity.\(^\text{55}\)

\(^{55}\) Furthermore, Section 253(b) of the Telecommunications Act of 1996 provides that “nothing in this section shall affect the ability of a State to impose, on a competitively neutral basis and consistent with section 254, requirements necessary to...protect the public safety and welfare....” On this section, Minnesota argued that the Agreement was competitively neutral because they followed a public procurement process in selecting the Developer. However, FCC decided that the imposition of requirements be competitively neutral in their effect as well as in their process. Concerning “the public safety and welfare,” Minnesota contented that allowing construction more than one every ten years would increase the risk to an unacceptable level. The Commission, however, accepted the opposing opinion that the roadside construction even decreased accident rates and no greater safety impact than typical roadside maintenance.
The FCC’s conclusion was that the agreement appeared inconsistent with the primary goal of the Telecommunications Act of 1996, effectively granting an exclusive license to the developer. Hence, Minnesota’s request for a declaratory ruling was rejected. However, it is noteworthy that the Commission also denied requests for preemption made by the parties opposing the Minnesota’s petition because of the lack of “supplemental information concerning the practical effects of the Agreement.” According the Commission, “depending on how an agreement is implemented, the potential competitive effects that fuel its concerns may be largely or wholly ameliorated.” Consequently, Minnesota was allowed to move ahead with the agreement as long as it addressed the Commission’s pro-competition concerns.

The impact of the FCC’s decision is not still clear. Even if the spread of shared resource projects is furthered, the small companies opposing exclusivity of the projects may attempt to stop them. The state and the developer expressed contradictory perspectives on what the Commission wanted, but probably the AASHTO Executive Director is correct in saying: “Minnesota’s agreement will accelerate the extension of fiber-optic service to every corner of the state,” but “I continue to be concerned about the chilling effect which further intrusion of the FCC would have in preempting States’ authority to control freeway rights-of-way.”

In addition to the matter of rights-of-way, in July 2000, the FCC made another important decision that affects the market share of information and telecommunication companies. The Commission assigned 511 as the nationwide telephone number for ITS traveler information, responding to the U.S. DOT’s petition for a national assignment of a single, easy-to-remember three-digit dialing code. Before the assignment, at least three hundred telephone numbers had been used for traveler information systems across the country. For the nationwide dispersion of 511, U.S. DOT strongly suggested regional cooperation and a single point of contact because the number 511 would be used by multiple agencies in charge with different categories of information such as real time traffic

information, transit information, commuter rail information, and weather and construction. The Department also suggested that transportation agencies contact the state regulatory agency, which had authority over any facet of 511 number administration. On funding and cost issues, DOT proposed that state and local governments utilize Federal aid transportation funding program and public/private partnerships, as well as encouraging competition among carriers (U.S.DOT ITS JPO, August 2000). However, the new assignment did not mean that the FCC order mandated the use of the number by transportation agencies or any other implementation and funding methods. Rather, it left a wide area of authority to state and local governments, and existing numbers were therefore allowed to coexist with the new number.

Although FCC’s decisions on ROW and 511 are fairly favorable to public agencies in partnering with IT businesses, it can be argued that those agencies are still responsible for providing more effective incentives to the immature ITS market. The industry lacks market information and business models. According to a business that collects, bundles, and provides information, called an Information Service Provider (ISP), no one yet knows how the revenue mechanism will combine advertising/sponsor-supported services with the ability to solicit funds directly from end-users through subscription or transaction fees. Furthermore, the ISP observes that no one has information on the true willingness to pay. Traditionally, access to traffic information has been achieved through free services on television or radio. Now, end-users still expect free services, but also like value-added services with more timely, focused, and personalized information. Consequently, as the ISP puts it, “it’s a matter of packaging them properly”...“the biggest cost is not gathering the information; it’s marketing these services to end-users.”

DeBlasio at the Volpe National Transportation Systems Center (interview, October 24, 2000) points out that in addition to an inability to measure consumers’ willingness to pay, slow governmental investment on ITS infrastructure is delaying the market entrance of the IT companies. In particular, they have waited for the public sector to build the integrated

system of electronics, communications, hardware, and software elements so that they can allow components to communicate with each other and work together. He also remarks that public agencies themselves are sometimes competing with the businesses because many agencies already have more web sites or telephone systems than traveler information systems to be developed.

Political Support for Automobile Manufactures

Many in the ITS field have expected the growing involvement of the automotive industry in the network. In particular, most interviewees for this dissertation regard the Intelligent Vehicle Initiative (IVI) as a noteworthy area to be emerging in the future. The program aims “to accelerate the development, introduction, and commercialization of driver assistance products to reduce motor vehicle crashes and incidents” (U.S. DOT ITS JPO November 1997: 1). As stated in the previous chapter, automobile manufactures have taken a major role in developing the ITS policy network since its early history. One of their great contributions was the National Automated Highway System Consortium (NAHSC), which was intended to demonstrate the feasibility of Automated Highway Systems (AHS). Among other things, the Consortium demonstrated the feasibility of both partially and fully automated vehicle-highway systems by means of a project on I-15 in San Diego know as Demo '97.

The procurement options used by the Consortium included the contracting practice of the private sector. Whereas the public sector traditionally maintains impartial, arms-length relationships with vendors, private firms attempt to foster close, flexible working relationships with their private vendors. When a private firm is uncertain as to whether it should acquire a new product or technology, the firm discusses its needs with its potential vendors without specifying all relevant details and entering into a formal agreement (U.S. DOT, June 1994: 3-2). In mimicking this practice, the FHWA solicited proposals and awarded several contracts using a Broad Agency Announcement (BAA) procurement framework that describes the project in general terms (3-4).
In 1998, building on this experience, a promising type of public/private partnership began to work within the framework of the Intelligent Vehicle Initiative (IVI). IVI is currently being implemented by a partnership between U.S. DOT and the automobile manufacturers at the federal level, but after some operational tests, the IVI systems will be nation-wide commercialized and deployed (U.S. DOT ITS JPO, July 2000: 10). The partnership will require motor vehicle manufactures to partner with state and localities where the vehicles will operate, since IVI services include vehicle-to-infrastructure as well as vehicle-to-vehicle communication capacity. For this, the Enabling R&D consortium composed of automobile manufactures is being formed to focus on pre-competitive issues, and the Infrastructure Consortium of state Departments of Transportation is being organized to focus on infrastructure issues (U.S. DOT ITS JPO, November 1999). In this sense, it is still uncertain whether the automotive industry will complete a successful entrance into the ITS market, especially with respect to maintaining cooperative relationships with state and local governments in the vehicle-infrastructure integration process.

The uncertainty of political support is another main obstacle to the intelligent vehicles R&D of automobile manufactures. Ray Pethtel, Associate Director of Virginia Tech’s Transportation Institute (interview, October 11, 2000), is optimistic with respect to federal and state R&D programs for intelligent vehicles because of growing interest in such vehicle technologies. At the same time, he is somewhat pessimistic regarding political support. As he puts it, “ISTEA created the AHS Consortium that was supposed to have six-year life with specific goals, but, in three years, Congress abandoned the program.” The R&D initiative recently revived the IVI program, but “funding has been still strained by a lot of Congressional earmarking decisions for R&D.” According to him, major reasons for the uncertainty are that while R&D is very expensive and competitive for dollars, it is invisible and takes a long time.

To minimize the uncertainty of political support, Pethtel argues that vehicle R&D requires not only public awareness but also “public support” in a more political sense though expedited vehicle-infrastructure integration. He continues, “The vehicle side is certainly growing faster than building, maintaining and operating roadway systems,” but what needs
to be achieved is “much better vehicle-infrastructure coordination and incorporation.” As he puts it, it is critical “to clearly improve safety and driver convenience on the roadway, so people see it and understand that this is a new technology” (interview, October 11, 2000). When the public perceives the technology is necessary for safety and convenience on the roadway, the automotive industry will receive more solid political support from the public and elected officials.

To summarize the conditions of three major industries in the ITS area: While defense contractors are in retreat, telecommunications companies and automobile manufacturers are emerging. A lesson is that the participating companies must have a proper understanding of new customers and their environments. Defense contractors failed to possess such an understanding in dealing with state and local governments. Despite a lack of experience, state and local transportation engineers are in a learning process for building better relationships with telecommunications companies. As their interactions grow, the FCC’s decisions are likely to have increasingly critical impacts on their relationships. Automobile manufactures currently have good partnership ties with U.S. DOT at the federal level, but their fate depends on the continuity of political support for R&D. A more real variable will be also partnering relationships with state and local governments in the future deployment phase of intelligent vehicles. Consequently, the potential of the private sector will heavily rely, in the future, on dealing with transportation engineers at the lower levels of government.
CHAPTER VII. INTERNAL DYNAMICS: PARTNERS IN MOTION

As an extension of the previous chapter, this chapter takes a closer look at the regional reality in the viewpoint of net riders. A selected case is Partners In Motion, which seeks successful governance for traveler information systems in the Washington, D.C. metropolitan area. In the ITS field, it is announced that Advanced Traveler Information Systems (ATIS) are a prime candidate for public/private partnerships. Partners In Motion is a “public/private partnership comprised of 37 agencies and business that are working together to bring a state-of-art traveler information network to the Washington metropolitan area.” In addition to being a public/private partnership, the project is also an inter-jurisdictional public/public partnership. This case affords a microcosmic view of the internal dynamics that are formed at the management level of a regional ITS project in a major metropolitan area.

Project Overview

Partners In Motion is designed to help travelers make informed decisions on the most efficient means of reaching their destinations, thereby reducing travel time and travel-related stress. Coverage area for the service encompasses the entire Washington, D.C. metropolitan area. This includes District of Columbia; Montgomery and Prince George’s counties in Maryland; Arlington, Fairfax, Loudoun and Prince William counties in Virginia; and approach routes covering a 25-mile radius from the center of Washington, D.C., as well as commuter rail and bus routes coming into the region from even greater distances.

Figure VII-1 illustrates the system architecture planned for the traveler information system. Information will be collected from the public agencies, merged with privately collected information, and housed in the database of a traveler information center. It will then be disseminated by independent service providers through a variety of technologies, such as telephone, Internet, personal pagers, cable TV, kiosks and in-vehicle navigation.

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58 Partners In Motion at a Glance, Pamphlet offered by FHWA in October 2000.
devices. At the same time, participating public agencies within Virginia, Maryland, and D.C. will have access to the information.

Figure VII-1. System Architecture for Partners In Motion

Source: Partners In Motion…A Public/Private Partnership Project, Slide offered by FHWA in October 2000.

In the 1980s, elected officials began to have concerns about increasingly severe congestion in the Washington, D.C. metropolitan area. They tried to address the issue, but

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59 Ibid.
60 The Washington, D.C., metropolitan region is the second most congested area in the U.S. The region also has the second longest commute time, and area residents spend a cumulative 552,900 hours per day stuck in traffic, costing $1,450 per car per year. Over the next 25 years, traffic in the region is expected to increase by 70 percent while highway capacity will
multiple jurisdictions were hard to coordinate. In fall 1995, a few public agencies met to
discuss congestion in the area, and Congress earmarked funds for congestion mitigation: $4
million in the fiscal year 1996 and $3.5 million in 1997. A consensus developed within the
group to use the funds for traveler information (Thomas Jennings, interview, October 13,
2000).

Early leaders of Partners In Motion included Administrators from three federal and
state agencies: the Federal Highway Administration (FHWA), the Virginia Department of
Transportation (VDOT), and the Maryland State Highway Administration (MSHA). At the
lower level, field leaders, such as James Robinson in VDOT and Pamela Marston in the
FHWA Baltimore Regional Office, took the lead in creating a supporting coalition (Glenn
McLaughlin, interview, October 6, 2000; Jennings, interview, October 13, 2000).

While the key organizations were transportation agencies from Virginia, Maryland,
and Washington, D.C., VDOT agreed to procure the traveler information system in behalf of
the region. FHWA headquarters, through the FHWA Richmond Regional Office, awarded
the congressionally earmarked grant to VDOT. In 1996, FHWA and VDOT negotiated a
partnership agreement that VDOT shall “maximize the involvement of the State and other
project participants in the ITS program.”

Thomas Jennings at the FHWA Virginia Division Office states that the primary task
of FHWA in Partners In Motion was to oversee the progress of the innovative structure.
Federal goals were “trying to develop a public/private partnership that will provide
information to the public” and “learning on how the two sectors can be brought together and
work together.” Indeed, Jennings stresses the importance of this institutional learning
component; we must differentiate “what can be done from the technical standpoints and

only increase by 20 percent (Partners in Motion…A Public/Private Partnership Project, Slide
offered by FHWA in October 2000).

61 VDOT internal document, “ITS Partnership Agreement between The Federal Highway
Administration and The Virginia Department of Transportation: Project No. ITS-9651(604):
National Capital Traveler Information System,” signed on September 1996.
from the institutional standpoints.” He says, while technologies have been matured, institutional issues, such as innovative procurements and public/private partnerships, are fairly new experiences and provide lessons to everybody (interview, October 13, 2000).

It is noteworthy that the successful initial progress of Partners In Motion was largely attributed to a substantial level of trust and partnership experiences between at least two primary state highway departments, VDOT and MSHA. Glenn McLaughlin at MSHA states that, before the project, ITS-related officials in VDOT and MSHA had “a substantial level of trust” as working together in several ITS projects including a federally funded highway-planning study and the I-95 Coalition (interview, October 6, 2000). Hence, they could save time on building a regional consensus among all partners.

The importance of trusting relationships has been noted by observers of other technology-related partnerships. In their study on four metropolitan areas carrying out the Model Deployment Initiative (MDI), DeBlasio et al. (March 1999: 5-18) suggest that partnerships, or networks, use existing social relationships, which will lay the basis for trust and a shared vision. For instance, in the AZTech MDI project in Phoenix, Arizona, participants came together to group faster than in other areas because they knew each other from previous studies or programs. The speed of this process is especially noteworthy in that the project included many interagency agreements, and also that a county, not a state, led the project (Allan DeBlasio, interview, October 24, 2000).

Shared Resources and Risks

In the Partners In Motion project, a partnership of 25 public agencies has a contractual relationship with a team of 12 private organizations. Specifically, the contract is between VDOT on behalf of the public sector and Battelle Memorial Institute (hereafter Battelle) on behalf of the private sector. Battelle, a non-profit organization, is a coordinating

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62 They include Seattle, Washington, Phoenix, Arizona, San Antonio, Texas, and the NY/NJ/CT (New York/New Jersey/Connecticut) metropolitan area. Theses areas, selected by U.S. DOT in 1996, have been carrying out the operational tests of a fully integrated, metropolitan-area Intelligent Transportation Infrastructure.
business and project agency. The relationship between Battelle and VDOT is a contract, not a partnership, and it is no different from other normal contractual arrangements; hence Battelle is not a partner, but a contractor (Robinson and Kell, interview, October 13, 2000).

Two separate partnerships exist within the project. One is related to a traveler information system dimension, where the partner of VDOT is SmartRoute Systems, Inc. (hereafter SmartRoute), a subcontractor of Battelle. The other is information exchange among the public agencies involved. James Robinson, Director of ITS Division at VDOT, emphasizes that there are “true partnerships” and “a lot of sharing” in Partners In Motion. According to Todd Kell, Senior Policy Analyst of the same agency, in the relationship what was shared included substantial risks to all participating organizations.

The pamphlet entitled Public/Private Partnerships for Intelligent Transportation Systems (VDOT, March 1999: 2) describes the concept of the partnerships to be reviewed by the potential partners of VDOT. The partnership refers to “an arrangement of roles and relationships in which two or more public and private entities combine resources to achieve their individual, and often divergent, goals through the joint pursuit of one or more common objective.” VDOT also defines three important dimensions to the partnerships.

First, “pooling resources distinguishes partners from traditional fee-for-service contracts where resources are exchanged.” Resources may include “financial and intellectual capital, time, goods, land, and intangibles such as name recognition or access to a client base.” Second, the two parties share both benefits and risks. Third, there must be a “motivating reason to maintain the partnership.” For instance, the partnership may allow for sharing the service or product that neither organization could provide on its own.

Figure VII-2 illustrates pooled financial resources in Partners In Motion. The total cost is valued at $12.2 million. About one-third of this amount, $3.9 million, is being funded by the private sector. The six-year project is initiated largely with public funds, but after three years it will continue and expand exclusively through private funds generated by revenue from various travel information products and services. The public sector will share
10 percent of the revenue, called a Reinvestment Pool, which will be used primarily for further system enhancements.

Figure VII-2. Financial Commitment of Partners In Motion

Source: Robinson, interview, October 13, 2000; and Partners In Motion…A Public/Private Partnership Project, Slide offered by FHWA in October 2000.

However, even under the private sector financed phase, the public sector may still finance the unexpected additional costs of the project at the contractor’s request, which must be made forty-five days before the completion of the public sector financed phase. Subsequent one-year periods of the contract will operate in a similar way. Hence, neither of the contractor, nor the public sector, is required to obligate funds in excess of the
Reinvestment Pool’s current cash balance less known expenditures. If any excess funds will remain in the Pool at the completion of the contract, then they will be forwarded to VDOT.\(^{63}\)

While receiving some funds for the first three years from the public sector, SmartRoute, VDOT’s partner, not only builds, operates, owns and maintains the system, but also provides traveler information services to the public via telephone, Internet, and other lines. Robinson describes sharing relationships in risk and revenue between VDOT and the company as follows:

If they never make money, they will lose money and go to bankrupt. That’s a big risk. We do have revenue sharing as well. If the contract will fail and go out of business, newspapers are going to say VDOT wasted money. That’s a big risk to VDOT, too. We are sharing risks. After the third year operation, they will share 10 percent gross revenue with public partners (interview, October 13, 2000).

The partnership outside of SmartRoute is characterized by a public/public partnership in information exchange. The Agency Data Server was conceptually the dial-up connection for each agency to be able to enter information into the system and have equal access to it. For instance, once VDOT has information on a major incident on an Interstate highway, the information will be disseminated to all partners outside of Virginia as well as Virginia local partners such as Arlington County and the City of Alexandria.

However, “as a matter of fact, it didn’t work,” admits Robinson. Each agency had only one workstation, only one person had access, and information input was too slow. Robinson recalls, “nobody saw the value of it, and they didn’t use it. So, we just terminated the server.” Instead, through the Internet, partners are using the same concept as the originally conceived information exchange. Hence, information is available on any computer that has access to the Internet with a password. Robinson says, “Any public agency on the list will have opportunities to enter and exchange information through the Internet base system” (interview, October 13, 2000).

Under the Council of the District of Columbia and one of its committees called the Transportation Steering Committee, the ITS Task Force has a meeting every month and the Partners In Motion subcommittee is convened whenever it is needed. McLaughlin remarks, “From the structure, we get to know each other, build working relationships, and communicate on Partners In Motion. Instead of having a formal contractual type of monitoring or guidance, everybody has equal voice in the committee meeting and usually we come up with a consensus” (interview, October 6, 2000).

For successful network management, there should be facilitative leadership, or at least a single point of contact. For instance, the New York/New Jersey/Connecticut (NY/NJ/CT) MDI was in trouble in its initial negotiation process, since “the lack of a single point of contract for the public sector, and the division of lead agency responsibilities for operations and contracting…delayed negotiations and created confusion regarding who had the authority to make a final agreement for the public sector.” Furthermore, a project manager was not hired for nearly one year after a project proposal was submitted (vanderWilden and DeBlasio, 1998: vii).

On behalf of public agencies in Partners In Motion, VDOT acted as a depository of funds from all public agencies and contracted with a private-sector contractor. Also, the Department led the development and operation of the partnership in accordance with its agreement with FHWA. In particular, VDOT project managers Robinson and Kell were empowered with authority to make commitments and negotiate for the public sector.

The VDOT project managers have common leads throughout the project, but they also remark that their role is based on an “unintended strategy.” It is because a predetermined strategy may spoil ongoing consensus building as they often deal with the partners, especially with private partners sometimes on a daily basis for weeks of time. As Kell puts it, “there may not be a strategy and may be unintended consequence,” but their role “provides some continuity to leads, policies and mindsets of VDOT that hopefully help the project smoothly” (interview, October 13, 2000).
The contract does not include measures required to evaluate policy outcomes. Kell argues that it is thus impossible to implement “monitoring” in a traditional way. It is difficult to determine whether vendors are doing what agencies originally thought and if they are doing the level that is acceptable to what agencies want. Kell remarks, “A kind of frustration on our part is that we cannot make them do that because there is no written agreement in the contract.” For example, a public agency may expect its private partner to update a video image every third minute, but it is actually done every five. This example never happened, but the decisions of private partners tend to be flexible under variable conditions because ultimately their goal is “to survive and to make profits” (Kell, interview, October 13, 2000).

In Partners In Motion, the only element of a “traditional way of monitoring” is monthly progress reports on achievements, problems, next-month plans, and all other progress. Because the contract includes no written performance standard required of the partners, VDOT is trying to evaluate policy outcomes rather than immediate policy outputs. Robinson explains:

We invest public funds in this project. An issue is not what services they [private partners] provide, but whether the expenditure of public funds is cost effective to improve transportation. The way we try to determine this is an evaluation based on user feedback. So, …we don’t have any rule or requirement [for monitoring]. We did develop what is different from traditional monitoring system. We developed an evaluation plan, with which George Mason did surveys on what we did for the last three years. It’s on effectiveness of the project, not individual service they provide.

VDOT generally makes greater efforts to operate a whole system properly and to improve policy outcomes rather than to investigate the specific activities of individual private partners. A primary measure of program success is a survey on travelers’ behavior by the third party. Also, through “the Partners In Motion Subcommittee” or “the operational committee,” VDOT receives progress evaluations by the other partners. The committee meets irregularly to discuss various issues currently developing in the project; and “it’s not monitoring, but more an operational development group,” remarks Kell. He also emphasizes
a critical value that makes it possible not to rely on traditional ways of monitoring: “It’s trust. It’s not to direct other parties” (interview, October 13, 2000).

Although the nuances of partnerships are embedded in the overall progress of Partners In Motion, the “Services Contract” includes the attached official document entitled the “Statement of Work,” which defines the roles and responsibilities of the private sector in the project. The document describes the objectives, major tasks and activities, and deliverables in thirteen functional categories, as well as project schedules.

To maintain accountability, it is still necessary to define the institutional roles of partners as clearly and early as possible, based on the strengths of each partner. However, this concept of role definition differs conceptually from functional specification as a major component of bureaucratic structure—where roles are already given and not the result of negotiation based on the strength of the parties. A further difference is that partners share risks regardless of divided roles. According to DeBlasio, after some public agencies in MDIs predetermined the role that the private sector should have, they switched from having partners to having a vendor and contractor-contractee relationships (interview, October 24, 2000).

To some interviewees, business reputation and program visibility are main variables that stimulate private contractors, or partners, to act cooperatively and to pay attention to accountability. According to Jennings at the FHWA, one of reasons why private businesses are getting together is that the DC area is exposed and has high visibility (interview, October 13, 2000). McLaughlin also argues that “Partners In Motion is a highly visible project in the DC area” and that “when it fails and the businesses walk away, their reputation and standing will be really damaged.” While Battelle, VDOT’s prime contractor, is not a normal company but a non-profit research organization that “does not necessarily optimize profits,” SmartRoute is definitely a business looking for profits. Nevertheless, the company still needs a reputation to expand its market share because it is a growing business that is currently expanding its traffic information services to New York, Philadelphia, and various areas (McLaughlin, interview, October 6, 2000).
Figure VII-3 is a brief illustration of the implementation network to carry out Partners In Motion. Jurisdictionally or functionally, different public agencies at various levels are connected through pooled resources and information. On behalf of them, VDOT received a congressionally earmarked fund, and FHWA was authorized to determine if the project is carried out in accordance with federal goals. VDOT, as a delegate for public agencies, also has a contractual relationship with Battelle, on the one hand, and a public/private partnership with SmartRoute, Battelle’s subcontractor, on the other hand.

Figure VII-3. The Implementation Network of Partners In Motion
Legal Issues

In the case of Partners In Motion, it was the partners’ intention to pursue the flexibility of a partnership arrangement on the basis of trust. However, if this aim was to be achieved, there were some significant procedural and legal issues that would need to be resolved and written into the agreement. Among them are issues of procurement and intellectual property rights—known as the most time consuming and irritating legal constraints faced by ITS participants (U.S. DOT JPO for ITS, 1997b: 27 and 57). We now turn to how those issues were handled in Partners In Motion.

Procurement

It has been argued by ITS professionals that traditional procurement methods are not suitable for ITS deployments because they create less flexibility in the timely procurement of technologies as well as lead to low quality. In particular, partnering arrangements put in place for ITS deployment are contradictory to traditional procurement mechanisms. One reason for this is the fast-changing nature of the technology. Kell remarks, “We would adapt to new technologies and create partnerships quickly and easily.” Now, technology changes too rapidly to be caught by traditional procurement processes. As Kell puts it, “once you send out proposals, get the requests, analyze them, determine who you want to go with, and then negotiate to have a contract…. In general, it takes us a year to go through procurement processes in many cases” (interview, October 13, 2000).

Yet, the Virginia Public Procurement Act governs all public/private partnerships in Virginia, and VDOT argues that, according to the Act, “competitive procurement is the preferred method to develop partnerships to provide ITS services in Virginia” (VDOT, March 1999: 1) Competition, a main thrust of the Act, is achieved through two types of contractor selection: competitive bidding and competitive negotiations, called competitive proposals in most states. When it is justified in writing that competitive sealed bidding is not appropriate, competitive negotiations can be used.
In Partners In Motion, the private sector contract was selected through competitive negotiations for good reasons. While competitive bidding is preferred for goods and non-professional services, professional services are obtained through competitive negotiations, when price criteria, the only factor in competitive bidding selection, are not considered until after the offerors of a Request for Proposal (RFP) are ranked and negotiations begin. Since price is the only factor in competitive bidding selection, the contractor only meets the specifications without regard to quality (Williams and Schott, November 1994: 12-18).

Furthermore, VDOT, like any other transportation agency, traditionally acquires highway design and construction services separately through the design-bid-build approach. The Code of Virginia authorizes the limited use of the design-build approach as an alternative to the traditional one. It is permitted only for certain capital outlay projects (Williams and Schott, November 1994: 5-6). In the new technique, a single contracting entity both provides design service and constructs the project under one contract. Through seamless transition from design to construction, contractors have more capability to maximize flexibility for innovation in the selection of design and construction techniques. Also they can minimize implementation timelines by starting construction activities prior to completing all design details. Furthermore, a single point of responsibility for all project processes improve project consistency, continuity, and overall quality assurance, as well as reducing the potential for conflict of interests between designers and constructors.64

Partners In Motion adopted an applied form of the design-build method. The contractor is committed to not only a full course of system-related technical activities ranging from system definition to system operation and maintenance, but also non-technical matters such as marketing and public relations, information dissemination, evaluation, and

training. The non-traditional procurement methods adopted by VDOT provide the private contractor with more contractual flexibility.\textsuperscript{65}

The form of payment is another issue that must be dealt with in ITS deployments. Traditionally, public agencies prefer a firm-fixed-price (FFP) contract for specific deliverables, largely due to a limited budget and a needed commitment to deliver projects without additional costs. In contrast, the private sector businesses generally have a preference for a cost-plus-fixed-fee (CPFF) approach for more contractual flexibility. Partners In Motion has adopted the CPFF, and VDOT shall pay the contractor actual costs, plus a fixed fee amounting to $701,689.\textsuperscript{66}

However, when VDOT wrote provisions in the contract, they were contrary to traditional Virginia procurement law. The Virginia Office of the Attorney General opposed VDOT with respect to signing the contract. When agencies purchase goods and services, the Attorney General’s people reasoned, measurable quantity such as miles and dollars should be available. However, it was difficult for the Department to know how to measure the traveler information services and what to pay for. According to Robinson, VDOT paid for “negotiated amounts,” but “services people receive were more than amounts, and there is no really measure” (interview, October 13, 2000).

\textsuperscript{65} When the transportation agency still wants to maintain authority for project control and management, it may adopt the systems manager technique, which combines the design-bid-build and the design-build methods. A systems manager provides system design and integration functions and technical assistance to the agency under engineering and design contracts, and various contractors under different construction contracts perform all construction activities. Instead, the transportation agency may employ a project manager, who is responsible for direct management and control authority on behalf on the agency without committing to design functions. For more provisions to complement the design-build and the systems manager methods, see \url{http://www.its.dot.gov/cybersocs/edldocs/3029}.

\textsuperscript{66} The actual costs include “such items as direct salaries, payroll burden, indirect cost or overhead, computer cost, and non-salary direct costs as deemed allowable in accordance with the Federal Acquisition Regulations and the contractor’s standard accounting practices” (Article III of “Services Contract for the Washington Metropolitan Traveler Information Services,” signed on December 1996).
However, VDOT was not bound by the Attorney General’s opinion; he just advises on legal issues, and is not supposed to be a policy advisor. Robinson recalls, “it happened five or six years ago, but it hasn’t changed.” Today, VDOT is still doing the same things. The Office and the Department are still discussing intellectual property rights, liability, privacy, and non-traditional contracts, and the Department has the Office of the Attorney General review them from time to time. The Office still doesn’t think the Department should do it because “it’s not a traditional procurement and it’s not that legal.” Robinson observes, “doing anything in the ITS field is not a direct purchase of something such as buying CCTV cameras or monitors. It’s hard to measure.” Currently, VDOT is measuring how many phone calls and web hits are served for a month. Also it is conducting a survey on what travelers are doing with that information (Robinson, interview, October 13, 2000).

Intellectual Property Rights

Within the ITS community, it has been widely accepted that the creation of public/private partnerships at the state and local level will be impeded by concerns over the allocation of rights in intellectual property developed with public funding, such as computer programs, patentable inventions, and propriety technical data. By integrating experiences in operational tests across the country, DOT (U.S. DOT JPO for ITS, 1997a: 27-37) suggested that ITS partners address the issue early in the negotiations and clearly define the rights to pre-existing technology developed by private contractors prior to contracts as well as the rights to technology developed or enhanced during the course of contracts.

Although federal policy has led to little uniformity among states on the issue, a clearer guideline was presented in a March 1997 letter that FHWA’s Associate Chief Counsel sent to Maricopa County Department of Transportation, a lead agency of the AZTech MDI in Phoenix, Arizona. A fundamental principle enunciated is that FHWA’s use of copyrightable and patentable products is limited to non-commercial purposes, since otherwise there will be competition between the Administration and the private sector. This
would, the letter states, “diminish the market for industry and would be contradictory to the broad mandate provided in the ISTEA.”

According to the letter, the Common Rule at 49 CFR § 18.34 provides the government with “a royalty-free, nonexclusive and irrevocable license to reproduce, publish, or otherwise use and to authorize others to use for Federal Government purposes” copyrightable works developed with Federal funds. Also, the letter stated that 37 CFR Part 401 at 401.14(b) “provides contractors with title to patents made with Federal assistance in exchange for royalty-free use by the federal government.” The scope of the license included “use for research and development and support services performed under a FHWA procurement contract” and “use of the subject invention on a federally-owned road.” It excluded “sublicensing the technology to a state or local government, bridge, tunnel or turnpike authority, or private entity for uses unrelated to the two described above.”

The letter concluded that the purpose of the guidance is to “ensure that the agency’s minimum needs (author’s emphasis) are adequately met, leaving contractors with the rights to generate private sector investment and develop commercial applications in the copyrightable work or patentable invention.” On the basis of the FHWA letter, the AZTech public officials developed two licensing agreements: (1) if private sector participants brought pre-existing products to the MDI, then the participants exclusively own the products, and (2) even if products are developed during the MDI with public funds, then the private sector developers still own the products and the public sector has just a free license to use the products for governmental purposes. Consequently, both of the federal policy and the AZTech agreement narrowly restrict the public sector’ ownership of intellectual properties primarily in order to promote the industry.

In contrast, the Partners In Motion agreement favors the public sector by defining its rights more broadly than in the two cases above. A reasonable assumption is that the

67 Letter from FHWA counsel to Maricopa County Department of Transportation, Arizona, in March 4, 1997.
“contractor reserves all rights in its intellectual property developed prior to the project, and that “no right to use the intellectual property outside of the project shall be transferred to VDOT by virtue of funding this project.” However, in terms of the products developed during the project, the party of funding sources has the ownership of the products. Hence, the property developed exclusively with public funds shall be owned by VDOT, and the property developed exclusively at private expense shall be owned by the contractor (or its respective subcontractors, as applicable). Once intellectual property is developed with mixed funding, the contractor shall own it but VDOT and the Federal Government shall have “a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced such intellectual property for any use of the Commonwealth of Virginia or the Federal Government.”

To summarize the legal issues, Partners In Motion balanced the preferences of the public and the private sectors. The public agencies have a relative advantage in the issue of intellectual property rights, in that their opportunities for ownership and free licenses are more broadly defined than in federal policy and other regional ITS projects. In contrast, a great deal of flexibility, in favor of businesses, is insured in the procurement process. Despite some contradiction to state laws, the public sector adopted three non-traditional approaches: a competitive negotiation, the applied form of the design-build technique, and CPFF. Such a balanced resolution in those two subtle and arguable issues will be a good partnership strategy that enables equal power distribution among network members as well as network stability. Insisting on traditional methods will be a stumbling block even in initial negotiation processes, resulting in the early breakdown of partnerships.

Institutional Issues

While progress is being made on procurement and intellectual property rights, other institutional problems remain unresolved. Robinson observes that in the governance of

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68 See the Article XXXIII of “Services Contract for the Washington Metropolitan Traveler Information Services.” Intellectual Property means “copyrights, patents, and any other form of intellectual property rights covering any data, data bases, software, inventions, training manuals, system design or other proprietary information in any form of medium.”
Partners In Motion, the unresolved institutional issues seem endless. He says, “This is too big, too complex. Nobody can understand and handle it” (interview, October 13, 2000). Two remaining questions are now discussed, potential inequities among partners and problems of applying the standard business model.

Free Rider Problems and Value Conflict

McLaughlin at MSHA remarks that VDOT “has the biggest voice because they have money” and that “they are leading well.” VDOT employees agree that their agency has the biggest influence at least in a contractual relationship with Battelle because the contractual agreement is made between the Department and the company (Robinson and Kell, interview, October 13, 2000). Robinson at VDOT argues, “Maryland, Virginia, and Montgomery County started it [the project] and are most influential,” but in terms of the contract, they [Maryland and Montgomery County] cannot make decisions again, once decisions are entered in the contract because “that’s our contract” (interview, October 13, 2000).

Among local governments, there are different levels of participation in the project. The governments usually provide transit and signal information to the other partners. According to an interviewee who prefers to be kept anonymous, some of local governments are “very active because they see potential money,” but actually “every local government has different perspectives on what part they can be.” As the interviewee puts it, some agencies wanted to split revenues up while others were willing to invest them back in the system. In another case, the officials of a county were “frustrated” by duplicated investment because they had a lot of their own ITS technologies in place already before the project.

Unfortunately, no written agreement defines equal contribution to putting data into the shared database among public agencies. As McLaughlin at MSHA puts it, “it was successful about the origin of Partners In Motion, but one of systems that didn’t work well was automatic access to data from different agencies going into systems.” To McLaughlin, the reason for the failure was an institutional problem in encouraging the continuous equal
contribution among different jurisdictions. MSHA, as an independent collector, has been collecting data for Maryland for the operational purposes, but all of the agencies involved have different capabilities of collecting information. For this reason, “partners have competition with each other, and everybody doesn’t have equal access currently,” McLaughlin points out (interview, October 13, 2000).

Even from the federal employee’s perspective, the issue of information sharing and equal access turned out to be a stumbling block. As Jennings puts it, “they are trying to have a system whereby each jurisdiction will be entering information, and all organizations have access to that network. But, some jurisdictions failed to put information. That approach did not work well, resulting in some modification.” Hence, there is indeed a “free rider” problem.

Kell, the VDOT project manager who is currently leading the partners, addresses more reasons for not participating, as well as a positive relationship between the levels of participation and the levels of power:

The major influential stakeholders really drew the inception of the project. But those who have influence today... are people who show in every meeting to have something to say, who are willing to try the new technology...and who are true partners trying to share information. [However,] partners’ participation is very difficult. So many different partners, especially in the public sector, change in position or job description. One person leaves, and then nobody in the agency comes to any meeting for years. Or, people get busy or don’t see benefits, and then they no longer participate (interview, October 13, 2000).

As Kell puts it, “part of my job is trying to get people back into the participation.” There is no official penalty against not participating, but he often told the partners that “if you don’t participate or don’t come to the meeting, you shouldn’t complain about what you’ll get in the end.”

As found in many MDI projects, the ongoing support of participants is especially important for ITS projects because they require more resources and efforts for operations and management than for construction (DeBlasio et al., March 1999: 45-47). Above all, an
appropriate committee structure should be established, and incentives for participating should be provided. However, ongoing active participation may be inherently difficult like any other meeting. In particular, the turnover of key staff in the middle of the project is often a critical factor causing the cease of participation. Hence, it is most important for every partner to recognize that active participation has increasingly a positive relationship with its own voice and influence in the partnership.

Although the public/public partnership is troubled with the lack of participation, more possibilities of conflict lie in the public-private relationship. Robinson argues that conflict is more often found in the public/private partnership rather than public/public partnership because of different perspectives in many aspects between those two sectors. He observes, “Public and private sectors have totally different objectives,” and “they are in conflict in many ways.” Public agencies’ whole goal is “to disseminate information as widely and cheaply as possible.” In contrast, private businesses have to “make profits and charge somebody and somewhere” (interview, October 13, 2000).

In sum, it is fundamentally required that partners recognize differing objectives among themselves, as also found in the MDI projects (DeBlasio et al. March 1999: 37-38). The difference might turn into conflict between the public sector aiming at the public interest and the private sector seeking profit maximization. Even within the public/public partnership, varying perspectives may result in apathy or intentional retreat, depending upon jurisdictional interests and the level of possessed resources. By understanding the differences, partners can be more patient in developing a common objective in the short term and trust in the long term.

The Lack of a Business Model

As Robinson puts it, “technology is not a problem and it’s been done,” but “business models and institutions will keep things happening.” What he calls a “business model” has different levels—“creating data, collecting data, using data, and disseminating data.” However, he argues that there are lots of ways to collect, own, and put data together, but
there are no right models on the issue. “They are not clear to us at all at this point,” he admits (interview, October 13, 2000).

Perhaps, the most fundamental question of the standard business model is who pays for data. Robinson observes that in traveler information some revenues flow from advertisements and other kinds of things, but the public wants traveler information services to be free because “quality of information still is not high.” “It is a good reason the public won’t pay for it,” and “that’s a national issue,” he remarks (interview, October 13, 2000). Kell also points out that many information services are becoming widespread and available throughout the country, but “marketing communication services is the weakest part so far.”

In particular, the market share of Partners In Motion services called SmartTraveler is still low compared to other traveler information services, although the number of customers who seek to save travel time and avoid traffic problems from the use of the SmartTraveler service is growing year by year. In 1999, the SmartTraveler phone service, web page, and Cable channel captured 1.4%, 3.7%, and 2%, respectively, of the driving age population. Its casual use increased over time, but regular use either decreased or remained constant. Its use for trips other than the commute also decreased over time.\(^{69}\) These negative trends may indicate either dissatisfaction of the service or a decline in the demand for traffic information.

Furthermore, as McLaughlin points out, “public awareness and availability of services in Partners In Motion are major weaknesses of this more than in other projects around the country.” According to general phone surveys, only 11% in 1997 and 16 % in 1998 of the driving age population had heard of SmartTraveler (Schintler, June 1999: 7). The service has “a fairly loyal customer base.” In 1999, “almost all of its phone service users were return visitors and over 50% were long-time customers having first used the service a

\(^{69}\) A draft of the second edition of Schintler, June 1999, offered by George Mason University in September 18, 2000.
year or more ago.”

Hence, the number of new customers for the information services is not growing much.

To summarize the case of Partners In Motion, it presents a valuable lesson for successful implementation networks. A primary requirement is to form “nuances of partnering” (DeBlasio et al., March 1999:37). This idea includes shared vision and shared power as well as trust. Traditional monitoring and control over individual participants are meaningless. Instead, the outcomes of the whole system are critical. The network is flexibly modulated through ongoing interaction and communication in consensus building processes—with organizational influence becoming correlated to the degree of participation over time.

However, it is extremely difficult to develop and maintain trust without written policies or agreements on some critical issues. Serious uncertainty arises from inherent perceptual differences between the public and private sectors as well as from the problem of free riders. Roles and responsibilities must be defined, legal concerns such as intellectual property rights and procurement must be faced, and relating financial contributions and revenue shares must be addressed. The purpose of such written policies is not control and inflexibility, but the further improvement of trust and belief in risk sharing among partners.

It was wise that Partners In Motion adopted the preferences of both the public and private sectors in terms of procedural and regulatory issues. While the public sector had a relative advantage on intellectual property rights by broadly defining its ownerships and free licenses, extensive flexibility was ensured in the procurement process in favor of the private sector through non-traditional approaches. A good partnership strategy involves a balanced resolution of these matters that enables shared power among network members and thus network stability.

Compared to other more dispersed areas, the D.C. metropolitan area was relatively easier to draw the interests of elected officials and top transportation decision makers in

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\textsuperscript{70} Ibid.
using ITS, since the visibility of concentrated traffic problems was high. The area is geographically particular as the nation’s capital and the second-highest congested area in the U.S. Their visibility was critical to the willingness of the private sector partners to seek success. Their business reputations, needed for market expansion across the U.S., were on the line. However, the lack of public awareness and use of the traveler-information services still remains a primary stumbling block. An immature market nationwide and the lack of appropriate business models have made it difficult for the private sector partners to commercialize traveler information of value-added high quality and to stimulate the consumption of the services.

Reprise: a Picture of the ITS Policy Network

From the perspective of “net riders” who are involved in ITS areas on a day-to-day basis, Chapter VI and VII discussed complex interactions among multiple policy actors. This section attempts to organize the interactions by two main variables: degrees of cooperativeness and interdependency. The former depends on goal and value conflict, and the latter relies on power asymmetry. Policy networks are the structural collective outcomes of purposive actions, which multiple policy actors take to attain different goals or to affect policy processes and outcomes. Therefore, the shape of a network depends on the interorganizational compatibility of values and the distribution of power.

Figure VII-4 is a full picture of the ITS policy network that is looked at by “net riders” from within a net. In terms of the degrees of cooperation (Marin, 1990), some ties are constantly either “cooperative” or “conflictual,” but some others are “inconsistent,” shifting to either cooperative or conflictual over time. Two parties may create “indifferent” ties to a third party that has no stake in the result of a dispute and thus is appropriate to reconsider decisions made. Furthermore, dyadic relationships may reveal varying degrees of interdependency; in other words, while most relationships are “interdependent,” some others are less interdependent and thus more or less “dependent” or “independent” (Thompson, 1967: 54-55). The variation depends on not only where resources, authority, and information are available, but also how they flow from one actor to the other. In the diagram, arrow
Figure VII-4. The ITS Policy Network
directions represent those flows; hence, those who receive the flow are dependent on the source of the flow, and two-way directions indicate interdependent relationships. A few paragraphs below explain the diagram.

The global networks include three functions: standardization, professional gathering, and research. U.S. representatives from DOT participate in global standardization activities along with U.S. business delegates from Standardization Development Organizations (SDO), which are also interactive with DOT at the national level. While ITS America is authorized by U.S. Congress to advise DOT, it has a Secretariat role in ITS World Congress along with other regional groups, VERTIS (the Asian-pacific area) and ERTICO (Europe). Two global research institutions are connected to each other and DOT, primarily for the reason of information.

Within U.S. DOT, ITS JPO as a coordination agency delivers policies and allocates resources to intermodal agencies on the basis of decisions made by its higher levels of entities. While companies from three main industries are members of ITS America, each of the industries has different relationship with other actors. While automobile manufactures are in a partnership with DOT for the IVI program, defense contractors have a contractual arrangement with the Department for the development of the national ITS architecture.

Defense contractors have also attempted to partner with state transportation agencies for ITS deployment, but their attempts often fail, primarily due to incompatible perspectives. Instead, information/telecommunication companies are emerging as new partners with state agencies; yet, the public and the private sectors here are in a learning process to understand each other. The FCC’s ruling decision is a critical role in resolving telecommunications issues.

Although state transportation agencies are affected by federal regulation, resources, and information, they are authorized to make spending decisions on whether the federal funds, once received, will be allocated to state or regional ITS projects; hence, states have
been recognized to be a powerful actor. Furthermore, most ITS projects across the country are headed by states rather than local governments because states have more advantages in statewide and region-wide integration of ITS. Yet, if cities or counties have already established their own system or have other reasons for independence, they are not necessarily cooperative for public/public partnerships. Accordingly, the degree to which states and local governments are cooperative varies project by project.

Congressionally earmarked funds are decisive impelling forces for many ITS projects at various levels of government and R&D activities. NAWG, composed of DOT and transportation-related associations, provides a useful Internet source to all levels of ITS officials. ITE is another professional group compatible to ITS America and is a major information source to local governments, which have fewer relationships to ITS America, usually focused on higher levels of policy.

The networks featured by net riders also can be presented through Figure VII-5 and Figure VII-6, which describe the external relationships of U.S. DOT and of state transportation agencies at large, respectively. Since U.S. DOT has interdependent and cooperative relationships with a majority of actors (see Figure VII-5), it is concluded that the Department and many other actors tend to share power equally and that their network relationships tend to be quite stable. In general, state transportation agencies (see Figure VII-6) are cooperative with, but dependent on, their higher levels of public institutions. Also, they have interdependent, but still conflictual or inconsistent, ties to local governments and businesses. This is reasonable in that most of those agencies are seeking to share power with those actors in partnership forms or in more flexible contractual arrangements, but they often confront intuitional and legal obstacles in working relationships with those actors.
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Figure VII-5. External Relationships of U.S. DOT

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<td>Local Governments; Telecomm. Companies</td>
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Figure VII-6. External Relationships of State Transportation Agencies
CHAPTER VIII. OVERVIEW, EVALUATION, AND CONCLUSIONS

Through previous chapters, it was found that the features of a policy network rely upon the vantage points of network actors in viewing the complex structural arrangement. There were perspective gaps between field leaders above the network and day-to-day managers within the network. By combining those findings, this chapter evaluates how well the ITS policy network is working so that it can conclude as to the value of policy networks at large as an alternative governance structure to conventional ones.

To do so, this chapter first discusses, through a viewpoint-fused framework, how the interrelationships among different variables, such as contexts, values, and constraints, contribute to network development at various levels. It then assesses what impact the use of the network has on normative outcomes as well as economic outcomes. For a convenient discussion, the evaluative comments are divided by three components of a network: public/private partnerships, intergovernmental networks, and professional networks. Finally, based on those lessons from the ITS policy network, this dissertation, as well as this chapter, ends with concluding on how policy networks will work better as a new governance model.

Globalization, Public Policy, and Networks

Figure VIII-1 illustrates the historical process of developing the ITS policy network. The process includes the complex relationships among contexts, actors, values, strategies, and constraints in the policy formulation and implementation processes as well as the global layer of the network. Similarly, the advocacy coalition framework (Sabatier and Jenkins-Smith, 1999) presents causal relationships among contexts, belief, constraints, and institutional changes in the development process for policy subsystems. In terms of the relationships, the framework was helpful for completing Figure VIII-1.
Figure VIII-1. Development of the ITS Policy Network
In the U.S, it was economic interests that fundamentally stimulated concerns for ITS throughout the late 1980s and the early 1990s. In terms of an economic context, the U.S. economy was seriously in decline and economic uncertainty prevailed throughout the late 1980s. Under this crisis, multiple industries confronted strong challenges from overseas competitors and domestic politicians (see Figure VIII-1). As the defense contractors continued to lose their long-time relationships with federal defense agencies, the contractors, through governmental incentives, were looking for a new market related to dual-use efforts. The automotive and the electronics industries, two of the most troubled business groups, began to solicit governmental support beyond the American tradition of “no industrial policy.”

Defense contractors had a high expectation that transportation agencies would be an alternative partner to purchase their defense technologies, once they are applicable to transportation demands. Automobile manufactures had a great interest in the vehicle dimension of ITS, while looking for the domestic and global market of automated vehicle systems such as navigation and collision avoidance systems. To the electronics industry, a huge marketable area was sensors and communication technologies to be applied to transportation infrastructure. Universities also were searching for opportunities for research dollars.

As shown in Figure VIII-1, the institutional context of U.S. DOT also was favorable to the emergence of ITS. With the Interstate highway system being completed, FHWA began to look for a new area where the Administration would become involved and spend from the Highway Trust Fund. Simultaneously, FHWA was in great need of new effective programs that would handle transportation problems such as congestion, energy and environment, safety, and productivity. The Administration recognized ITS technologies to be the current best way to minimize the problems altogether at a time. In particular, it was perceived that the advances and lowering costs of the information technologies would improve the capacity of transportation agencies for utilizing the technologies efficiently. A “policy window” thus opened for those needs for governmental assistance and interests in ITS.
Figure VIII-1 shows that all of the institutional interests above together developed a coalition under the banner of global competitiveness in the ITS area. There were some limitations in bottom-up input from state and local levels and differences among the coalition members in agenda and culture. Nevertheless, the members shared anxiety that the U.S. might lag behind Europe and Japan in developing ITS technology and products, leading to its entire dependence on foreign developments, unless the U.S. established active ITS programs. In response to the national concern, Congress launched the national ITS program by passing ISTEA of 1991. The coalition of these multiple fields was formalized and congressionally authorized in the public-private forum named ITS America (see Figure VIII-1).

Under the congressional mandates, U.S. DOT had to resolve two issues at a time in relationship with the private sector. One was to boost the market of ITS products and services so that U.S. companies could deal with macro-level challenges at the global level. The other was to encourage state and local agencies to create partnering relationships with the private sector at the micro-level. The Department believed that the private sector would be able to minimize the implementation problems that the public sector would surely confront in terms of resources, experts, and experiences. To attain the two goals, DOT worked out strategies that would maximize the input of business interests in the national planning process. For instance, the Department and ITS America jointly completed The National ITS Program Plan. This cooperative interaction for plans and strategies continued in such issues as architecture, standards, and other technical and non-technical issues (see Figure VIII-1).

In addition to public/private partnerships, U.S. DOT assisted two other types of networks: interjurisdictional and professional networks (see Figure VIII-1). It was perceived that developing seamless regional networks for ITS interoperability would be the most intriguing and time-consuming task in the implementation process. On the basis of the national plan, DOT provided financial and informational incentives, as well as architecture and standards, in order to motivate region-wide ITS deployment, which could also be a market for ITS products and services. Finally, professional networks were
important strategic elements that would support the public/private and public/public partnerships, alike. Federal incentives, including training, education, and shared Internet resources, were designed to diffuse the values of new transportation professionals as well as advanced skills and expertise.

A full picture of the ITS policy network cannot be completed without illuminating the interaction between domestic and global networks. As shown in Figure VIII-1, the global networks were developed through information exchange fora and standardization organizations. ITS America and U.S. DOT continued institutional interaction with those networks, along with individual participation. The global networks were originally conceived for neo-liberalism, but they now became economic battlefields where governments play as economic agents for their businesses. Therefore, well-organized domestic networks between the public and private sectors could contribute to a U.S. position in the global networks and thereby the global market. U.S. influence and market share will also grow through U.S. ITS companies that have been domestically grown via three types of policy networks: public/private partnerships, intergovernmental networks, and professional networks.

The outcomes of implementation networks often turn out to be different from initial intentions (Pressman and Wildavsky, 1973). As shown in Figure VIII-1, it was found that four areas of issues impeded public/public and public/private partnerships at the implementation phase of the ITS program. First, partners often failed to understand the “nuances of partnering” in network management or inter-organizational relationships. Existing social relationships were very helpful for a shared vision and trust, but the first task was to mutually understand differing perspectives, culture, and mission. Roles should be defined as clearly and early as possible, based on partners’ strengths, and catalytic leaders should encourage partners to maintain continuous participation. In particular, the newness of ITS caused urgent needs for training and education of existing employees.
Second, some legal issues were stumbling blocks. Intellectual property rights were vexing challenges that often impeded public/private partnerships; hence, some principles for their assignment should be defined in a written agreement ahead of time. It was argued that traditional procurement methods were not appropriate for high technologies like ITS, but the adoption of innovative methods were often difficult under current state laws. Privacy problems in ITS would be chronic as in any other information technology areas. Liability litigations were still potential, but they should be an important factor to be considered by firms in deciding their market entry. It was expected that the deployment of ITS vehicle-highways control technology could shift liability from the driver to the systems operator or the manufacturer, with accidents charged to bad information from the traffic center or malfunctions of vehicle control. Hence, the occurrence of tort claims would be dormant until massive automation of driver functions and substantial dependence of consumers on traffic information are realized.

Political and economic environments were not always favorable for ITS implementation. Since it is professional- and operation-centered, the ITS area is too invisible to easily draw public awareness and the attention of elected officials. Another important issue was on how to incorporate ITS projects into the mainstream planning. Despite growing governmental investment in ITS infrastructure, the ITS market did not mature enough to induce companies to make market entry. There was also the serious lack of market information on such issues as investment return and consumers’ willingness to pay. Because business models were also unavailable, there was confusion on who collects, owns, puts together, and disseminates traffic data.

Furthermore, Figure VIII-1 shows that the implementation networks among public agencies had hidden power that would determine the success levels of public/private partnerships as well as the whole policy network including the global level. Regional groups of multiple governmental units were the main clients for ITS companies. Hence, if the groups fail to deploy region-wide ITS, the private sector will have no incentive for market entry, let alone partnerships with the public sector. In turn, it will lead to a decline in the U.S. ITS industry in the domestic and the global markets alike.
Figure VIII-1 identifies learning and feedback as an important element. At the current point in about ten years after the start of the ITS program, it is good time for discussing the lessons learned from the development and management of implementation networks. In December 2000, U.S. DOT, through experts’ helps, published a comprehensive evaluation document entitled “What Have We Learned about Intelligent Transportation Systems.” The Department was also beginning to develop another ten-year plan for ITS. Unlike a five-year plan, which goes through 2003, the ten-year plan is looking beyond TEA-21 and attempting to secure a future vision for the ITS program in a longer timeframe. For this, “we’re going to use a whole variety of people having input and existing people in the community,” remarks Jeffrey Paniati, Deputy Director of ITS JPO (interview, October 25, 2000).

Public/Private Partnerships vs. Contracts/Privatization

When public agencies have insufficient resources, expertise, and experiences, public/private partnerships are one of three different relationships that the agencies may have with private sectors. The other two are fee-for-service contracts and privatization, which are more conventional forms. While the contracts are featured by bureaucratic control over vendors, privatization is marked by total commitment to the private sector and market mechanism. The partnerships are a network structure that is a third alternative to bureaucracy and market. Based on the findings of the previous chapter, this section compares the partnerships with the other two conventional public-private relationships in terms of their strengths and weaknesses as well as conceptual characteristics.

Under traditional fee-for-service contractual arrangements, a public agency contracts with an outside party, and the contractor is paid a fee in exchange for its services. Its assumption is that the public sector client retains overall control of the undertaking to protect the public interest, while drawing on private sector resources to reduce the total cost to the public. Some ITS experts point out that many transportation agencies actually are carrying out ITS projects in contractual arrangement, not in
public/private partnerships, although the partnership were strongly recommended by the federal government and extensively discussed in the ITS community.

Richard Worrall, an ITS consultant, argues, “Most things reported as partnerships are not partnerships. They are contractual arrangements between public and private sectors. In true partnerships, parties have to accept shared risks, shared responsibilities, and shared returns” (interview, September 31, 2000). Similarly, Allan DeBlasio (interview, October 24, 2000), at the Volpe National Transportation Systems Center, remarks that in a pure legal, technical sense, many of what are called “public/private partnerships” are not true partnerships, but rather public/private collaboration. As he puts it, “nobody knows how to define it…. We are in trouble with it….. I think it is used too loosely in the ITS area.” Furthermore, DeBlasio, in his study of four MDI projects, points out that they actually use “many different contracting mechanisms, but basically they use still the same type of mechanism that they use for any other vendors’ contracting relationships.

There is a good reason why government officials still stick to some elements of the traditional contractual arrangement, while some of them profess the partnership. A majority of public executives still are not comfortable with taking risk for innovative techniques, whose outcome is not yet evident sufficiently. The advantages of the traditional contracts over the new ways have been widely recognized: roles and responsibilities are clearly defined by legally bounded exchange relationships, and a public agency, as a purchaser of privately owned resources, has authority to control and monitor its private vendors as well as to direct them to comply with legal requirements and policy directions. Therefore, as Philip Tarnoff at the University of Maryland puts it, “to some degree, the contractual nature is legitimate because public agencies have some constraints and requirements.” He also observes, “Public agencies can’t free them in the notion that they are in charge with that project, and they feel having a control over projects” (interview, October 6, 2000).
Therefore, the success of the contractual relationships depends partially on how the public sector can retain effective control over its private vendors. Their disadvantage is a possible risk of monitoring problems. In the words of agency theorists, government, as a principal, is often vulnerable to behavior by private sector contractors serving as agents which is shirking, distortion, and opportunistic. Kettl (1988) argues that many failures of “government by proxy,” under contracts, come from not only goal and value conflicts between government and its proxies but also improper feedback from proxies who want to avoid censure and risk. Paul Light (1999) also argues that the growth of a “shadow workforce” leads to an “illusion of smallness” that may mislead the public about the true size of government. The illusions result in the improper flow of information not only about who works in the shadow and under what conditions, but also about how faithfully the shadow workforce works for government and the public. As he puts it, “the government knows virtually nothing about its shadow.”

In particular, expertise-centered areas like ITS have great possibilities for the monitoring problems that arise from contractor-contractee disparity. For instance, the Environmental Protection Agency (EPA) increased use of contractors to obtain their scientific and technical expertise. In 1992, EPA’s contract program more than doubled in size while the Agency’s own workforce increased by 25%, thus expanding its total manpower effort to 7,000 contractor work-years and 17,000 federal employees. Most Inspector Generals in EPA agreed that contract management of EPA was based on too much trust of contractors and over-dependence on contractor support at the cost of close contract monitoring (Reilly, 1992: 1-5).

In addition to the monitoring problem, procurement delay is another disadvantage of contractual arrangements. There are two kinds of contracting techniques: competitive bidding, which is preferred for goods and non-professional services, and competitive negotiations, which is for professional services. Of course, competitive negotiations are more appropriate for the better quality of procured ITS products and services than is competitive bidding, where price criteria are the only factor in selection. However, even competitive negotiations cannot shorten procurement schedules. The proposals sent out
by businesses are collected and analyzed by agencies. Contractors must then be determined and negotiated with to have a detailed contract. In general, it takes a year to go through procurement processes. Now, technology changes too rapidly to be caught by competitive procurement processes.

DOT, in its 1996 Report to Congress, reports that “the potential for development of public-private partnerships is now seen as being more limited in scope than previously thought” (U.S. DOT JPO for ITS, 1997b: E-46). In the ITS community, there are roughly two different responses to the comment on the potential of the partnerships. One is that the arrangement is more complicated than formerly thought, although people are just beginning to understand how to deal with it. The other comment is that the limited potential of partnerships will encourage ITS services to be further privatized.

Some people shed light on a more positive side of the potential. Worrall observes, “I don’t think it’s more limited. I think it’s not a simple thought as we once thought. It depends on what you mean by partnerships. There are in fact some very effective cooperative arrangements between the public and private sectors…. A lot of experience is not just in transportation but also in other areas.” He goes on argue that what has occurred in the world of transportation is that members of state highway departments and traffic engineers in cities are only beginning to understand what are public/private partnerships (interview, September 31, 2000). James Robinson at VDOT implies that the PiM project will be an exemplar that demonstrates a successful adoption of the innovative approach to public/private partnerships: “a major impact will be that this [the partnership] by itself drives change in VDOT because of a lot of connected things. We don’t have a contract but just a few-page agreement…a sort of standard agreement. There is no trouble at all. To me, that’s a future business model between the private sector and us” (interview, October 24. 2000).

Although there is still conceptual confusion on public/private partnerships, it is certain that they should be understood as being more than traditional contractor-contractee relationships in a way that two (or more) equal parties are commonly
committed to a business arrangement. Glenn McLaughlin at Maryland State Highway Administration states:

Public/private partnerships refer to non-traditional relationships between the public and the private sector entities. “Non-traditional” means, instead of contractor-contractee relationships, you have relationships of teaming meeting. A partner has a say on how the project is going to go for. You don’t need to develop requirements. Also another issue is monetary sharing. Two sectors put a certain amount of money.

Since the two sides in the partnership are placed in an equal position by pooling resources and sharing risks, a principal and an agency are not necessarily separated; hence, the principal-agency problem in contractual relationships is not supposed to be found in the partnerships.

As most interviewees for this dissertation agree, the partnership makes it possible to complete what no one entity could do on its own. In the ITS program, the public sector relies on the private sector in resources, expertise and experience, and the private sector depends on the public sector in the policies and funds that will help their investment in projects or their efforts to expand a market share. As well, the ways of mutual support in the partnership are different from those in contracts, since resources and others are pooled and shared rather than exchanged. Although it is necessary to define roles and responsibilities through partnership agreements, specific strategies and approaches are not predetermined, but flexible and negotiable under changing circumstances. This flexibility enables public agencies to procure services and products on time under rapid changes in technology and in needs for traffic and travel information.

A commonly recognized disadvantage of the partnering process is that consensus building generates extra costs against benefits of flexibility: staff workload and time. For instance, public employees in Partners In Motion agree that the primary costs of partnerships are related to staff time and energy. Thomas Jennings at FHWA observes, “Compared with organizational arrangements of other projects, this took much more time and much more effort, and it needs very focused staff continuously”—…[it] “really needs
to have a prime project manager.” McLaughlin also points out that despite its long-term benefits, the staff burden of partnerships is great only in the short run. Finally, Todd Kell at VDOT observes, “you’ve got to put the time in even if system partners resist from time to time. There is no penalty in not participating. Everybody modified [the agreement] and added to it, and very few agencies just signed it... very few...it took months and months.” This is also the case with the MDI projects reported by DeBlasio et al. (1999): against multiple benefits, the only costs of partnerships recognized are staff time and workload.

A deeper point is that heavy reliance on the incremental process of partnering may make it difficult to insist on arguments for the public interest as articulated in the public sector. This is because the fundamental and permanent goal of the private sector in an equal position is definitely profit maximization, which is often opposed to the public sector’s goal. For this reason, DeBlasio argues that although there might be some incentives to get businesses involved in partnerships, there is “no way” to stimulate them to serve the public interest. Similarly, Worrall also admits, “there is not a single solution for accountability,” except for trying to hear as many stakeholders as possible, keeping in mind that there is no single issue and solution.

In fact, it is not widely shared that public/private partnerships will be a dominant governance form in the ITS area. Those disadvantages in staff time and value conflict may be reasons for a positive response to DOT’s comment: “the potential for development of public-private partnerships is now seen as being more limited in scope than previously thought” (U.S. DOT JPO for ITS, 1997b: E-46). Furthermore, many ITS projects may be privatized instead of partnerships in the future, due to the benefits of privatization itself. Once the market matures, companies will feel their capabilities of independency and no longer the necessity of the partnership.

According to Tarnoff (interview, October 6, 2000), “there is a general agreement” that the DOT’s comment is true because of “unrealistic expectations and the lack of knowledge on how to improve partnerships.” For instance, Advanced Traveler
Information Systems (ATIS), such as Partners In Motion, “are way behind what most people expected because two sectors have different culture and expectations. The public sector will think the private sector people will be getting rich and make unrealistic demands and even break deals,” says Tarnoff. He also predicts that companies will be more independent in services: “some companies like Yahoo and AOL possibly will get their information through private sources such as satellite geo-locational things. Partnership concepts will disappear as these companies go ahead with what they want to do…. ATIS will become part of Internet businesses.”

Furthermore, Shelley Row at FHWA responds, “I think that’s probably a true statement. When we first started the program, we thought it was going to be huge market out there and all of the opportunity to make money”…“we can partner with the private sector organizations that needed to collect…and wanted to sell travel information. It was certain there was potential.” However, as she puts it:

The speed that the public sector can get information systems and gather information was very slow…. The public sector would be hard to respond to the private sector’s demands. The private sector is more able to pursue it independently than we thought. The private sector has much more speed than the public sector has because we seek a funding cycle of five years. If we will develop a new business, we must see five years for the first piece of infrastructure. Their interest is moving much faster than we can typically move. Consequently, you see some models that are just going anyway. They will have their own infrastructure, fund, and collect data anyway (Row, interview, October 26).

It may be generally true that the private sector has better technical capabilities of providing high quality of services by adding attractive and marketable values to raw traffic information. Furthermore, it may be also true that the sector has better abilities and experiences in marketing and figuring out consumers’ demands.

However, it is doubtless that companies will step back from the ITS market until foreseeing clear profits through partnerships or meaningful governmental incentives and assistance. As discussed in the former chapter, the ITS market is still immature; as a
result, there exists no appropriate business model as well as no precise information on consumers’ demands and fair prices. As shown in the case of Partners In Motion, the market problem discourages companies from providing high quality information even through a partnership; in turn, this does not push up consumers’ demands, resulting in the problem of “chicken and egg.” Even if businesses once enter the market, they may leave it on their own judgment on profitability rather than on accountability to the public.

Further multiple problems, especially concerning the public interest and equity, will emerge even after ITS services are ready for privatization. The service prices will be raised in return for value-added information until the market expands enough. This high price may discourage many low-income families from having access to traffic and travel information. The access problem becomes even more serious in small urban or rural areas because companies prefer investing in large urban areas, where more demands and profitability are available. Finally, if public agencies, like at the current time, keep providing some information to the public, there will be unintended competition for the market between the public and private sectors. Consequently, all of those privatization problems will be discussed seriously until a radical change occurs in the traditional belief that traffic information is a public good.

Altogether, Figure VIII-2 compares the public/private partnership with the other two conventional ways of structural arrangement: fee-for-service contracts and privatization. In fact, it is not necessarily a clear-cutting classification in actual ITS projects, but rather one project may intermingle two or more structural arrangements as is the case with most current ITS projects, or include them in separated ways as in Partners In Motion. U.S. DOT itself allows for a wide variation of the partnership definition. In a seminar held by the Department, a public/private partnership refers to “an arrangement of roles and relationships in which two or more public and private entities coordinate/combine complementary resources to achieve their separate objectives through joint pursuit of one or more common objectives.”

<table>
<thead>
<tr>
<th>Structure</th>
<th>Fee-for-service Contract</th>
<th>Public/Private Partnerships</th>
<th>Privatization</th>
</tr>
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<tbody>
<tr>
<td>Mechanism</td>
<td>Bureaucracy</td>
<td>Network</td>
<td>Market</td>
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<tr>
<td>Control</td>
<td>Legally Bounded Exchange</td>
<td>Trust, Flexibility &amp; Ongoing Negotiation</td>
<td>Market Price</td>
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<tr>
<td>Resources</td>
<td>Public Sector over Private Sector</td>
<td>Public-Private Interactive</td>
<td>Private Sector Itself</td>
</tr>
<tr>
<td>Risk Shareness</td>
<td>Primarily Public Sector; Limitedly Shared on the Legal basis</td>
<td>Public-Private Equally Shared</td>
<td>Private Sector only</td>
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**Advantages**
- Clear Responsibility; Policy Directions by the Public Sector
- On Time Procurement & Marketing; Richer Resources, Expertise & Experience
- High Quality Services; Industry Growth

**Disadvantages**
- Expense Burden on the Public Sector; Delayed Procurement; Monitoring Problem
- Staff Time & Workload; Public-Private Value Conflict
- Higher Service Price; Less Public Interest; Public-Private Competition; Disadvantaged People

**Figure VIII-2. Comparing Public-Private Relationships**

While the partnerships surely include flexibility and trust as main mechanisms, it is hard to say that they are a totally new “anti-structural approach.” They should be “formalized in a legally binding partnership agreement that spells out clearly each party’s role(s), responsibilities, and obligations.” These may include “assumption of risk, investment requirements, governance arrangements, oversight authority, and rights to participate in any ultimate financial gain or loss” (VTTI, September 2000: 27). It is inevitable to incorporate some components of the structural approach because they will serve as an initial framework in developing trust among partners as well as avoiding role conflicts and turf battles. In particular, they are important to the partners who have little experience in working together and thereby have few chances to develop trust. As time
passes and trust grows, partners will become less dependent on the elements of the structural approach.

In developing and maintaining partnerships, it is wise to create an inverse relation between structure and trust (or meaning). This relation can be inferred from Weick’s excellent case study, “The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster” (1993). By analyzing the death of 13 members of the smokejumper crew in the fire disaster, Weick explores why organizations unravel and how organizations can be more resilient. He argues that a main reason for the disaster was a “deviation-amplifying feedback loop,” in which once the role system lost its structure, it led to a loss of meaning, which led to a further loss of structure, and so on. As a way to avoid this loop, Weick proposes to take advantage of the inverse relation between structure and meaning. By inverse relation he means that when the role structure is unstable, more attention must be given to meaning than to role, and vice versa. Likewise, when trust is initially not lacking among partners, clear role definition should be a primary focus; and as social relations become clear, partners’ attention must shift back to trust or meaning. Consequently, structure and meaning are two conditional alternatives that can be employed for the success of partnerships.

Clarifying roles and responsibilities in a cooperative way is important not only for partnerships but also for all kinds of network structure. Unfortunately, there is limited literature on networks’ impact on normative issues. However, as O’Toole (1997b) puts it, while the emergence of a networked world tends to have positive impacts on responsiveness due to improved communication with different actors, it may have negative impacts on responsibility due to ambiguity of roles.

Partnerships vs. Entrepreneurship

Worrall precisely argues, “public/private partnerships are important, but intergovernmental/agency cooperation is more important” (interview, September 31, 2000). For ITS project implementation, the partnerships are just recommended, not
mandated, by the federal government to states and local governments. Hence, depending on resources and other various factors, they may select forms other than partnerships such as contracts, privatization, or even their mixed form. However, the regional networks are essential in terms of the technical nature of ITS: they require at least interoperability and, ideally, seamless integration and reliable operation among jurisdictional systems.

Despite their necessity, it is inherently arduous to develop and maintain inter-jurisdictional partnerships. U.S. DOT’s 1996 report to Congress summarizes a number of existing reports on multi-jurisdictional impediments in order to propose how to overcome the “stovepipe” approach to project development. The reviews of early ITS projects, such as operational tests, tended to take a pessimistic view of the issue. In most operational tests, a particular ITS group pushed ahead projects with the poor participation of operational agencies, local governments and Metropolitan Planning Organizations (MPO) in the initial discussions. Some test participants point out, “Full operation might never be achieved because agencies may continue to have different philosophies and priorities” (U.S. DOT JPO for ITS, 1997b: E-50–E-55).

Among many possible reasons for the impediments, a fundamental one will be a mindset of governmental units in viewing each other. An important issue is how the partnerships can be compatible to the current federalism condition, where state and local governments act like entrepreneurs conducting “a blood sport” and an “arms race,” as the nation-states do so at the global level.

Throughout the 1990s, the New Public Management (NPM) movement swept the world, and in this context the Clinton Administration proposed the entrepreneurial model of government to define intergovernmental relationships as well as government-society relationships. The efforts to apply a market mentality to government replaced the concept of citizens with that of customers and substitutes a market place pervaded by utility maximizers for society as a larger social and political community. Hence, units of government view each other as competitors for “customers” rather than interdependent cooperators who may contribute to each other and together to higher goals.
For instance, the entrepreneurship of states does not remain just prescription or theory, but rather a precise description of reality pervasive throughout today’s federalism. States pursue activist entrepreneurial strategies to improve their economic competitiveness. A common finding of multiple studies is that states make growing efforts to improve entrepreneur capacity by investing in education, job training, infrastructure and new technology development rather than attempting to attract firms from outside by classical incentives such as tax abatement, subsidization and so on (Eisinger 1988; Fosler, 1988; Brace, 1993; Clarke and Saiz, 1996).

In particular, infrastructure has been treated as a critical component for economic competitiveness. Both Peterson (1995) and Rivlin (1992) propose the functional theory of federalism: the American federal system would work best when governments at different levels specialize in carrying out different functions. They argue that redistributive policy, such as welfare, should be committed to the national government because the lower levels of government, fearful of becoming “welfare magnets” that attract the poor, will cut their welfare benefit—hence causing a “race to the bottom.” In contrast, development policy, such as highway projects, is appropriate for state and local governments. Because they believe that the projects generate state economic development by attracting industry and jobs, they will make “the race to the top.”

Now, state and local governments across the U.S. are encouraged and attempt to act like private sector businesses in dealing with each other, at least in all activities for economic development. However, if they act like entrepreneurs concerned overly with their own competitive advantages, it will be highly difficult to develop public/public partnerships or inter-jurisdictional networks in ITS projects. Even if they are once developed, they could easily be transformed into mere economic exchange relationships. It is important to know that partnerships are more than mere exchange relationships with rational mindsets as well as competitive relationships.
However, it is critical to know that partnerships are now widely used in the private sector, but the limitations of its exchange perspective have already been recognized in the field of business administration. For instance, Kanter (1994), a scholar in this field, describes successful partnerships as follows:

They are living systems that evolve progressively in their possibilities. Beyond the immediate reasons they have for entering into a relationship, the connection offers the parties an option on the future, opening new doors and unforeseen opportunities…. [They] involve collaboration (creating new value together) rather than mere exchange (getting something back for what you put in) (97).

In other words, successful partnership relationships “begin, grow, and develop—or fail—much like relationships between people” and are built on hopes and dreams like romances (99).

Such lessons from the private sector are also the case with the public/public partnerships as learned from the case of the ITS field. The partnerships can be completed only through institutionalized social relationships built on trust and shared vision, which may be facilitated through existing relationships. Compared to public/private partnerships, partnerships between public agencies may have especially more constraints on maintaining continued relationships. While businesses won’t make initial arrangements for the projects where they do not see profits, initial partnering process between public agencies are often stimulated by political or other various external factors.

However, their initial passion and willingness to participate does not necessarily continue over time because of emerging disparity in jurisdictional interests and possessed resources. Furthermore, there is usually no official penalty against withdrawing from partnerships, and sometimes staff turnover ruins elaborated relationships abruptly. Consequently, a strategy for preventing free riders will be to develop a self-regulatory system where voice and influence is increased by the levels of ongoing participation as well as initial resource contribution.
Furthermore, developing and maintaining network relationships is possible only through ongoing efforts made by catalytic or facilitative leadership, as opposed to heroic and visionary leadership (Luke, 1998). The network literature tends to shift the unit of analysis to a macro level, such as inter-organizational relationships or community, often overlooking the roles of individuals. Yet they are a very important component even in networks. Their initial workload is great in pooling resources and building consensus, and it is even more daunting to facilitate partners’ continuous participation. However, deep interpersonal relationships often resolve small conflicts before they escalate.

Therefore, networking is a process of building what Bardach (1998) terms “interagency collaborative capacity” rather than seeking immediate, tangible policy outputs: hence, its focus is on capacity, not outputs. As he puts it well, creating a network is like that of craftsmen building a house in that it is integrative, creative, and purposive. The house’s construction is “a function of the skill and purposiveness of craftsmen interacting with the quality of available materials and the craftsmen’s ability to fashion protections against potentially destructive environmental force” (49).

The Professional Network’s Missing Links

Professional networks have a critical role in diffusing a common value and meaning among professionals. By making good use of the networks, the ITS community has been empowered to overcome stumbling blocks placed among jurisdictions and between the public and private sectors. However, there are some issues to be resolved for a better professional network.

Political Support

Wamsley (1985) argues that his political economy framework\textsuperscript{73} for policy subsystems (or policy networks) includes four dimensions: political environment,

\textsuperscript{73} For his original political economy framework applied to public organizations, see Wamsley and Zald, 1973.
economic environment, internal polity, and internal economy. The division of the dimensions depends on whether factors are contextual or internal, on the one hand, and whether types of action are power exertion or rational actions, on the other hand.

In the current ITS policy network, ITS professionals tend to overlook political elements both in external and internal relationships, while overly focusing on economic components. As a result, the ITS community externally has too loose a connection to political institutions and the public, and internally confronts the challenges from mainstream transportation needs such as road construction and maintenance. Overall, the whole history of the network has continuously been dominated by economic interests who debate how to improve the U.S. position in the global market, how to supplement the lacked resources of the public sector, and how to stimulate the ITS industry and market.

Power games with the transportation mainstream may be intensified with ITS losing a special status and being integrated into regular transportation planning and implementation (Michael Schagrin, interview, October 26, 2000). As Paniati, Deputy Director of ITS JPO, puts it, “it’s our way of trying to make it more mainstreamed and institutionalized into the whole process. That’s a long-term thing, and it doesn’t happen overnight.” He also observes, “ITS is not a side thing or a special thing, but a just part of the processes of figuring out transportation problems—maybe a combination of technology, road capacity, or transit. It’s a whole set of things, but ITS is a part of a set” (interview, October 25, 2000).

A major reason for the missing links to external political forces lies in the awareness or perception of ITS. As DeBlasio puts it, “ITS staffs in MDI projects commonly recognize that it is critical to make ITS visible by reaching out to the general public and policy makers due to the newness of ITS.” He also argues that “the public and decision makers will not support what they do not understand,” but “people can’t really understand what it is, especially when they come to politicians” (interview, October 24, 2000).
Even if politicians come to be aware of ITS, they may still be reluctant with the invisibility of ITS-related operation and its long-term effect. DeBlasio argues that the next issue is long-term, day-to-day operation of ITS, but “operation is not something that politicians are thinking about now. They want to build a highway, not operate it” (interview, October 24, 2000). In other words, most federal funds are targeted toward capital expenditure and infrastructure deployments, as opposed to operations that are invisible to the public and elected officials.

As Tarnoff (interview, October 6, 2000) puts it, the leaders in ITS implementation are professional staff people because “ITS services are less visible than a new freeway or transit system and thus attract less public and political attention.” This uncontroversial condition may actually expedite ITS implementation, but the invisibility may also make it harder to draw on political support. Tarnoff points out that between 10 and 15 percent of projects costs per year should go to operation, but federal funds still continue to be used for construction and capital improvement.

A good strategy for political support will be the further use of Metropolitan Planning Organizations (MPO), since elected officials and a number of community stakeholders participate in the MPO’s governing boards. Furthermore, MPOs are existing regional organizations, where multiple jurisdictions have rich experiences in cooperation for transportation decision-making. MPOs may also be communication routes between the public and private sectors in the community (U.S. DOT FHWA, December 2000: 158). Fortunately, it is likely that MPOs can take increasingly critical roles in ITS decision-making because TEA-21 of 1998 directs ITS projects to be funded through traditional federal aid. MPOs are authorized to make some spending decisions on this aid, and in this way ITS projects may be integrated into the metropolitan transportation planning processes.

Another way of acquiring political support will be to reinforce the relationship between ITS and the National Information Infrastructure (NII), since the Internet and the NII have been widely embraced by political institutions as well as the public in the U.S.
In fact, this issue has been discussed in the ITS community since the Clinton Administration launched a National Information Infrastructure Initiative, which aimed at linking every home, school, library, hospital and business in the U.S. to “the information superhighway.” According to proponents for the better relationship, if educational networks, science networks, medical networks and financial networks are developing within the context of the NII, there is no convincing reason why ITS networks should be developed outside of it.\footnote{See IVHS Legal Issues, summer 1994: 8-10.}

Branscomb and Keller (1996) also argue that ITS and the NII be further integrated into a more unified scheme. As a result of analyzing 29 ITS user services,\footnote{See Chapter IV of this dissertation (pp. 45-49), for more information on ITS user services.} they observe that a significant component of ITS services may be provided through general-purpose communication infrastructure except for only two applications, traffic control and automated vehicle operation. Yet, they point out, “to date, ITS activity has occurred almost exclusively in the transportation domain;” in other words, there is “no formal mechanism connecting state and federal interests in ITS and the NII,” and “ITS has been largely absent in reports coming out of the Clinton Administration’s Information Infrastructure Task Force, the focal point for federal coordination on NII activities” (18).

Political support will be even greater, if elected officials and the public come to realize that NII-ITS coordination is an efficient way of avoiding redundant investment. Fortunately, there are some clear indications that ITS will be developed in the context of the NII: the Federal Communications Commission assigned 511 as the nationwide telephone number for ITS traveler information, and state and local governments in pooled resource projects share their public rights-of-way (ROWs) with telecommunications companies in exchange for access to telecommunications systems and services. However, transportation engineers at the state and local levels are still unable to figure out the unfamiliar information/telecommunication (IT) area, including handling companies and professionals from the area. Hence, it is further required that federal agencies encourage
flexible exchange in financial and human resources between transportation and information technology areas.

Japan provides an implication about the relationship between ITS and NII. In that country, five national governmental bodies completed a “Comprehensive Plan for ITS in Japan” as a result of coordinative interaction with the Advanced Information and Telecommunication Society Promotion Headquarters headed by the Prime Minister under the “Basic Guidelines on the Promotion of an Advanced Information and Telecommunication Society” (see Figure IV-7). This is not to say that the U.S. should adopt the Japanese top-down, government-led model. Rather, it is necessary to rethink the U.S. approach that tends to treat ITS as separate from NII.

Social Construction of Knowledge

The discussion of social construction of knowledge provides ITS engineers and professionals with a valuable implication for accountability and the public interest. The importance of the issue lies in the fact that the ITS area is dominated by engineers and professionals. The pursuit of rationality is a main vehicle for the influence of the scientific or professional community in policy design and process, but rationality is easily reduced to a mere instrument of political influence rather than an agency of moral insight and public discourse (Cozzens and Woodhouse, 1995; Bimber and Guston, 1995; Sclove, 1995; Schneider and Ingram, 1997:150-188).

In this sense, the influence of professionals often depends on the consensus that the professional network can build in favor of particular policy design choices (Schneider and Ingram, 1997: 157). In the early 1990s, the U.S. ITS program could be successfully initiated under professionals’ consensus: governmental investment in ITS technology would significantly contribute to a U.S. position in the global market. The consensus fit into the contemporary political context and the most salient political issue. In fact, ITS professionals have already shown that technology is not value neutral, but value ridden.
However, it is generally hard to say that the question of how to best serve the needs of society through transportation has been a familiar issue to transportation engineers, who take a main role in the ITS area. Traditionally, their primary goal was “the safe and efficient movement of people and goods,” but there has been little attention to the role of transportation in society (Richardson, 1995; Bowman, 1993). Despite some discussions and studies on social impacts that ITS is likely to have, most of them are “highly exploratory, searching for questions rather than arriving answers.” In particular, it was found that the ITS distributive potential was a rare discussion topic (Little and Luscher, May 1995: iv).

Although considerable studies focus on the aggregate impacts of ITS user services on traffic congestion, productivity, efficiency, mobility, safety, air quality, and energy use,76 little is known about how these efforts could be distributed among users and non-users of ITS technologies and services (Little and Luscher, May 1995: v). Access to ITS infrastructure and information may be limited to only those people who can afford expensive add-on equipment and information services. For this reason, there has been anxiety about a “class-based transportation system,” with “smart” drivers and “dumb” drivers who can’t afford the expensive technologies and services (Dittmar, 1994: 3). As identified in TEA-21, a program goal is “accommodating the needs of all users of surface transportation systems,” but there is no clear policy direction on how to improve equal accessibility to ITS technologies and services. This concern is not exaggerated as shown in the customer survey for Partners In Motion: customers tend to be middle-aged (35-55), well-educated, and relatively wealthy men.77

The extent of ITS benefits also varies from region to region. Tarnoff remarks that parts of the ITS infrastructure installed in the early 1990s by government were 6 or 7 percent urban miles of freeway and 10 years later up to 9 or 10 percent; but “it’s just

76 For a comprehensive study, see Proper, May 1999; for more readable study, see Apogee/Hagler Bailly, January 1998; and for a global-wide perspective, see PIARC Committee on Intelligent Transport, 1999: 79-107.
urban road. What about rural roads of the other 90 percent of the system?” (interview, October 6, 2000). This concern is also quite convincing in consideration of the Interstate highway history. The Interstate program succeeded in its primary goal but had unanticipated results in terms of urban sprawl, destruction of neighborhoods and the deterioration of bypassed small towns.

Consequently, as Donal Camph, a transportation policy advisor, puts it, ITS offers:

two possible visions for America’s transportation future, either more roads with more cars, now souped up with fancy technology, or an opportunity to harness technology to empower people by providing access…to jobs, to health services, to cultural and recreational opportunities…and by helping to address questions of social equity, environmental quality and community cohesion” (quoted by Dittmar, 1994: 2).

Furthermore, when a successful ITS program requires public acceptance, privacy is another primary ITS issue to be sufficiently discussed, as in any other information technology area. Fortunately, the privacy issue is not an absolute, but flexible concept; generally, people expect not only the issue to be resolved but also the opportunity not to have current information sources curtailed. It has been agreed that the best way of reducing privacy problems is to make the collected personal information anonymous. Currently, the hottest issue is the use of ITS technology for the purpose of law enforcement. Systems collect individually identifiable information, and a centralized computer system could make issuing speeding tickets easier; hence, the release of identifying driver information to enforcement agencies is unavoidable. ITS America is setting up privacy principles, but concerns about privacy will grow with different technologies being further deployed.

As Stone (1997) puts it, reasoned policy analysis is necessarily political, and policy is how to classify and categorize the world and arguments; hence, policy disputes

are border wars, and policy boundaries are drawn and redrawn. There might be potential political opposition to the side effects of ITS in the future, although it is not emerging now. To prevent it, the ITS community needs to treat the issue of equity and privacy more seriously ahead of time.

Businesses and the Public Interest

Jasanoff, in her book *The Fifth Branch: Science Advisers as Policymakers*, argues that the Environment Protection Agency (EPA) has maintained cooperative relationships with the Science Advisory Board (SAB), its advisory committee. She observes that the SAB seeks independent studies by clearly identifying the boundary adjunct to EPA’s policies, as well as employing a representative cross-section of the scientific community. In contrast, advisory committees of the Food and Drug Administration (FDA) rarely draw the boundary between science and policy, and a majority of the committee members are deeply and frequently involved in policy processes, influenced by not only the FDA staffs, but also by scientists and nonscientists out of the committees.

With a blurred boundary between policy and technological knowledge, ITS America is acting more like the advisory committees of FDA. Federal employees have participated in the various activities of ITS America before its advice is given to DOT. This participation may be necessary for enhancing the public interest of policies by checking the value-neutral application of technologies and the high risk resulting in special-interest access (Cozzens and Woodhouse, 1995: 533-553). However, it is more desired that balanced input from various social entities, as required by FACA (Federal Advisory Committee Act), be secured in the activities of ITS America.

Local governments have relatively fewer relationships with ITS America, a law-made advisory group, than with ITE, an alternative professional association for transportation engineers. Since historical needs for defense conversion and global competitiveness, the macro-scale interests of the contractors have dominated ITS America without a notable change. However, the situation grows problematic with a
critical turning point, TEA-21 of 1998. A program orientation has been shifted from R&D, which requires the large contribution of defense contractors in technologies, to deployment, which requires local governments to be one of main actors. In this sense, there should be further efforts of both ITS America and FHWA to diversify information input beyond traditionally limited sources of input.

In a policy network highly characterized by public-private cooperation, approaches and strategies may be negotiated depending upon each sector’s goals and perspectives, but an umbrella norm to be shared by both sectors should be, for both parties’ survival, the public interest. In his book *Reversals of Fortune*, Mucciaroni (1995) argues that producer-group fortunes are variable depending on how much two types of context are favorable to the group. One is issue context, which refers to what types of issues become salient and to how those problems get defined. The other is institutional context in that certain institutional arrangements and actors resist or challenge policy changes. The author concludes that “producer groups succeed when they convert their special-interest claims into convincing public-interest arguments” (11) because the contexts can regulate concentrated benefits and diffused costs.

The major industries involved in ITS projects along with state and local governments in the implementation process also have experienced variable fortunes over time. Their issue context usually continues to be favorable to the producers thanks to strong encouragement from Congress and U.S. DOT for public/private partnerships and market entrance. In contrast, their institutional context is not necessarily favorable, since state and local governments are generally reluctant to allow for business interests at the expense of what they believe to be the public interest.

The defense contractors continue to fail in this arena because of double challenges in institutional context: budget cuts by DOD and conflict with state and local transportation agencies. The companies fail to have proper understanding of new customers and their environments. The emerging telecommunications industry has a much brighter future, but it is still under network development with its new public
partners. The industry seeks more effective governmental incentives, which if provided will bring deadlocks to an end in marketing issues as well as in institutional and legal issues. Automobile manufactures have already experienced uncertain political support, but their current favorable institutional context may be changeable; in other words, significant variables will be political support from the public and elected officials, as well as partnering relationships with state and local governments at the future deployment phase of intelligent vehicles.

A lesson is clear: the fate of the private sector will be variable according to how successfully special interest claims will be converted into convincing public-interest arguments—now, in a way of meeting state and local needs. In fact, those industries in the ITS field have already learned the lesson in the early history of the national ITS program. They could develop a favorable institutional context by successfully converting special interest claims into convincing public-interest arguments under the slogan, “a U.S. position in the global market.”

Conclusion

The devastating effects of the global economy have razed nations’ external sovereignty that had been built on tariffs and other trade barriers. Also, the global economy has made a critical impact on internal sovereignty, radically changing original relationships between a nation and its people or companies. Firms located outside their mother country come to have more relationships with foreign countries, and so too with those who make livings through foreign companies. As internal sovereignty fades away, government has confronted more challenges to legitimacy.

Under the current global context, policy networks are a promising governance structure that enables effective political mobilization for national plans. Through loosely coupled networks with firms, government is empowered to cope with global competitors by maintaining internal sovereignty and legitimacy, even while gaining capacity to meet pressures from global liberalism. While too loose ties between a government and its firms
(e.g., pluralism or liberalism) will further the decline of internal sovereignty, too strong ties (e.g., corporatism or state-led industrial policy) will be a target of criticism by “formidable” global neo-liberalism. Network as a new definition of government-firm relationships will be a third alternative to state-free liberalism, which formerly pervaded the U.S., and strong industrial policy, which overwhelmed Europe and some East Asian countries. Hence, the network mechanism both aids competitiveness and protects against the worst conclusions of global liberalism.

A way of building the network is to allow the public and the private sectors jointly to participate in national planning processes or at least permit meaningful input from the private sector. Cross-sectoral cooperation should be supported by a professional network, providing a common ground where professionals across the sectors develop a shared vision and values and thereby narrow public-private disparities in missions, culture, and perspectives. Furthermore, the professional network will be able to diffuse professional values and information resources down to implementation levels. Within the network boundary, professionals may be cohesive through their shared vision and confident of their rationality and expertise, but they also need to use the network as a channel of democratic discourse aimed at the public interest (Miller, 1994; Fox and Miller, 1995). This is necessary in order to obtain political support from elected officials and the general public.

At the micro level, implementation networks usually comprise public/private partnerships and intergovernmental networks; and the public/public partnership is a special form of the latter. Partnerships are designed to complete what each organization is not capable of completing on its own for the reason of lacked resources, expertise, or experiences. In general, “ideal” partnerships should include the following five elements: (1) a shared vision and trust coming out of experiences of working together; (2) the potential of attaining different goals together; (3) pooled resources and information; (4) shared risks and benefits; and (5) ongoing, flexible consensus building processes for decision-making.
However, it is hard to treat partnerships as “anti-structural” arrangements. For better results, they should include some structural factors in innovative forms, especially at the initial relationship where trust has yet to build. Also necessary are catalytic leadership, consensus-based role definition, and written legal agreements on contribution, risk, and reward. Required leadership and staff time are the two most critical factors to be considered before partnering. More significant and fundamental problems are goal conflict in public/private partnerships, on the one hand, and a free rider in public/public partnerships, on the other. Both of them occur when the partners’ mindset is grounded in entrepreneurship for exchange and competition rather than shared aims.

In Figure VIII-3, all findings of this study are synthesized to describe the concept and practice of a policy network. Its qualities are portrayed by the intersection of two axes: the bureaucratic-entrepreneurial axis, which represents the variable of micro-level governance, and the issue network-policy community axis, which consists of the variable of macro-level governance. The central core area represents the pure concepts of a policy network: trust, shared vision, interdependency, and institutionalized ties. Improving the core concepts makes possible what one party is not capable of completing on its own and reduces transaction costs in the long term. Also it may fulfill the needs for democracy within the network through equal power sharing.

However, there are roughly three disadvantages with employing only the pure concept. First, responsibility may be damaged due to loosely coupled relationships without a controlling force. Second, it is not enough to ensure accountability to the general public and responsiveness to broad areas of stakeholders, since the pure network is characterized by closeness and exclusiveness. Finally, partners are often burned out, since great staff time and effort is required to network. Moreover, full benefits appear only in the long term; hence partners may need a temporary structure focusing on economic or political incentives in initial networking processes.
Figure VIII-3. Policy Network as Alternative Governance
For better results in the practical world, policy networks need to include some components of a wide range of structures, ranging from highly bureaucratic to highly entrepreneurial. Furthermore, the networks may occupy a part of the spectrum ranging between issue networks grounded in American pluralism and policy communities based on European corporatism. Yet, it is noteworthy that policy networks lean somewhat toward policy communities, since they are conceptually more or less stable patterns of social relations. The peripheral area of policy networks may thus be flexibly bounded, but it should overlap with the particular components of four conventional governance structures: stakeholder participation; leadership by brokers; clear roles and written agreement; and a coalition or exchange partnership. The core concept of policy networks will be supported by those components, employed in consideration of a realistic appraisal of the extent to which ideal contexts and capacities can be present.

Policy network studies focus on interorganizational relations in a structural dimension and public policy in a functional dimension; hence the research area may serve as a nexus between organization studies and public policy studies. As one of the studies, this dissertation covers the practical and research-based agendas that O’Toole (1997a) points to for the field of public administration. It discusses descriptive questions on “how and what,” taking a well-defined policy field as a case for research. The level of analysis includes highly networked contexts such as global and professional worlds as well as partnerships. The impacts of the networks are also conceptualized in some aspects, dealing with program delivery results and strategies as well as normative questions.

To elaborate policy networks as a governance model, further research needs to focus on empirical theory testing concerning the multiple impacts of using networks to achieve normative and economic outcomes. Since this dissertation is an early exploratory work to encompass issues as multiple as possible, its primary purpose is to build theories and frameworks for policy network studies. Theory testing will be possible through analytical generalization and perhaps statistical generalization by using case studies of other compatible well-defined fields such as information technology and biotechnology.
(Yin, 1994: 10). Many successful public/private partnerships or professional networks are likely to be found in high-tech areas, but the roles of the public sector, especially at the state and local levels, are likely to be much more limited in other areas than in the Intelligent Transportation Systems.
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