ABSTRACT:

The U.S. Department of Transportation (DOT) is developing a 21st Century transportation system, one that uses emerging wireless technologies to create a ‘connected’, Intelligent Transportation System (ITS) in which vehicles, mobile devices, and transportation infrastructure interact (ITS Strategic Research Plan, 2010-2014, http://www.its.dot.gov/strategic_plan2010-2014/index.htm ). ITS may bring substantial benefits, including improved traveler safety, responsive transportation networks, fuel savings, and reduced environmental impact. ITS is a step toward a more sustainable transportation system. However, ITS presents one of the most complex governance challenges the DOT has undertaken since the Interstate Highway System. An analysis of ITS governance issues suggests DOT should consider using varieties of collaborative governance.
INTRODUCTION

The U.S. Department of Transportation (DOT) is developing a 21st Century transportation system, one that uses emerging wireless technologies to create a ‘connected’, Intelligent Transportation System (ITS) in which vehicles, mobile devices, and transportation infrastructure interact (ITS Strategic Research Plan, 2010-2014, http://www.its.dot.gov/strategic_plan2010-2014/index.htm). ITS will allow vehicles and infrastructure to communicate wirelessly over a 5.9 gigahertz frequency that the Federal Communications Commission (FCC) has granted to the DOT for this purpose. The proposed system may bring substantial benefits; including improved traveler safety, responsive transportation networks, fuel savings, and reduced environmental impact. ITS is a step toward a more sustainable transportation system. However, ITS presents one of the most complex governance challenges the DOT has undertaken since the Interstate Highway System. Recognizing the complexity of the task ahead, the DOT ITS Strategic Plan calls for research on governance.

ITS is a system that demands collaborative governance. Collaborative governance represents an emerging alternative to traditional command-and-control or hierarchical approaches. This paper will use ITS as a case study to explore how public leaders and public managers can design governance and incorporate collaboration into that design. First, relying on information gathered during an informal DOT discussion group, the paper will describe the ITS project governance issues. Second, it will address collaborative governance processes to engage citizens and stakeholders, as well as elements of collaborative governance in the ITS Strategic Plan. Third, it will describe principles from the fields of institutional and dispute systems design. Finally, it will begin
to scope out and identify governance design issues and choices in the ITS project as a case study. This analysis may yield a research program on designing collaborative governance.

**ITS GOVERNANCE ISSUES**

The ITS presents a variety of governance issues. The Intelligent Transportation Systems (ITS) Joint Program Office (JPO) Policy and Institutional Issues “was established to identify, research, analyze, and present policy options to enable successful connected vehicle deployments” within the U.S. Department of Transportation’s (U.S. DOT) Research and Innovative Technology Administration (RITA).\(^1\) It articulates these as issues regarding “[t]he roles and responsibilities of the entities that will be involved (i.e., governance, authority, enforcement)” for “successful deployment of ITS technologies.”

The ITS will be successful if it achieves goals for improving transportation safety and mobility, which present substantially different governance concerns. There are a variety of components pertaining to safety in ITS.\(^2\) The first goal is to reduce deaths and injuries from vehicle crashes as a whole through enabling vehicle-to-vehicle (V2V) communications and vehicle-to-infrastructure (V2I) communications. (See generally, [http://www.census.gov/compendia/statab/2011/tables/11s1102.pdf](http://www.census.gov/compendia/statab/2011/tables/11s1102.pdf) shows 39,000 traffic fatalities in 2008.) This requires high speed, high reliability communication. In the V2V case, vehicles are travelling 70 miles per hour or 140 mph toward each other; the vehicles need to detect a message about an imminent collision,

---

\(^1\) Statement on *ITS JPO Policy and Institutional Issues* (June 2011).

\(^2\) The following discussion is based on information shared by representatives of RITA’s ITS JPO at a workshop on governance issues on June 23, 2011.
transmit the information, and the car and/or the driver has to react quickly to prevent the crash. The basic V2V technology for crash avoidance already exists. However, there is no national system for certifying that a wireless radio transmission on the dedicated frequency is legitimate and from the vehicle it purports to be. For example, the system has to screen out someone sitting by the side of the road with a computer. Because this concerns the safety of life, it presents a substantially more significant policy issue than a simple Internet transmission, for which an international certificate system exists.

In the V2I arena, there are complex financial and jurisdictional issues. The wireless transmitters and related cable must be installed in infrastructure. However, all infrastructure investment ultimately is local, not national, in the United States. Federal matching grant funding supports state funding for the interstate highway system. There is no current mechanism for specifically funding the V2I infrastructure.

While the safety platform needs to be built to one consistent standard and requires a more controlled environment, mobility presents different issues. It is possible to achieve mobility improvements in a variety of ways by building an open platform to let the thousand flowers bloom using any communications technology. There are already smartphone applications to transmit traffic information to drivers, for example. There are congestion management technologies (Albalate and Bel 2009; Bryson, et al. 2009), information signs for travelers on freeways, and websites for public transit alternatives. Mobility does not require a single environment; instead, it requires minimal controls, an entrepreneurial environment, and an open platform. Mobility requires data standards, aggregated data, data environments, and open source data portals that allow developers to use each other’s source code. It focuses on getting and using data.
While safety and mobility present different issues, both are sides of a single, complex national system. The ITS will cross jurisdictional boundaries of multiple national agencies, 50 states (for a discussion of ITS in Rhode Island, see Vanasse Hangen Brustlin, Inc. 2006), countless regional, county, and local governments, and national borders (Prok 2008; Scassa, et al. 2011). It requires work with private sector stakeholders that include transnational corporations in industries as various as mobile technology, automotive manufacturing, railways, and construction, to name a few. Ultimately, it will require the United States to work with partners internationally to develop global standards for this new system. What is the role of the nonprofit and voluntary sector in ITS governance? How can the DOT engage the general public, the system’s ultimate beneficiaries and users?

An informal discussion among governance experts and transportation professionals identified a number of issues and considerations related to governance of the ITS:

- Financial responsibility (California has already invested $2 billion in ITS, but how will it fund operation and maintenance?)
- Bus and truck transportation (A commercial app for navigation has caused accidents by sending trucks on roads crossed by bridges with insufficient clearance.)
- Integrating transit modalities of autos, busses, trains, planes, and boats (Passenger cars focus on crash avoidance, but ITS is supposed to cross all transportation modalities.)
• Crossing jurisdictions (“It is easier to go to the moon than to get a train to go from Boston to Washington at high speed…”)³

• Coordinating technology or engineering expertise with demands of policy (Engineers and policy people need to work together and move in the same direction.)

• Private sector investment and coordination in the absence of national policy (Nine major auto manufacturers are cooperating on a technology platform to ensure V2V interoperability and investing in advance of a national ITS V2I deployment. Cars have a 17-year life cycle that can inhibit innovation; Cell phones have a 2-year life cycle allowing faster innovation.)

• Spectrum sharing on the 5.9 GHz band (To what extent do you invite private software developers to share the band; what about cyber-security?)

• Trust and interoperability in the security of the information coming over the network (How do you prevent other applications or uses for the data, as for example, by police?)

• Differing stakeholder priorities (Auto manufacturers and insurance companies care about safety and reducing injury and loss from collisions; state transportation authorities also care about mobility or reducing congestion and its effects.)

³ Beauchamp and Warrne (2009, p. 1) observe: Maintaining and enhancing effective and efficient mobility are critical factors for the [Northeast] Corridor if it is to maintain and increase its status as a leading space in the United States for economic, educational, and cultural activity, and innovation as well as livability.

In this context, the need to improve and expand the planning and policy-making capacity for the NEC’s transportation infrastructure frequently receives mention. However, from a governance perspective, no single entity is responsible for its infrastructure. The public sector agencies that have formal authority for the major modes of transportation within it are many and have different powers and spatial scales.
• Differing policy goals (Transportation agencies care about safety and mobility; environmental agencies care about reducing emissions from all traffic.)

• Encouraging entrepreneurial software applications development (What are the business models for cellular applications and applications for the 5.9 GHZ network?)

The ITS also presents substantial legal and substantive policy issues such as connectivity for health and medical information, information privacy (Scassa, et al. 2011; Douma and Deckenbach 2009) and liability arising out of automobile accidents (McDonald and Cranor 2006, recommending use of existing OECD policies on use of trans-border transmission of information for the ITS). Privacy in particular raises substantial concerns. These more substantive policy issues may require legislation and are outside the scope of this paper.

COLLABORATIVE GOVERNANCE

In a recent comprehensive review of the literature, Burris, et al., (2008, p. 9) define governance as “the management of the course of events in the social system.” They unpack this concept into:

three main elements: institutions - organizational sites where governing resources are gathered and mobilized (government agencies, corporations, foundations, NGOs, street gangs); methods of power - tools that governors use to project influence (deliberation, bribes, military force, claims of legitimate right to rule, forum-shifting); and constraints on governors - limitations on the freedom of action of governors that may arise from laws (like a constitution or treaty), competition from other governors (as in a market), or from culture (social norms).

(p. 9-10, citations omitted).

Notably, this definition omits the word ‘collaboration’ in any of its forms.
In a recent comprehensive study, Professor Mark Bevir observed that a variety of academic disciplines use the word ‘governance’ without engaging each other; he suggests the following as the most general meaning:

\[G\]overnance refers to theories and issues of social coordination and the nature of all patterns of rule. More specifically, governance refers to various new theories and practices of governing and the dilemmas to which they give rise. These new theories, practices, and dilemmas place less emphasis than did their predecessors on hierarchy and the state, and more on markets and networks.\(^4\)

This identifies three distinctive features of modern governance: it is hybrid, multijurisdictional, and has plural stakeholders who operate in networks.\(^5\)

In legal scholarship, this understanding of governance is sometimes referred to as “the new governance,” which includes the use of policy tools that involve privatization of previously public work and devolution of responsibility from unitary bureaucracies to networks and contractors.\(^6\) Some have characterized new governance legal scholarship as a new form of legal realism, one that looks pragmatically at law in context and in action; these legal scholars “seek[] to reinvent governance from the ‘bottom up’ by rejecting ancient administrative strategies of command and control and replacing them with a continuous dynamic process governed by the relevant stakeholders.”\(^7\)

---

\(^4\) Mark Bevir, Governance as Theory, Practice, and Dilemma, in THE SAGE HANDBOOK OF GOVERNANCE 1 (Mark Bevir, Ed., 2011).

\(^5\) Id. at 2.


Collaborative governance\(^8\) like the “new governance” focuses on the processes through which governance is accomplished (Bingham, \textit{et al.}, 2005). Collaborative governance includes the public and stakeholders in decision-making across the policy continuum through deliberative democracy, collaborative public management, and alternative dispute resolution (ADR) in the policy process; these provide ways for people to exercise voice and to work together in governance.\(^9\) Upstream in policy formation, collaborative governance entails dialogue and deliberation or deliberative democracy,\(^10\) as contrasted with the traditional adversarial processes of governance, which usually entail debate. Deliberative democracy uses a variety of models and techniques for engaging the public and stakeholders.\(^11\) Midstream in policy implementation, collaborative governance also entails collaborative public management, through which agencies and stakeholder organizations from the private and nonprofit sectors cooperate to provide public services through a variety of contractual arrangements or policy tools.\(^12\)

\(^8\) Jody Freeman, \textit{The Private Role in Public Governance}, 75 N.Y.U.L. REV. 543 (2000). Professor Freeman argued that public/private interdependence is a reality best understood as a set of negotiated relationships in which “public and private actors negotiate over policy making, implementation, and enforcement.” She ultimately rejected the term governance in favor of “problems to confront and decisions to make,” observing “[t]here is nothing to govern.” Id. at 548. She advocated institutional analysis and design, arguing that institutional design should move away from the traditional legislative, executive, and judicial branches to an examination of alternative private institutions and stakeholders and the role they can effectively play in governance.


\(^10\) In dialogue, participants engage in a reasoned exchange of viewpoints, in an atmosphere of mutual respect and civility, in a neutral space or forum, with an effort to reach a better mutual understanding and sometimes even consensus. In debate, participants listen in an effort to identify weaknesses in the argument and score points in an effective counterargument; in deliberation and dialogue, participants listen in an effort to better understand the other’s viewpoint and identify questions or areas of confusion to probe for a deeper understanding. Deliberation is the thoughtful consideration of information, views, and ideas. For a number of case studies and essays on deliberative democracy, see \textit{Deepening Democracy: Institutional Innovations in Empowered Participatory Governance} (Archon Fung & Erik Olin Wright eds., 2003), and \textit{The Deliberative Democracy Handbook: Strategies for Effective Civic Engagement in the Twenty-First Century} (John Gastil & Peter Levine eds., 2005).


\(^12\) See generally ROBERT AGRANOFF, MANAGING WITHIN NETWORKS: ADDING VALUE TO PUBLIC ORGANIZATIONS (2007); ROBERT AGRANOFF & MICHAEL McGUIRE, COLLABORATIVE PUBLIC MANAGEMENT: NEW STRATEGIES FOR LOCAL GOVERNMENTS (2003); EUGENE BARDACH, GETTING AGENCIES TO WORK TOGETHER: THE PRACTICE AND THEORY OF MANAGERIAL CRAFTSMANSHIP
Downstream, collaborative governance generally entails ADR in quasi-judicial or judicial government contexts.  

Collaborative governance can include the broadest scope of partners within and outside government, including the public, transnational, national, state, regional, and local government agencies, indigenous peoples, nonprofit organizations, businesses, and other nongovernmental stakeholders. Collaborative governance produces participatory decision-making. It may produce transparency by forcing government to provide information to the public in order to allow them to participate. This in turn can provide accountability by allowing the public to exercise voice in government. In theory, collaborative governance may be more efficient than hierarchical decision-making, in that many diverse voices provide government with better and more complete information upon which to base decisions.

Thus, governance encompasses not only institutional reforms within the branches of government, but also experiments that entail partnerships with a variety of stakeholders and the public outside government. Designing governance in the modern world means more than simply creating a constitution that establishes branches of government and well functioning public institutions. Governance necessarily entails a complex dance with public, private, or nonprofit stakeholders and with the public more generally to make, implement, and enforce the law. Governance happens as a function of system dynamics;
government’s branches and agencies interact with each other, with stakeholders, and with the public.\(^\text{16}\)

A recent review of empirical literature on collaborative governance defines stakeholders to include both individual participants and organizations or agencies (Ansell and Gash 2007). They find that face-to-face dialogue, trust-building, and the development of commitment and shared understanding are crucial factors for collaboration, and that small wins deepen trust, commitment, and shared understanding (for diverse practice resources, see Institute for Local Government, Collaborative Governance Initiative (Public Engagement), [http://www.ca-ilg.org/cgi](http://www.ca-ilg.org/cgi)). Emerson, et al. (2011) have developed an integrative framework for understanding the causal relationships and dimensions of collaborative governance regimes through a comprehensive review of the literature.

The DOT has been using collaborative governance in the area of congestion management. Koliba, Campbell, and Zia (2011) explained that traffic congestion is defined as, "too many travelers on roads and highways at the same time" (525). The consequences of congestion tend to fall into the following categories: environmental impacts, atmospheric impacts, impacts on land patterns, economic impact, and overall quality-of-life indicators (527). Congestion Management Networks (CMN) are typically made up of metropolitan planning organizations (MPOs), agents, regional and local governments, transportations agencies, travelers, and third party contractors. All three sectors are part of the process. The structure of CMNs tends to be "either situated in a department or division of a regional governance body or a stand-alone transportation planning and programming organization" (532).

---

Bryson, et al. (2009) determined that five key factors contribute to the success of collaborative efforts in congestion management: 1) understanding prior initiatives and the environment for collaboration; 2) developing effective processes, structures, and governance mechanisms; 3) understanding the roles of key actors; 4) demonstrating leadership and key competencies; and 5) creating an outcome oriented accountability system.

INSTITUTIONAL AND DISPUTE SYSTEMS DESIGN: MAPPING GOVERNANCE FOR THE ITS

Thoughtful design can coordinate collaborative and participatory interventions or programs across the policy continuum in ways that allow the legislative, executive, and judicial branches of government to reinforce each other synergistically, and that present a role for the nonprofit and private sectors in governance. Literatures in political science and other social science disciplines on institutions shed light on the broader context for designing ITS governance. Elinor Ostrom and the Indiana School’s Institutional Analysis and Development (IAD) frame is one way to understand systems through which humans organize themselves for collective action. It is an effort to explore and explain the wide diversity of institutions that humans use to govern their behavior (Ostrom, 1990, 2005). Examples of the diversity of its application include “regularized social interactions in markets, hierarchies, families, sports, legislatures, elections” and others (5). The study of institutional design is the subject of literature in political science, economics, sociology, public affairs, and policy analysis. Institutions arise, operate, evolve, and change (Ostrom 2005, p. 6).

Ostrom attempted to identify an underlying set of universal building blocks, a grammar and syntax, and a method for researching institutions and how they function.
She argued that these universal building blocks are arranged in layers that one can analyze using the IAD framework. A basic building block is an action arena or action situation. To analyze an action situation, Ostrom used seven categories of information:

1. the set of participants [single individuals or corporate actors],
2. the positions to be filled by participants,
3. the potential outcomes,
4. the set of allowable actions and the function that maps actions into realized outcomes [action-outcome linkages],
5. the control that an individual has in regards to this function,
6. the information available to participants about actions and outcomes and their linkages, and
7. costs and benefits – which serve as incentives and deterrents – assigned to actions and outcomes.

These are the common structural components that represent the building blocks for all institutions at their most general level (Ostrom 2005, 32, and see generally Chapter 2, 32-68). To understand a complex system, Ostrom advocated the notion of action arenas that are nested within each other.

Designing ITS governance entails understanding the existing default system that would apply to the ITS, identifying its structural gaps, and developing new institutions. Some participants at the DOT governance discussion observed ITS will not start from a blank slate; to some extent, it already falls within the policy arenas of the other governance entities. This can enhance or limit governance options. Transportation is a distributed governance environment; what is the governance space for ITS?

The default system for the ITS includes nested action arenas. For example, a variety of federal agencies have a piece of the ITS and are nested within the Department of Transportation (DOT). These include National Highway Transportation Safety Administration (NHTSA), Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), Federal Transit Administration (FTA), Maritime Administration (MARAD), and Research and Innovative Technology Administration (RITA), among
other centers of activity within DOT. These, in turn, are nested in the executive branch with other agencies like the Environmental Protection Agency (EPA) that have interacting policy mandates, or the Department of the Interior, that has control over passage through some public lands. There are local action arenas for municipal city and county transportation departments, nested within local government, and state departments of transportation housed within state government, which in turn are action arenas nested within the federal system. Beauchamp and Warren (2009) describe the thick network of regional transportation agencies in the Northeast Corridor that makes governance so difficult. Local structures include the metropolitan planning organization, which uses stakeholders, public engagement, and transparency in governance (Beauchamp 2009).

These arenas are separate from those regulating the market and entrepreneurial side of software application development. To design a governance system for the new ITS, one must first map the current system of governance for transportation.

Beyond mapping these nested action arenas, there is the question of what happens within them. Ostrom directs us to identify participants, their positions, the action function, outcomes, control over the action function, information, and costs and benefits. One study of metropolitan transportation governance found that federal mandates are the single most significant external motivator for the Kansas City Metropolitan Area system (Johnson and Swearingen White 2010). This stage of mapping requires scoping out stakeholders and their roles in both the current and future ITS system, together with the interventions, mechanisms, or policy tools and structures that currently exist and will be necessary to bring the ITS into implementation. To what extent will the ITS trigger
regulatory activity? To what extent will it leave activity to the markets? And what role can civil society and nonprofits play?

COLLABORATIVE GOVERNANCE AND THE ITS

There are values related to good governance that motivate much of administrative law in the U.S.; these include transparency, accountability, participation, collaboration, efficiency, and effectiveness (Bingham 2010). All of these values are implicated in the ITS governance challenge. Safety demands both transparency and accountability; it suggests a government role for setting mandated safety standards for the new technology. Efficiency demands a market role; many argue that government is not the driver for innovation in the U.S. However, the boundaries between government and the other sectors are not as clear for much of the work of governing the ITS. Jody Freeman (1997, p. 22) identified the hallmarks of collaborative governance as

1. A positive problem-solving orientation;
2. Broad participation by interested and affected persons at all stages of the decision-making process;
3. Solutions that are provisional and subject to revision (plasticity);
4. Accountability; and
5. Synergistic, flexible, and engaged government institutions.

These qualities are what the ITS needs.

There are a variety of collaborative processes that might profitably be brought to bear on this challenge:

- Mapping governance requires identifying issues and problems. Broad public engagement at the national level can surface information about how the average person will interact with the ITS, what people need and want from their transportation system, and what their priorities and values are. This is more than human factors research, which is well advanced in the V2V area.
• Broad public engagement at the local level can help transportation officials identify what public priorities should guide the tough financial choices on investing in V2V and V2I infrastructure. Johnson and Swearingen White (2010) found that citizens were primarily concerned with maintenance and traffic flow. In the current economic environment, public resources are severely constrained. ITS requires infrastructure investment, and that investment is largely state and local. There is a growing body of research on methods of deliberative democracy that can help.

• Traffic safety standards are a uniquely government function. Rulemaking on safety will involve significant technical issues. There is already close collaboration both among companies in the auto industry and between that industry and government. Negotiated rulemaking could provide an opportunity for industry, government, and other stakeholders who speak for the public and consumers to develop a shared understanding for draft rules. There are also institutions other than government that can help address the governance issues of the ITS. A few examples include:

  • There are national and international precedents for nonprofit certification organizations and for standard setting by international organizations. In some cases, it is more effective to have competing organizations that drive standards higher by each claiming the more prestigious or exclusive certification.

  • Privatization may permit more flexibility for governance structures to evolve. Contracts can permit the use of temporary institutions that do not become part of a permanent government bureaucracy. Designated private laboratories do
elite athlete drug testing for Olympic sports, not the International Olympic Committee. So too, private contractors could monitor the ITS.

- Public-private partnerships (PPPs) have succeeded more in road construction than public transit, according to one study of almost 1,000 projects (Siemiatycki 2011), which found that a significant factor contributing to failure was overlapping jurisdictions with fragmented institutions in urban governance. Collaborative governance could strengthen PPPs.

- The energy industry evolved a combination of public, private, and independent nonprofit institutions to govern the interstate transmission of power including the Regional Transmission Organization that oversees the whole system (Koch 2000, 2005). The RTO evolved over time from a baseline of existing governance structures.

In other words, it is not clear that the ITS requires a substantial new government bureaucracy. Instead, it creates new work for existing structures, and it may require experiments with new institutions, including private and nonprofit ones, to manage the as yet unforeseen policy issues.

CONCLUSION

The ITS presents substantial challenges for governance. Its complexity also presents opportunities for collaboration. The task is huge. A first step is mapping the existing system through institutional analysis. A second step is identifying opportunities to engage the public and stakeholders at the varying jurisdictional levels. The size and scope of the system suggests that an evolutionary approach, one that experiments with
collaborative governance processes and network mechanisms to develop new institutions, may help transportation move into the 21st century.

REFERENCES


