



**Center for  
Technology in Government**

# **Government Worth Having: A briefing on interoperability for government leaders**





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## **A briefing on interoperability for government leaders**

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October 2008

## **Interoperability: an important issue for government leaders**

Interoperability is a key enabler of the information and knowledge sharing necessary for Information and Communication Technologies (ICTs) to deliver on the promise of government transformation. Interoperability is not an end in itself; interoperable systems deliver value to the public through the opportunities they enable. Value is realized through better coordination of government agency programs and services and through opportunities for information to be shared among, and used by, networks of government, private sector, and other key actors to serve the priorities of society and its institutions. The United Nation's Millennium Development Goals<sup>1</sup> offer a "blueprint" for bettering the world's poorest countries and interoperability contributes to the critical foundation necessary to meet those goals. Interoperable systems cannot replace basic supplies like food and shelter; but they can assist nations in their efforts to make the best use of scarce resources and provide services to citizens in new and innovative ways. This paper focuses on why interoperability is an issue for government leaders, and what must be done specifically by these leaders to build the critical foundation of interoperability.

To understand why government leaders should make interoperability a top priority, consider the ways it contributes to the value of government as a public asset; to creating a government worth having.

### ***Democracy and Citizen Participation***

- Access to information for engaging in political action activities such as advocating, debating, and voting.
- Creation of new electronic forums for citizen engagement.

### ***Transparency and Citizen Trust***

- Access to integrated, holistic views of government resources and operations contribute to transparency and citizen trust in and allegiance to government.
- Access to information about government processes for public scrutiny influences decision makers and other officials to pay closer attention to public interests and desires.

### ***Citizen and Business Services***

- Information about benefits and services available to citizens that they would otherwise be unaware of or unable to acquire.
- Easy to use, accessible, and geographically distributed citizen and business services (multi-channel access to payment services and applications and forms).
- Facilitate the connecting of citizens and businesses into the global economy.

#### **Interoperability**

The creation of systems that facilitate better decision making, better coordination of government agency programs and services in order to provide enhanced services to citizens and businesses, the foundation of a citizen-centric society, and the one-stop delivery of services through a variety of channels.

United Nations Development Programme,  
*e-Government Interoperability: Overview, 2007*

<sup>1</sup> <http://www.un.org/millenniumgoals/>

### ***Government Management and Economic Development***

- Internal, modernized infrastructure for government operations to support the back office processing of citizen and business services.
- Make government much more capable in financial, human resources, and equipment management to support government decision making, wise use of resources, and provide information for financial transparency and accountability.
- Improved government wide coordination of crisis responses.
- Stimulate local, regional, and national economies by attracting investments through enhanced reputation for improved government operations and new and innovative services available to citizens and businesses.

Achieving interoperability across the boundaries of agencies, levels of government, and even across national boundaries, requires the kind of leadership and authority only available at the top most levels of government. The reason for this has much to do with the number and diversity of the organizations that need to become interoperable. We refer to this distinct and interdependent group of organizations as an “enterprise.” For example, linking two databases and a case management process within a single social services agency within a single government requires one set of capabilities. Creating a public safety communications network consisting of many different agencies at several levels of government, even across national boundaries, with different, but overlapping business processes, using similar but not standardized information, requires quite a different set. This briefing is focused on the second of these scenarios—enterprise interoperability initiatives.

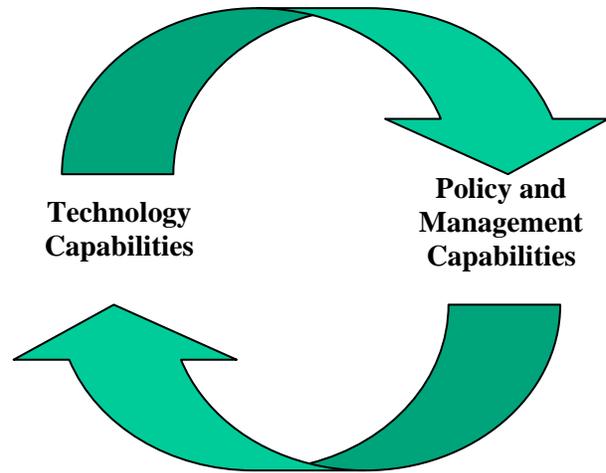
While public sector officials at all levels of government play important roles in a wide range of interoperability efforts, government leaders alone have the power to alleviate the institutional constraints that impede these potentially transformative, but highly complex enterprise interoperability initiatives. Interoperability depends on the combination of capabilities that exist within the enterprise. Not all organizations need to develop the same capability profile. Instead, the combination of interoperability capability profiles across a set of organizations seeking to share information determines the effectiveness of an initiative. Four assumptions about capability underlie this perspective:

<p style="text-align: center;"><b>Enterprise</b></p> <p>A defined network of organizations that share either a policy area (e.g., public health, public safety, poverty alleviation, and economic development) or need to provide services (e.g., government procurement and financial management, health services, and the administration of justice) that no single agency or organization provides alone or exclusively.</p>
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1. *Capability is multidimensional*—is made up of several dimensions, all of which contribute to overall interoperability.
2. *Capability is complementary*—high or low overall levels of capability can result from different combinations of factors; high levels in some dimensions can often compensate for lower levels in others.
3. *Capability is dynamic*—it can increase or diminish due to changes within an initiative or in its external environment.

4. *Capability is specific to its setting*—some elements of capability apply to all settings, but capability for any particular project must be assessed relative to its own specific objectives and environment.<sup>2</sup>

Governments need a mix of policy, management, and technology capabilities to create interoperability (see Figure 1). Government leaders alone have the authority to influence the political environment to the extent necessary to enable and support the creation of such capabilities. How authority is delegated and shared must be reconsidered in the context of intergovernmental networks. These new authority relationships must be used to establish joint understanding of problems and priorities and to establish a scope of vision and focus of effort. Collaboration must be institutionalized as a principle and facilitated as a management strategy within our traditional bureaucratic institutions. Unfortunately, while leaders have the unique power to make these changes, experience shows that the policy environments they have created, or in many cases inherited, often limit the capability of governments to share authority, to collaborate, and to jointly and strategically manage enterprise initiatives. To change this, leaders must understand the link between their policy decisions and the capability of governments to create the systems necessary to share information across boundaries. The transformation of government depends on these new capabilities: interoperability and information sharing across borders, jurisdictions, agencies, and sectors.



**Figure 1. Capabilities for interoperability**

To create interoperability government leaders must understand:

1. Regardless of context; local, national, or international, interoperability is an important foundational capability for government transformation.
2. The complex nature of interoperability.
3. The institutional and organizational constraints that impede efforts to create interoperable systems.
4. New kinds of capability for sharing authority, leadership and funding across organizational and maybe even governmental lines must be created.

As a starting point for change, this briefing provides insights into the gap between the capability that exists and the capability required, as well as current institutional and organizational constraints on interoperability efforts. This briefing describes a unique focus on the creation of policy and management capability rather than technical capability. Technical capability is central to interoperability, but the creation of policy and management capability should be considered essential requirements as well. Without a solid policy and management

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<sup>2</sup> [http://www.ctg.albany.edu/publications/guides/why\\_assess](http://www.ctg.albany.edu/publications/guides/why_assess).

foundation oriented toward creating interoperability, governments should proceed with great caution, if at all, in the implementation of technical interoperability. A set of recommendations to guide leaders in the development of policies and principles for action are presented as well. The list of suggested readings and resources found in the Appendix of this briefing includes additional information on this important topic.

## **The public value of interoperability**

Information is one of the most valuable resources of government. Governments are finding, however, that the information needed to plan, make decisions, and act is often held outside their own organizations, collected for widely different purposes, and maintained in disparate formats and systems. This is why governments are increasingly turning to interoperability as a strategy for maximizing the value of information. Interoperability allows government managers to work at the same time, with the same information integrated from multiple sources. It has the potential to support the transformation of organizational structures and communication channels among numerous organizations working in different locations.

The growing support for interoperability as an infrastructure investment transcends political partisanship and crosses policy areas and institutions as well as continents and oceans. This support stems from an increased understanding of the potential public value of more effective interoperability. Interoperability capabilities, when available, allow information to be used to meet the priorities of government; to track the spread of disease across regions, to pay health benefits to workers who live and work in different countries, and to monitor air quality in border regions. The following case vignettes are provided to illustrate how interoperability has contributed to government transformation in the areas of services improvement, efficient and effective operations of government, and the development of stable and vital economies.

### **Increasing the legitimacy of government through transparency and efficiency.**

Financial management systems are key links in the flow of revenues to the government and the flow of expenditures and services back to the public. Improving financial management, therefore, has the potential to produce significant returns in terms of both greater internal efficiencies and enhanced value to the public. These were the goals of the Austrian Federal Budgeting and Bookkeeping System project initiated in 1997 by the Minister of Finance and supported by the Chancellor. The goal of the project was an interoperable federal government budget and bookkeeping processes. By 2005, one of the results of the interoperability initiative was that the Ministry of Finance successfully consolidated 85 bookkeeping units across the federal government into one federally owned, but privately operated, agency. These improvements reduce the burden of financial support on the public—taxes, fees, etc.—and ease the burden of compliance with rules and policies. Better financial information can make government budgets and expenditures more transparent, and thus more legitimate and acceptable to the public.

**Increasing the value of government to citizens through enhanced services.** Canada's Service New Brunswick (SNB) is well-known internationally for its expertise in providing multi-channel single window citizen access to government services, as well as for developing and maintaining geographic information databases. SNB's award-winning approach provides one-stop-shopping for different government services on behalf of

provincial and municipal government agencies. It also provides a linkage to the Canadian Federal Government in a joined-up government model. As a crown corporation operating outside of, but in partnership with Canadian governments, SNB represented a new model for sharing resources and managing programs.

**Transforming government through modernized, integrated, and world-class practices.** The Merkava Project in the Government of Israel restructured the financial, logistics, and human resource components of government wide administration into an interoperable system. An interoperability framework was used as a way to implement a much more standardized and modernized government operation and an enhanced management infrastructure on which to build improved services.

Interoperability as a priority is also gaining support as a consequence of new understanding of the cost to society when interoperable systems are not in place. This new understanding has realized through the examinations of several national and international crises that required governments to coordinate and work together both within and across governmental boundaries and with civil society and the private sector.

**Missed opportunities for collaboration.** A post-tsunami lessons learned report released by the Government of Indonesia and the United Nations<sup>3</sup> noted the many missed opportunities for coordinated response among national and international responders. The consequence of this was a myriad of coordination problems resulting in each responder providing what they could based on an internal setting of priorities rather than a shared understanding of needs.

**Weak systems for processing and using information.** The 2004 bipartisan *9/11 Commission Report* presented a sobering characterization of the U.S. public sector's current ability to leverage information. It emphasized that a weak system for processing and using information is stymieing the U.S. government's ability in leveraging the vast amount of information it has access to.<sup>4</sup>

These insights and experiences together and the growing concerns about global health, financial, and other crises has pushed interoperability and transparency to the center of the debate about governments' abilities to respond to these events.

**Incalculable human misery.** At a November 2007 meeting of the World Health Organization, interoperability and transparency were identified as "essential" to the efforts of the member countries to "increase country capacity in surveillance, early detection, diagnosis, and reporting of cases – both animal and human." The cost of not being prepared to share information, to coordinate our responses, and to work together, is well understood, "If we are unprepared, the next pandemic will cause incalculable human misery."

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<sup>3</sup> Post-Tsunami Lessons Learned and Best Practices Workshop; Report and Working Groups Output, Jakarta, Indonesia, May 2005, Government of Indonesia, United Nations.

<sup>4</sup> National Commission on Terrorist Attacks on the United States *The 9/11 Commission Report* (Washington, D.C.: July 2004).

From a global and local perspective we know the future presents many challenges. The president of an association of U.S. local government health officials, speaking before U.S. state legislators in early 2004, testified that “while we can't predict future challenges, we know they will be there. We know they will be difficult, surprising in complexity, and growing in frequency and severity.” He emphasized that the infrastructure of local public health units needs to be further strengthened to meet the increasing challenges and emerging public health responsibilities in our communities. Information must be shared and systems must work together at new levels.

## **Understanding complexity and building capability**

Technical advances make interoperability possible, but research and practical experience tell us that technology alone cannot solve the challenges of creating interoperability. The complexity of creating enterprise interoperability lies in the interdependence among policy, management, and technology capabilities and the gaps between the levels of capabilities required within an enterprise and the capabilities that exist. The broad view used here considers capability in terms of two closely related, but distinct components needed for creating new multi-organizational interoperable systems:

1. Capability to create effective collaboration across organizational and governmental boundaries.
2. Capability to develop new interoperable systems and procedures.

Making a distinction between sets of capabilities is critical to understanding the complexity common to many transformative efforts. For example, collaboration capability is about working together and making plans and decisions. This seemingly simple capability is often found to be lacking within a cross-boundary environment. Collaboration at the individual level, even at the unit and agency level is often within the skills and authority of government managers to arrange. However, creating capability for collaboration within the public health enterprise of a country, or across country lines to create regional programs, requires the unique attention and authority of government leaders.

### **Stovepipe funding models**

Stovepipe funding generally undermines work on initiatives that cut across disciplines and agency boundaries when those initiatives are forced to compete for financial support with individual agencies' operational needs.

*Optimizing State Investments for Justice Information Sharing,*  
U.S. National Governors Association, 2002  
<http://www.nga.org/cda/files/1102FINANCINGJUSTICE.pdf>

### **Creating two kinds of capability for interoperability**

In 2004, the State of Oregon experienced its first case of West Nile virus (WNV). Interoperability was a central part of the response coordination effort and required new capabilities within the state and with federal agencies. One county-level communicable disease expert involved in Oregon's WNV response efforts found that for agencies to achieve interoperability on a more systemic and institutional level, they must understand each other's missions and needs. To achieve this level of understanding, she said, agencies go through several stages of collaboration. The first stage is "shake hands." Meet and get to know the

people from agencies you will be working with. The second stage is to coordinate planning and training with agencies through exercises and routine responses. Only after going through these first two stages can agencies reach the stage of true interoperability. Building this collaboration capacity takes time and resources, and only with the support of top leaders can these separate organizations begin to work together and build interoperability when and where it is needed.

The second component contributes to the building of systems and inter-organizational processes used to share and integrate information. Leadership involvement is required here as well. Creating interoperable business processes and information systems builds on new agreements about how work will be done to actually create interoperable systems. This typically requires resources to be managed differently. Appropriate resource allocation and procurement strategies are necessary and as a consequence operating agencies, control agencies, and policy making bodies must also act in new ways.

Creating this capability within complex enterprises is constrained by many factors including technical issues such as data and technical incompatibility. But institutional and organizational factors present their own constraints on the ability of governments to create effective collaboration across organizational boundaries. These include:

1. A lack of experience leading in network forms of government.
2. An insufficient or lacking cross-boundary governance structure.
3. A lack of policies that allow new, innovative resource allocation models.
4. A lack of policies that engender investments in the principles of scalability and sustainability of solutions.
5. A focus on crisis-oriented response.

## **Boundaries and complexity**

The complexity government agencies face in creating interoperability appears to increase proportionally with the number of boundaries crossed, the number and type of information resources to be shared, and as the number of technical and organizational processes to be changed or integrated increases. These difficulties result from the reality that sharing information involves large parts, if not the whole, of an enterprise or policy domain.

“While we can’t predict future challenges, we know they will be there. We know they will be difficult, surprising in complexity, and growing in frequency and severity.”

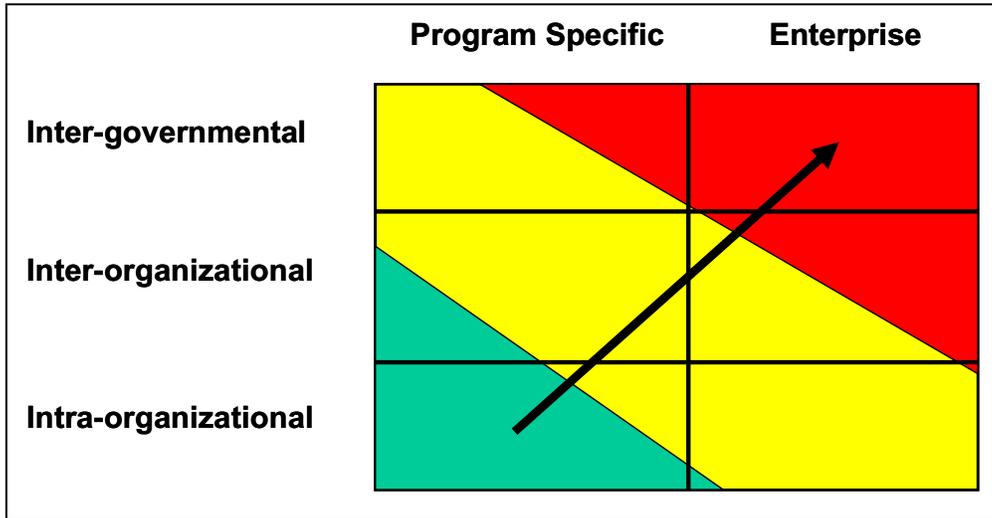
*A U.S. Local Government Public Health Official*

The *Information Sharing Complexity Matrix*<sup>5</sup> (see Figure 2) provides a mechanism for characterizing a cross-boundary interoperability initiative and identifying the level of complexity to be expected in creating the interoperability and information sharing capability necessary for transformation. The first dimension refers to the focus of the initiative, which can be meeting a specific need or problem or building systemic capacity. The second dimension

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<sup>5</sup> Gil-Garcia, et. al, 2005.

takes into consideration the associated level of organizational involvement with three categories of involvement: intra-organizational, inter-organizational, and inter-governmental.



**Figure 2. Information Sharing Complexity Matrix**

With respect to improving interoperability, the ability to understand the level and nature of the complexity early on and before investments are made is important. The *Information Sharing Complexity Matrix* provides a simple but clear conceptual model to help government managers identify the types of “boundaries” that will be crossed and some of the associated barriers and challenges that they might face within a specific interoperability initiative. Of course, acknowledging the complexity of these “future challenges” is only a beginning. Government leaders need to move from understanding to action. The following section explains the specific role of government leaders as they enhance the capability for interoperable governments.

## Four recommendations for government leaders

Many government leaders understand the need for interoperability; however, they have not yet consistently recognized the unique role they must play in creating the conditions necessary for building interoperable systems. As a result, while agency leaders and program managers seek to organize and work differently—to get people to do *different things in new ways*—they continue to be constrained by the traditional bureaucratic models that favor and reinforce the *old ways of doing things*.

Leaders must use their political will to create the conditions for interoperability, in particular for establishing appropriate policy frameworks and creating the governance mechanisms necessary for governments to organize and work effectively along new lines; networks of organizations working collaboratively on common interests and shared priorities.

### Four recommendations for government leaders

1. Build network leadership skills.
2. Create effective cross-boundary governance structures.
3. Create enterprise resource allocation models.
4. Reduce barriers to non-crisis capacity building.

A more interoperable government can change the nature of democracy, and citizen participation, and provide systems for services improvement, efficient and effective operations of government, and the development of stable and vital economies. Four recommendations for realizing these changes are presented as a roadmap for government leaders. Collectively, the recommendations guide the transition to the policy environment for creating the interoperability necessary to realize government transformation. The recommendations focus on changes that must be made to create a government that is capable of effectively managing itself and its resources to provide the day-to-day services necessary to its citizens while at the same time being prepared to work with others to respond to crises as they emerge; in a sense creating a government worth having.

# Recommendation # 1

## ***Build network leadership skills***

The delivery and management of public services, historically provided through traditional bureaucratic organizations, today relies on networks of interdependent organizations. Effective and efficient delivery of programs and services through these networks requires interoperable systems. Leading a group of interdependent organizations to create this interoperability requires a different set of skills than those required in traditional bureaucratic organizations and traditional program and service delivery models. Crosby and Bryson describe this setting as “no-one-in-charge, shared-power world,”<sup>6</sup> where a great number of organizations and groups have only partial responsibility to act on a public problem and share the power required to solve it.

Leaders in this context must understand the challenges of working in networks; they must recognize the complexities inherent in working with many agencies and levels of government to coordinate programs and services. Two fundamental assumptions of traditional leadership literature<sup>7</sup> do not apply to collaborative settings. First, a leader cannot exert formal authority based on hierarchical rank because the individuals involved are from different organizations. Second, it is very difficult to agree upon a common goal because participating organizations, by design, have different missions, priorities, and, therefore, conflicting goals. Network leaders require boundary spanning skills. They must be skilled at creating the conditions for collaboration across the boundaries of these organizations. They must be able to identify shared opportunities for joint effort, to build energy and interest in working in new ways, and to navigate the complexity of network-based initiatives. They must be capable of drawing together key stakeholders to establish joint agreements about technologies, processes, policies, and practices.

Creating interoperable systems across a government enterprise requires leadership that is knowledgeable about the challenges of working in networks and able to navigate the inherent complexities of this environment. Since IT permeates all business functions of an organization, IS leadership requires a holistic cross-functional view of the organization, which poses unique challenges for many chief information officers (CIOs) (Karahanna & Watson, 2006). It is imperative that government leaders recognize the importance of this type of network leadership style and put their support behind those individuals that demonstrate such skills and those programs and policies that support the development of these skills throughout the government workforce.

Leaders in this context must understand the challenges of working in networks; they must recognize the complexities inherent in working with many agencies and levels of government to coordinate programs and services in new ways.

<sup>6</sup> See John M. Bryson and Barbara C. Crosby. 1992. *Leadership for the Common Good: Tackling Public Problems in a Shared-Power World*. Jossey Bass Public Administration Series.

<sup>7</sup> Chris Huxham and Siv Evy Vangen. 2000. "Leadership in the shaping and implementation of collaborative agendas: how things happen in a (not quite) joined-up world." *Academy of Management Journal*, Vol. 43 No.6, pp. 1159-75.

## **Recommendation # 2**

### ***Create effective cross-boundary governance structures***

Effective cross-boundary governance processes are critical to creating and sustaining interoperable systems. These governance processes must exist outside each participating organization's traditional bureaucratic structures and be designed to provide a similar kind of decision making capability to these "no-one-in-charge, shared-power world" environments. To be effective in this horizontally oriented setting, cross-boundary governance processes must be acknowledged by and supported by government leaders.

Interoperability requires, to varying degrees, changes in organizational resources beyond information technology such as personnel, equipment, and funding. It most often necessitates changes to current policies and procedures and the creation of new structures of authority to support decision making processes that must involve multiple organizations. Sometimes these organizations have similar goals and work models, sometimes their goals are quite divergent or even competing. Developing clarity about roles and responsibilities of each participating organization has been found to be an important factor in the success of information sharing and interoperability initiatives. Cross-boundary governance bodies are critical in creating this clarity.

Often the capabilities necessary to create network oriented governance structures is lacking. In part, this is due to the inherent conflict between traditional hierarchical processes versus the kind of cross-boundary processes required to create interoperability. The kinds of decisions necessary to build enterprise interoperability often come in conflict with existing governance processes. For many governments and the specific organizations involved, creating enterprise interoperability is uncharted water. In these environments there is often a lack of agreed upon decision making processes as well as a lack of knowledge of each of the participating organizations and clarity about roles and responsibilities, and the fear of losing autonomy. Enterprise interoperability initiatives require cross-boundary governance structures that have their own clear lines of authority and decision making processes.

New governance structures must recognize the realities of the political environment in which they seek to create interoperability. They must be designed to complement traditional mechanisms with transparent, realistic, and flexible cross-boundary governance structures. These structures should not arbitrarily replace existing lines of authority with cross-boundary governance structures that disregard how decision making flows through agencies and branches of government.

Government leaders often hold the exclusive authority to empower cross-boundary governance structures to make decisions on behalf of a group of organizations; decisions that, while not in the best interests of or supported equally by each individual agency or partner, may reflect the overall enterprise priority. It is a focus on the enterprise priority that will guide interoperability efforts; decision making must be removed from individual agencies and shared across those agencies involved.

## Recommendation # 3

### ***Create enterprise resource allocation models***

Most existing resource allocation models do not allow for the movement of money or people across agency or government lines; at least without great pain inflicted to all involved. Even when organizations recognize the value of interoperability and are willing to commit resources to an enterprise priority, they are typically limited by law or regulation in their ability to allocate dollars across organizational boundaries. Small, short-term problem solving projects can often find innovative ways to share resources across boundaries and make it work. Complex and long-term projects designed to create new capability in government are stymied by the inevitable limitations of traditional resource allocation models organized to fund agencies to work on agency-specific projects. Even in situations where interoperability initiatives are sanctioned by government leaders, participation and commitment are severely limited by these traditional funding and spending models. New legislation is needed to lay the foundation for resource allocation models that recognize and support this new way of working.

#### **Existing funding models constrain interoperability strategies**

Resource allocation was a consistent source of interagency conflict in one government's justice information sharing project. Given existing funding models, some agency directors wanted to know how an integrated justice solution would affect their agency before the group could even begin discussing possible courses of action. Concerns that their agency would end up having to carry the burden of additional system administration and training costs without additional funding while other agencies simply benefited from the resulting information integration handicapped collaboration. Existing funding models provided no way for funds to be jointly appropriated and used.

New enterprise resource allocation models are necessary also to accommodate the use of scalable systems strategies and to acknowledge the need for sustainable systems. Developing scalable systems allows organizations to start small and to learn through more modest implementations and to "scale-up" as considered feasible and advisable to do so; a start small, and scale up strategy. Many resource allocation models require an all or none approach.

Increasing emphasis on sustainability also requires the unique attention of government leaders. Investing in systems to solve today's problems but are not sustainable over time is a common scenario for government agencies. Leaders alone have the ability to create new resource allocation models as well as require scalable and sustainable strategies. Government leaders are necessary actors in changing how money can be requested and spent.

## Recommendation # 4

### ***Reduce barriers to non-crisis capacity building***

Governments in general, react well in a crisis. They loosen the institutional and organizational constraints on working together across organizational boundaries, between public and private organizations, and across levels of government; network leaders emerge, priorities become clear and common, and decision making is streamlined. Sharing information and other resources becomes easier. Interoperability is more readily created within the context of a crisis to share information about victims of the crisis, about the equipment needed to respond and recover, and about the spread of a disease within the context of that crisis. Creating interoperability ahead of time and building capacity to share information in normal times is often viewed as unnecessary and expensive; but in the long run, it may not be.

Immediately following a crisis governments tend to see the value of interoperability and will commit resources to build overall capability. Those involved in the 9/11 and the Tsunami responses saw this need very clearly; those planning for the next pandemic also see it clearly. Unfortunately, diverting resources, scarce resources, from other priority programs to create interoperability becomes politically unpopular as soon as memories of the most recent crisis begin to fade.

#### **Lessons from the World Trade Center Reponses - Advance planning during normal times**

Some unexpected needs, such as the need to fly over Ground Zero to capture remote sensing and visual data, were so unusual that no existing legal procedures or routine relationships could be immediately invoked. The process of securing permission and resources to carry out this effort was invented as it unfolded, with frustrating gaps in understanding and overlaps of authority among people and organizations that had never met or worked together before. Because the fly overs involved civilian, military, local, state, and federal authorities, delays and misunderstandings added to the confusion. One person recalled that it took days to get the effort up and running. “I think everyone now recognizes that we’d like to set up contracts in advance, and specs, and have a company ready to go, so that when something happens, [you] lift up the phone, fly, no questions, everyone knows [what’s happening], and they’re up in the air and we’re getting that intelligence back to us.”

*Information, Technology, and Coordination: Lessons from the World Trade Center Response*, Center for Technology in Government, 2004  
[http://www.ctg.albany.edu/publications/reports/wtc\\_lessons](http://www.ctg.albany.edu/publications/reports/wtc_lessons)

Government leaders alone have the ability to keep a focus on the need for interoperability. They alone can ensure transformation by sustaining investments in the necessary capabilities. They can create an environment that helps cultivate enterprise interoperability for both day-to-day government operations and interactions with citizens as well as emergency management and crisis responses. The benefits are twofold: first, governments end up being more proactive rather than reactive when it comes to crisis response; and second, investing in capabilities that serve both day-to-day and crisis needs demonstrates a more efficient use of scarce resources and produces a more resilient government.

### **Acknowledgements**

This issue brief is based on the findings of a number of research studies conducted by the Center for Technology in Government as well as many government projects involving capability assessment for cross-boundary information sharing and interoperability including:

1. *Modeling the Social and Technical Processes of Interorganizational Information Integration*, National Science Foundation, Grant # 0205152.
2. *Knowledge Networking in the Public Sector*, National Science Foundation, Grant # 9979839.
3. The United States Department of Justice.

The authors would like to acknowledge the support of Microsoft Corporation in the development of this white paper. In particular, we would like to thank Martha Nalebuff and Lorenzo Madrid for sharing their thoughts and expertise and reviewing earlier drafts of this document. In addition, the authors would like to thank Anna Raup-Kounovsky and Alison Heaphy from CTG for their assistance.

## Appendix. Suggested Readings and Resources

Resource	Brief Description
<p><i>Roadmap for E-government in the Developing World: 10 Questions E-Government Leaders Should Ask Themselves.</i> The Working Group on E-Government in the Developing World, April 2002.  <a href="http://www.pacificcouncil.org/pdfs/e-gov.paper.f.pdf">http://www.pacificcouncil.org/pdfs/e-gov.paper.f.pdf</a></p>	<p>This project was motivated by a desire to leverage e-government lessons already learned in the developing world to maximize the chances of success for future projects. The “Roadmap for E-government” that follows highlights issues and problems common to e-government efforts and offers options for managing them.</p>
<p><i>e-Government Interoperability: Overview.</i> Bangkok: United Nations Development Programme, 2007. Available at  <a href="http://www.apdip.net/projects/gif/GIF-Overview.pdf">http://www.apdip.net/projects/gif/GIF-Overview.pdf</a>.</p>	<p>UNDP created a Study Group of government officials from 14 nations, supported by a team of industry experts, to help countries, especially those in the Asia-Pacific region, reverse the trend of fractured ICT projects by developing and promoting Government Interoperability Frameworks (GIFs).</p>
<p>The Justice Information Sharing Capability Assessment Toolkit.  <a href="http://www.ctg.albany.edu/publications/guides/sharing_justice_info">http://www.ctg.albany.edu/publications/guides/sharing_justice_info</a></p>	<p>This toolkit is designed for use when considering or planning for a justice information-sharing initiative. It provides a process for assessing where capability for interoperability exists and where it must be developed in order to achieve public safety goals. Assessment results provide a basis for action planning to fill capability gaps both within and across organizations.</p>
<p>Enterprise Interoperability Centre  <a href="http://new.eic-community.org">http://new.eic-community.org</a></p>	<p>The EIC defines and applies integration methodology and tools leveraging existing standards where possible to define common public business processes for achieving interoperability of networked organizations across multiple industries. He EIC is a product of Project Athena. The Centre includes an eLearning Portal with a variety of courses including Concepts of Interoperability and Business Interoperability.</p>
<p>European Commission Interoperable Delivery of European eGovernment Services to public Administrations, Business and Citizens (IDABC)  <a href="http://ec.europa.eu/idabc">http://ec.europa.eu/idabc</a></p>	<p>EIDABC works on behalf o the EC to improve the interchange of data between members States’ administrations and the European Institutions. To achieve the objectives of the program, IDABC operates by issuing recommendations, developing solutions and providing services that will enable national and European administrations to communicate electronically.</p>
<p>European Interoperability Framework v1.0  <a href="http://europa.eu.int/idabc/en/document/3761">http://europa.eu.int/idabc/en/document/3761</a></p>	<p>Issued by the EC to support the delivery of pan-European eGovernment services to citizens and enterprises.</p>

Resource	Brief Description
<p>Gasser, Urs and Palfrey, John G., <i>Breaking Down Digital Barriers: When and How ICT Interoperability Drives Innovation</i>. Berkman Center Research Publication No. 2007-8 Available at SSRN: <a href="http://ssrn.com/abstract=1033226">http://ssrn.com/abstract=1033226</a></p>	<p>This study attempts to understand a range of views on how interoperability comes to pass, what is optimal in terms of interoperability, how interoperability relates to innovation, and how to approach achieving greater interoperability.</p>
<p>Open GIS Consortium <a href="http://www.opengeospatial.org/">http://www.opengeospatial.org/</a></p>	<p>The Open Geospatial Consortium, Inc.® (OGC) is a non-profit, international, voluntary consensus standards organization that is leading the development of standards for geospatial and location based services.</p>
<p>Roberta Balstad Miller. Toward Global Interoperability. <i>Directions Magazine</i>, April 30, 2004. <a href="http://www.directionsmag.com/article.php?article_id=527&amp;trv=1">http://www.directionsmag.com/article.php?article_id=527&amp;trv=1</a></p>	<p>There is a growing recognition worldwide that interoperability is essential to the Information Society. Increasingly, however, interest in interoperability is spreading beyond information, hardware, and software professionals and is being expressed both by longstanding and new users of data and information and by those who wish to advance development around the globe.</p>
<p>Study on Interoperability at Local and Regional Level <a href="http://ec.europa.eu/idabc/en/document/7038/254">http://ec.europa.eu/idabc/en/document/7038/254</a></p>	<p>This interoperability study was prepared for the e-government unit, DG Information Society and Media, European Commission, April 2007. It presents an extensive discussion of key factors and includes an extensive set of current practice case studies.</p>
<p>The European Virtual Laboratory for Enterprise Interoperability <a href="http://interop-vlab.eu/INTEROP-V/LAV">http://interop-vlab.eu/INTEROP-V/LAV</a></p>	<p>INTEROP-VLab is a virtual, i.e. distributed and coordinated research organization. One of the services it provides is an education program with tutorials and two masters on Enterprise Interoperability.</p>



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