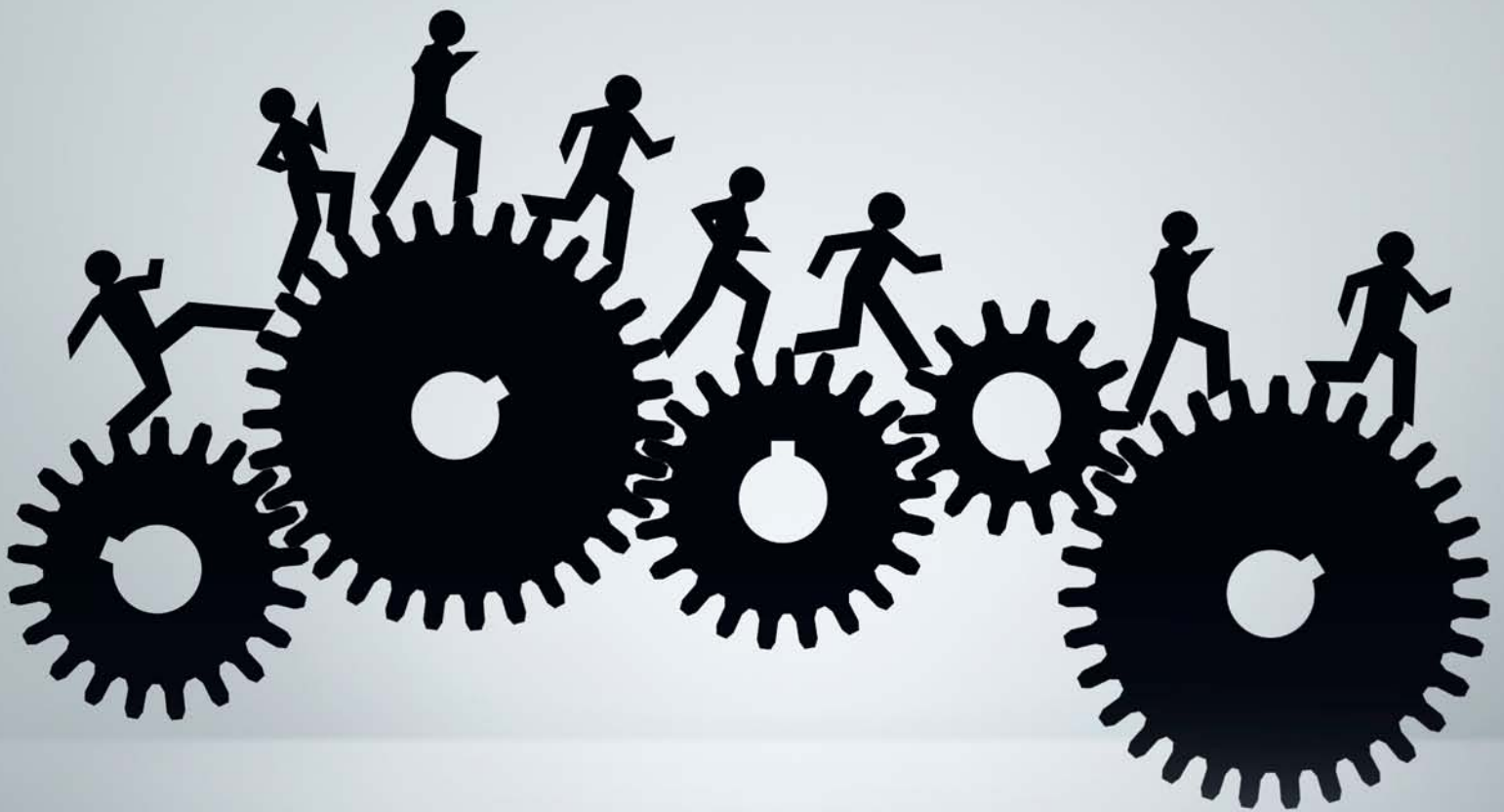




Center for
Technology in Government

Improving Government Interoperability:

A capability framework for government managers



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Introduction

In their provocative essay, “Wicked Problems, Knowledge Challenges, and Collaborative Capacity Builders in Network Settings,” Edward Weber and Anne Khademian discuss the value of networks for dealing with unstructured, crosscutting, relentless problems (Weber 2008). These problems are unstructured in that little consensus exists about how to define them, cause and effect are unclear, and attempts to solve them often cause them to morph into different problems. “Wicked problems” are associated with multiple diverse stakeholders, high levels of interdependence, competing values, and social and political complexity. To top it off, while they can sometimes be ameliorated, they are never fully resolved. Among other challenges, such problems present enormous ongoing demands for information and knowledge.

Those demands are not easily met in a typical hierarchical bureaucracy. The division of labor and compartmentalization of expertise in these structures inhibits easy knowledge sharing. Professional identities and organizational cultures may be barriers to trust and risk taking in forming new relationships. These structures separate and often isolate practice domains, knowledge resources, and routines. The lines of authority, formal reporting relationships, and policy frameworks usually do not encourage and may even prohibit many forms of information and knowledge sharing and cross-boundary collaboration (Dawes, Pardo, and Cresswell 2008).

What often emerges to meet these new demands is a *network form of organization*. In this form of organization, the hierarchical pyramids don’t disappear, but they are penetrated by both formal and informal information sharing and work relationships that cut across jurisdictions and program structures. Decisions and control are matters of exercising formal authority *and* negotiating and collaborating. New groupings of persons and forms of organization (i.e., networks) must learn to work together and share information, exchange knowledge, and respond to demands in new ways that transcend traditional constraints or operate with newer, more appropriate controls. These may be ad hoc networks that emerge in unexpected, temporary situations or more permanent networks that can meet the knowledge demands of a new program or long-term project. Regardless, organizations operating within these networks need to be connected and interoperable in new ways so that knowledge and resources can be shared among network members and, when necessary, can be shared across networks as well. With regard to delivering coordinated government programs and services, governments are important partners in such network forms of organization along with private corporations, non-profit groups, and research institutions (Goldsmith and Eggers 2004). Moreover, the ability of government to more effectively share resources and knowledge—both within government and with their non government network partners—has become a top priority for many countries.

Government interoperability is the mix of policy, management, and technology capabilities needed by a network of organizations to deliver coordinated government programs and services.

Historically, governments around the world, while differing in their specific political structures and even degrees of civil society and rule of law, tend to share at least one similarity: they struggle in their efforts to effectively share authority, resources, and information across the organizational boundaries within those governments, i.e., to become interoperable. While the degree of complexity of the conditions varies, the struggle of working together across the

boundaries of organizations, whether simply two agencies or a multi-level, multi-sector network of organizations, remains intense.

This paper is presented as a guide for government managers as they begin to move beyond the vision of a more effective government to the reality. For those governments that believe network forms of government can help achieve more effective government, they must understand the types of capabilities required to improve government interoperability. Then, they must determine if those capabilities exist and where new capabilities must be created. A discussion of the challenges of working across the boundaries of government agencies is presented first to set the stage. Next, the discussion focuses on understanding government interoperability as a concept and current research on interoperability development. Several current interoperability and capability maturity models are presented and discussed as background. Drawing on these previous models and new discussions, we present a framework for understanding interoperability in the context of new network forms of government. This framework focuses first on understanding the capabilities needed to develop and manage (i.e., plan, select, control, and evaluate) initiatives to improve interoperability among government agencies and their network partners, and second on determining the right mix of capabilities needed to share information across a network of organizations. Finally, the complete framework is presented for use by government managers with some suggestions for next steps.

Government leaders must first understand the types of capabilities required to improve government interoperability.

A network form of organization for government: working across boundaries

In many cases, the organizations that form a network are engaged in diverse but overlapping business processes and depend on similar, if not identical, information. They also generally interact with the same population or stakeholders, but at different points in time (Cresswell et al 2005b, p. 5). Therefore, improved interoperability among these organizations is a key enabler of better programs and services. However, working across the traditional boundaries of agencies, levels of government, and with the private sector is difficult and complex. It is difficult and complex because it often requires fundamental organizational change and must contend with current political, social, and economic realities. Often the government capabilities necessary to affect change across the boundaries of organizations are missing. Many efforts to improve government interoperability have been invested in over the years, however, the challenge facing most of them has been an over emphasis on the technology dimensions of working across boundaries and an under emphasis on the policy and management ones related to the kind of fundamental organization change necessary.

Technology must interact with and enable the policy and management dimensions of interoperability.

Improving interoperability through the use of information and communication technologies (ICTs) can deliver value to governments and the public. ICTs, when effectively designed and deployed, can enable interoperability within networks of government, private sector, and other key organizations. However, improving interoperability depends not on the technologies alone,

but on a mix of capabilities that can produce organizational as well as technological interoperability. These are capabilities that may already exist or need to be developed within the networks of organizations working together to deliver government programs and citizen services.

Research and practice shows that most governments are inconsistent and ad hoc in their abilities to operate in a network form. Many governments have developed successful interoperability in individual policy areas such as criminal justice, public health, and environmental protection, or in various e-government areas such as integrated government accounting systems and online tax filing and educational resources. However, there is little evidence of any government that has demonstrated the level of government interoperability that brings together multiple policy domains in support of a broader citizen need; for example, creating interoperability between the criminal justice and public health communities in support of more effective public safety.

Examples of Network Capability in Single Policy Domains or Government Program Areas

- *Justice Network (JNET)* – U.S. Commonwealth of Pennsylvania’s state and local criminal justice information sharing
- *Federal Accounting and Budgeting System* – Austria’s consolidated federal accounting and budgeting
- *Service New Brunswick* – New Brunswick, Canada’s online citizen-to-government and business-to-government services
- *BioSense* – U.S. Centers for Disease Control and Prevention’s federal, state, and local integrated public health disease surveillance system
- *E-learning portal (MyGfL)* – Malaysia’s citizen online learning tools
- *eGov Portal payment server* – Israel’s online citizen and business payment of taxes
- *Europass CV* – EU’s online, pan-European standardized curriculum vitae (CV) sharing system

Understanding government interoperability requirements

We define interoperability as the mix of policy, management, and technology capabilities (e.g., governance, decision making, resource management, standards setting, collaboration, and ICT software, systems, and networks) needed in order for a network of organizations to operate effectively. Government interoperability emphasizes the ability of network members to share knowledge and other resources *in addition to* creating interoperable technological infrastructures. In addition, it also assumes that governments

E-Government Interoperability is the ability of two or more diverse government information and communications technology systems or components to meaningfully and seamlessly exchange information and use the information that has been exchanged. (UNDP Overview 2007, p. 1).

must take responsibility for improving their own capabilities in order to be effective partners with other non-government network organizations (e.g., private corporations, non-profit groups, and academic institutions). While recognizing that there are multiple definitions of interoperability currently in use, we believe that by using this broader definition and others like it—rather than those interoperability definitions that are focused on the technology systems aspect—governments are more likely to realize and understand those non-technical yet essential

capability dimensions needed to improve government programs and services through interoperability.¹

As Luis Guijarro discusses in his work on European investments in IT for e-government services, new ways of public service delivery involving a customer-centric approach tend to hide the complexity of the administrative procedures and involve a high degree of interaction between local, regional, and national administrations (2007, p. 92). A citizen-service focus can give governments a false sense of calm and distract them from the significant cost of creating the capabilities needed for governments and non-governmental organizations to work effectively together. These changes in service delivery strategies as well as many other occurring in government require government managers to be prepared to face three distinct but related problems:

1. Creating interoperability requires potential network members to invest in changes to internal organizational arrangements, practices, and technical resources in response to an externally agreed upon set of priorities.
2. Creating interoperability requires potential network members to create new, and in some cases, renew cross-boundary relationships; recognize and manage the challenges to network formation including the creation or modification of a sufficient legal framework to enable new ways of sharing resources including money and data, as well as barriers to communication, collaboration, and issues such as divergent policies and practices.
3. Participants seeking to improve interoperability for coordination across government agencies do not know in advance all the tools or resources needed or how to acquire them, or precisely what configuration of old and new capabilities will be needed to achieve initiative goals (Cresswell et al 2007, p. 125).

In addition to accepting this broader understanding of interoperability, government managers must also realize that improving government interoperability does not automatically assume the need to invest in new technical and organizational capabilities and discard existing ones (e.g., replace all computer systems and software and hire new employees). Rather, they should view government interoperability as a set of *multidimensional, complementary, and dynamic* capabilities that are *specific* to both a defined network of organizations and achieving a particular goal. Therefore, if some of the necessary capabilities already exists within the defined network, it gives governments the opportunity to take advantage of existing strengths and focus valuable and limited resources on those capabilities that are missing.

The term *e-health interoperability* is used to signify an overall capability of all participants to interoperate, spanning information, technical, as well as organizational perspectives (NEHTA 2007, p. 117).

¹ For 34 examples of interoperability definitions see Ford et al. (2007). *A Survey on Interoperability Measurement*. Paper presented at the 12th International Command and Control Research and Technology Symposium (ICCRTS) “Adapting C2 to the 21st Century.” June 19-21, Newport, RI. (http://www.dodccrp.org/events/12th_ICCRTS/CD/html/papers/096.pdf)

Capability is ...

multidimensional – it is made up of several dimensions, all of which contribute to overall interoperability;

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;

dynamic – it can increase or diminish due to changes within an initiative or in its external environment; and

specific to its setting – some dimensions of capability apply to all settings, but capability for any particular government interoperability initiative must be assessed relative to its own specific objectives and environment (Cresswell et al 2005a).

Understanding risks and costs

Government attempts to address these problems can be both risky and expensive. *Risky*, since government agencies tend to resist efforts to change the way they operate and because failures of such change efforts can jeopardize existing government operations and services. These changes in government are also *expensive*; not only in financial terms, but also in terms of opportunity cost. Changing the way government and government organizations operate—and inter-operate—requires developing and implementing new policy and management practices, all of which must be negotiated with and coordinated across multiple organizations. Consequently, deciding how to become more interoperable is among one of the most complex decisions that governments are expected to make. More importantly, the consequences of such decisions will have a direct impact on the public (Dawes et al 2005, p. 12). The combination of this high risk and cost is why governments are finding it so difficult to launch sustainable and ultimately successful, efforts to improve government interoperability, even when they know it is the right thing to do.

An overly ICT and customer-centric focused project can hide the true complexity of government efforts to improve programs and services (Guijarro 2007, p. 92).

A number of tools, techniques, and models are available to help organizations determine the likelihood of success when planning risky and expensive initiatives. Over time, research efforts and practice-based experiences have provided the foundation for these resources. However, improving interoperability is a relatively new area, in general, for most types of organizations, and more so for governments. Some of the existing tools and techniques can be used in this context as they relate generally to good ICT project management, others have more relevance to building the policy, management, and technology capabilities needed for government interoperability. Two tools in particular, developed by the Center for Technology in Government provide a foundation for this discussion. Core ideas from both provide a foundation for the government interoperability improvement framework presented below.

Making Smart IT Choices: Understanding Value and Risk in Government IT Investments. This toolkit guides government agencies and their partners through the process of up front business case development. This toolkit has been applied in the context of government interoperability initiatives and can be used to guide the selection, control, and evaluation of such initiatives. The tools, techniques, and models presented in *Smart IT* are designed to provide government leaders

and other appropriate decision makers with the necessary knowledge and resources to then select from among investment options and control and evaluate selected initiatives. The core principles of *Smart IT* provide the business case foundation for a set of capability dimensions for improving government interoperability.

Why Assess Information Sharing Capability? A network form of government’s ability to share information among its organizational partners is at the core of interoperability. This toolkit provides a comprehensive and systematic process for determining the policy, management, and technology capabilities required to share information across a network of organizations. The ability of governments to generate comprehensive information about both existing and missing capabilities among the network of organizations involved in trying to achieve a specific goal is another critical step in the process of making smart investment choices and improving government interoperability (Cresswell et al 2007).

As further foundation for development of the framework, the next section provides a discussion of existing interoperability maturity models before introducing the framework itself.

Existing interoperability maturity models

A number of interoperability maturity models provide some guidance to governments interested in developing or improving their ability to work effectively in network forms of organization. Table 1 lists a few of these models. These models define both specific types of capability and levels of maturity related to specific disciplines or government policy areas. Of note, this table does not include an exhaustive list of interoperability and capability maturity models but provides a selected list of those that capture the complex multidimensional nature of government interoperability.

Table 1. Existing Interoperability Maturity Model Examples

<i>Policy Area or Discipline</i>	<i>Model</i>	<i>Year Released</i>
Software Development and Systems Engineering	<i>Capability Maturity Model for Software (CMM)</i> , Carnegie Mellon	1986
	<i>Levels of Information Systems Interoperability (LISI)</i> , Carnegie Mellon	1998
	<i>Capability Maturity Model Integration (CMMI)</i> , Carnegie Mellon	2000
Defense	<i>Organizational Interoperability Maturity Model for C2(OIMM)</i> , Australian Defence Science and Technology Organization	1999 and revised in 2003
Criminal Justice	<i>Increasing Information Sharing Effectiveness: A Capability Assessment Model for the Justice Enterprise</i> , Center for Technology in Government	2005
Government Digital Information Preservation	<i>Building State Government Digital Preservation Partnerships: A Capability Assessment and Planning Toolkit, Version 1.0</i> , Center for Technology in Government	2005

Table 1. Existing Interoperability Maturity Model Examples (Continued)

<i>Policy Area or Discipline</i>	<i>Model</i>	<i>Year Released</i>
More Generic Government Services (often referred to as e-government)	<i>IT Investment Management Framework (ITIM)</i> , U.S. Government Accountability Office's (GAO)	2004
	<i>Interoperability Maturity Model (EIMM)</i> , European Union	2005
	<i>Government Interoperability Maturity Matrix (GIMM)</i> , Sarantis, Charalabidis, and Psarras	2008

Most interoperability maturity models reference the Carnegie Mellon Capability Maturity Model (CMM) and the Carnegie Mellon Capability Maturity Model Integration (CMMI). These models were first developed in the 1980s for software development and systems engineering efforts and continue to be refined today.² Within the last ten years several other models have been developed. In general, these models expand their perspectives beyond a technology development perspective (i.e., software development or implementation) and focus on the required mix of policy, management, as well as technology capabilities to achieve the broader goal of improved delivery of government services and programs.

Table 2. Examples of Interoperability Maturity Levels

<i>Model</i>	<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>	<i>Level 4</i>	<i>Level 5</i>
CMMI	Initial	Managed	Defined	Quantitatively Managed	Optimizing
ITIM	Creating investment awareness	Building the investment foundation	Developing a complete investment portfolio	Improving the investment process	Leveraging IT for strategic outcomes
LISI	Isolated	Connected	Functional	Domain	Enterprise
IMM	Initial	Managed	Defined	Measured	Optimized
OIMM	Independent	Cooperative	Collaborative	Combined	Unified
EIMM	Performed	Modeled	Integrated	Interoperable	Optimizing
GIMM	Independent	Ad hoc	Collaborative	Integrated	Unified

A variety of models have been developed to guide thinking across a continuum of interoperability maturity. Each adopts a unique vocabulary to express the levels and ideas, however, the models are in general consistent in terms of their characterization of interoperability capability maturity on scales ranging from low to high (see Table 2):

² The Capability Maturity Model for Software (also known as the CMM and SW-CMM) was developed in the mid to late 1980s and retired in the late 1990s-early 2000s. CMM was replaced by the CMMI (Capability Maturity Model Integration). For more information, visit the Carnegie Mellon Software Engineering Institute's Web site at <http://www.sei.cmu.edu/cmm/>.

- An organization with a low level of interoperability is characterized as working independently or in isolation from other organizations and in an ad hoc or inconsistent manner.
- An organization with a high level of interoperability is characterized as being able to work with other organizations in a unified or enterprise way to maximize the benefits of collaboration across organizations and across multiple government investments or projects (i.e., multiple networks).

In the middle of these maturity scales, fall those organizations that have developed some capabilities needed to collaborate, integrate, or cooperate with other organizations. However, this medium level of capability to be interoperable tends to be ad hoc, limited in scope (i.e., specific to a single network or policy or program area), and difficult to repeat or reproduce with other organizations or networks.

The existing interoperability maturity models also include a diverse mix of elements (e.g., areas of concern, goals, and interoperability attributes) considered essential to creating government interoperability (see Table 3). These elements cover what we refer to as dimensions of capability (or capability dimensions) needed for interoperability (Cresswell et al 2005b).

Table 3. Examples of Capability Dimensions from Three Selected Maturity Models³

<i>EIMM (areas of concern)</i>	<i>IMM (goals)</i>	<i>GIMM (interoperability attributes)</i>
<ul style="list-style-type: none"> • Enterprise Modeling • Business Strategy and Processes • Organization and Competences • Products and Services • Systems and Technology • Legal Environment, Security and Trust 	<ul style="list-style-type: none"> • Metadata • Business Focus • Standards Basis • Governance • Scalability • Configurability 	<ul style="list-style-type: none"> • Government Process and Alignment • Compatibility with eGovernment Legislation Issues • Interoperability at Local Level • Interoperability at National Level • Connectivity with Central Government Gateways • Existence of Common XML-based Data Schemas

We use the term *capability dimensions* to make explicit the fact that each of these elements represents a mix of policy, management, and technology elements. For example, achieving *Interoperability at Local Level* in the GIMM model arguably involves a mix of policy, management, as well as technology dimensions. The same case can be made for *Metadata* in the IMM model and *Legal, Environment, Security, and Trust* in the EIMM model. As a result, one challenge government managers face in applying these existing interoperability maturity models is recognizing that each of these capability dimensions requires a mix of diverse yet interdependent and interacting capabilities to improve interoperability. This challenge contributes to the already complex, risky, and costly process of improving government interoperability. Understanding, and where appropriate, unpacking the capability dimensions, is a necessary part of the government interoperability development process. The remainder of this

³ This table includes only some of the capability dimensions identified in each of the three models presented. For a complete list of the capabilities identified in each model, please see the list of references at the end of this document.

paper will layout an alternative way of thinking about interoperability and interoperability maturity and propose a new framework for governments to use in their efforts to improve government interoperability.

A government interoperability improvement framework

To leverage the power of a network form of organization government leaders must understand that *not all organizations involved in a network need to have the same capabilities* to achieve interoperability. They must understand the complementary and multi-dimensional nature of capabilities among the organizations in a network. They must also understand that while capability is specific to a setting, it is also dynamic and requires ongoing assessment to ensure that the capabilities held collectively by the network are relevant to and appropriate for the task at hand. To build this understanding, government leaders need a framework for assessing current capabilities and then using assessment results to guide capability development investment decisions.

A new model for assessing government interoperability maturity is presented in Table 4. This new model, comprised of three maturity levels, combines and simplifies the most relevant aspects of the maturity models presented earlier. These three levels of government interoperability are most appropriate for guiding a government in understanding and assessing its *existing* level of government interoperability in order to determine what additional types of capabilities need to be developed to achieve the *desired* or *target* level of interoperability.

Table 4. Government Interoperability Maturity Levels

Level 1	There may be evidence of interoperability within individual government organizations, but there is little to no evidence of any interoperability across agency or organizational boundaries. At this level, government agencies work independently and do not share information with other organizations; government or private sector. In addition, there is little evidence of the decision making, strategic planning, and resource and project management structures and processes needed to develop and manage ongoing or future initiatives requiring improved government interoperability.
Level 2	There is evidence of interoperability in specific policy or program areas. However, there is little evidence of interoperability across multiple networks (e.g. criminal justice networks can not share information with public health networks). In addition, while interoperability initiatives in these areas may be planned and managed in a consistent way, the process for selecting, controlling, and evaluating initiatives is not consistent or standardized across networks or at a governmentwide level.
Level 3	There is evidence of interoperability across multiple networks. For example, public health and criminal justice networks can effectively share information across their two networks in support of the larger policy goal of public safety. In addition, consistent and standardized processes and structures are in place to develop and manage government interoperability initiatives regardless of policy domains. As a result, existing networks can scale and apply resource sharing and process integration across multiple policy and program areas as needed, essentially creating new networks.

As outlined earlier in the *Understanding risks and costs* section of this paper, government agencies seeking to create government interoperability maturity need capabilities in two key areas:

1. **Developing and managing interoperability initiatives.** This has to do with establishing government processes and structures to facilitate the development and management (i.e., planning, selecting, controlling, and evaluating) of government interoperability initiatives.
2. **Information sharing capability.** This has to do with the ability of a network of organizations participating in a government interoperability initiative to successfully share information.

Making smart investments in interoperability

The ability to select projects based on well informed decisions is a governmentwide prerequisite for improving interoperability. Such well informed decisions require accurate and detailed information. The information necessary to guide these investments decisions is generated through two processes. The first is the creation of a business case for the project and the second is an agreed upon and standardized process for reviewing business cases and making decisions on which ones to fund. An example of these processes can be found in Stage 2 of the U.S. Government Accountability Office's (GAO) *IT Investment Management Framework (ITIM)*: "Building the Investment Foundation." In the GAO model, this capability is improved upon in subsequent stages, but Stage 2 is the baseline requirement. The importance of these types of capabilities is also supported in some of the other capability maturity models in their discussions of "business and technical architectures" and "enterprise architecture." U.S. and European models show increased incorporation of architecture approaches to address aligning government missions, strategic plans, goals, and processes with investments in technology (Guijarro 2007; GAO 2004; Athena 2004, Pardo et al 2005, Cresswell et al 2006).

In *Stage 2: Building the Investment Foundation*, basic selection capabilities are being driven by the development of project selection criteria, including benefit and risk criteria, and an awareness of organizational priorities when identifying projects for funding (GAO 2004, p. 11).

Figure 1 on the next page illustrates a business case development and evaluation process from the Center for Technology in Government's *Making Smart IT Choices: Understanding Value and Risk in Government IT Investments*. *Smart IT* was developed specifically for those types of government investments that involve organizations working in new ways and with new partners.

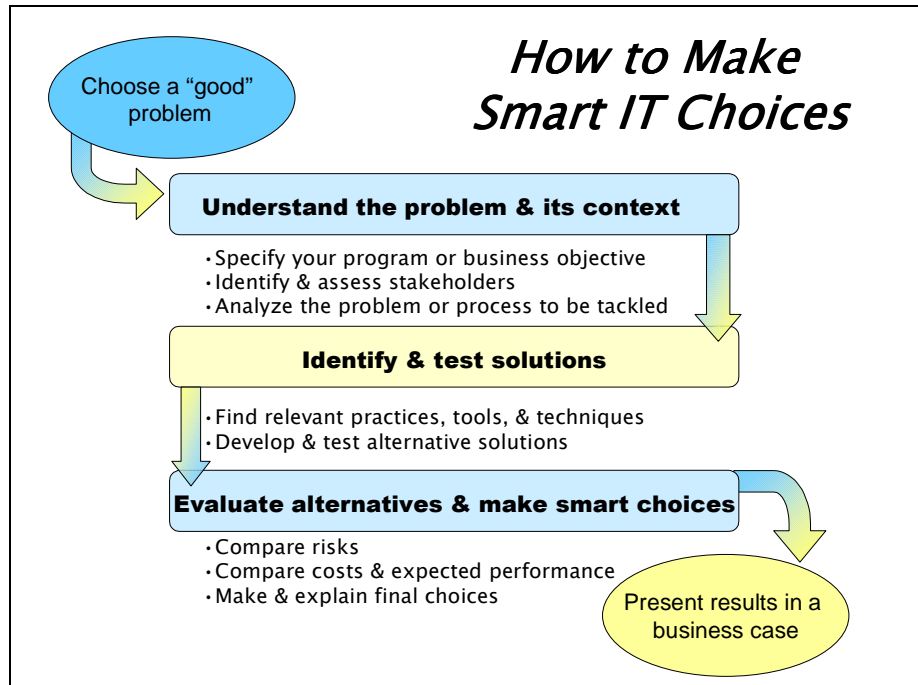


Figure 1. The Analysis and Evaluation Process (Dawes et al 2005)

In addition, to making well-informed decisions about which initiatives to invest in, government professionals must be trained in managing large, complex, and multi-agency and multi-sector projects. Recent research indicates that success in government interoperability initiatives can be attributed in part to the management of these initiatives by people with specialized project management skills specific to the network context. These individuals proved capable of working in the “seams” that hold multi-agency collaborations together (Cook et al 2004, p. 31).

Identify & test solutions

This phase makes substantial use of the experiences of other government organizations, other governments, and even private sector companies who have attempted to achieve similar goals. It leads to the identification of alternative solutions and offers ways to test them in low-cost, low-risk ways. Tools to facilitate this process do not include actual IT systems design or implementation but rather focus on best and current practice research, technology awareness reviews, benchmarking, environmental scanning, and prototyping. (Dawes et al 2005, p. 25).

The capability to develop and manage interoperability initiatives

A set of nine dimensions of capability relevant to working in a network to develop and manage government interoperability, to working in the “seams,” are presented in Table 5a. Developing capability along each of these dimensions in an appropriate and sustainable way provides government agencies and their network partners with the foundation for success in government interoperability initiatives.⁴

⁴ There are a number of governments out there and at all levels (federal, state, and local) that have developed and instituted project management training programs for government employees. In a number of cases, government

Table 5a. Capability Dimensions for Developing and Managing Government Interoperability

<i>Capability Dimension</i>	<i>Description</i>
Governance	The existence of appropriate decision making rules and procedures to direct and oversee government interoperability initiatives that are planned or underway. Also, to ensure that government interoperability investments (in IT and other resources) align with priorities and goals defined in strategic plans or by legislative and executive leadership. Governance structures should support and work closely with legal frameworks to enable new ways of sharing resources including money and data.
Strategic Planning	The quality and comprehensiveness of strategic plans and strategic planning processes, including resources and integration of planning with other elements of governance and management.
Business Case Development	The existence of processes and tools to develop a well-reasoned argument designed to convince key stakeholders of the benefits of a particular investment. This includes a problem statement, mission or visions statement, stakeholder analysis, expected benefits and potential risks, cost estimates, and funding sources.
Project Management	The availability and use of mechanisms for goal and milestone setting, scheduling development and production activities, analyzing resource needs, managing interdependencies among activities and goals, and provisions to anticipate and respond to contingencies.
Resource Management	The extent of effective and sustainable use of financial, human, and technical resources through budgeting, strategic plans, financial analyses, and accepted financial management procedures and practices.
Stakeholder Identification & Engagement	The extent of awareness of and interaction with the persons or groups with an interest in the information sharing initiative and capacity to influence it. This dimension is based on stakeholder analyses, staff experience and knowledge, records or reports of participants in making policy and decisions, and membership of advisory or constituent groups.
Leaders & Champions	The involvement of leaders and champions. Leaders motivate, build commitment, guide activities, encourage creativity and innovation, and mobilize resources; they see the goal clearly and craft plans to achieve it. Champions communicate a clear and persuasive vision for an initiative, provide the authority and legitimacy for action, and build support in the environment.
Business & Technology Architectures	The degree to which government has developed business and technology architectures that describe the existing service and operational components of organizations and networks of organizations and how they are connected to each other through business processes and technologies.
Performance Evaluation	The presence of the skills, resources, and authority necessary to observe, document, and measure: 1) how well investments are developed and implemented, 2) whether goals are achieved, and 3) how the performance of the government is improved.

employees who are responsible for large ICT implementations and other large and complex projects are required to undergo project management training. For example, in New York State, the Project Management Mentoring Program (information found at www.cio.state.ny.us/Services/Training/SrvTRPMMP.htm) was designed in response to the state’s increasingly complex and expensive projects necessary to support the government’s business. There also are a number of internationally recognized project management focused professional organizations that offer training in this area. For example, visit the Project Management Institute’s Web site at <http://www.pmi.org/Pages/default.aspx>.

Information sharing capability

Whereas the capabilities described in the previous section focus on a government's ability to make the case for, select, and then manage individual and multiple government interoperability initiatives, this section focuses on the capability dimensions needed by the network members to successfully share information. As mentioned earlier in this paper, information sharing across a network form of organization is at the core of interoperability and the ability of a network to deliver coordinated programs and services. Table 5b presents eight capability dimensions based on CTG's extensive research and practice in the development and use of capability assessment models in support of cross boundary information and knowledge sharing initiatives in government (see Pardo et al 2005 and Creswell et al 2006).

Table 5b. Information Sharing Capability Dimensions

<i>Capability Dimension</i>	<i>Description</i>
Collaboration Readiness	The degree to which relationships among information users and other resources support collaboration. Examples include staff, budget, training, and technology that support collaboration as well as prior successes or failures in collaborative activities
Organizational Compatibility	The degree to which the work styles and interpersonal relationships, participation in decision-making, levels of competition and collaboration, and styles of conflict resolution support information sharing. Compatibility of cultures may be gauged by the degree of centralization, degree of conformity, deference to authority, adherence to rules, and symbols of status and power
Information Policies	The level of development of policies that deal with the collection, use, dissemination, and storage of information as well as with privacy, confidentiality, and security.
Change Acceptance	The extent of talk and actions expressing positive or negative attitudes toward workplace changes, trust of new tools and techniques, success or failure stories that are widely shared and believed, and enthusiasm for innovations.
Technology Knowledge	The levels of knowledge about current and emerging technology for information sharing, including technical qualifications and experience of staff, training, records and documentation of technology assets, and the actions of staff in compiling, storing, and sharing such knowledge.
Data Assets & Requirements	The extent of specification and identification of formal policies for data collection, use, storage, and handling, as found in documentation of databases and record systems; and in data quality standards and dictionaries. It may include procedures for and results of data requirement analyses and data models and modeling techniques.
Secure Environment	The degree to which appropriate security protocols for data, applications, systems, and networks as well as policies, training, and management practices are in place.
Technology Compatibility	The presence of agreed-upon standards for hardware and software, the extent of connectivity among the persons and organizations seeking to share information, and the experiences of staff with information sharing activities.

Using the *Government Interoperability Improvement Framework*

For any country or government, improving government interoperability can be a complex, risky, and expensive endeavor. The *Government Interoperability Improvement Framework* (see Appendix) was developed to help government managers take the first step in understanding the multi-dimensional and complementary nature of capability in a network of organizations and to begin to think in a new way about the need to examine capability in the context of a specific setting and on an ongoing basis. Determining the maturity level of individual organizations to engage in effective interoperability initiatives is useful, but it is the capability of the network to create interoperability that is of interest here.

The *Government Interoperability Improvement Framework* is comprised of the capability dimensions from Tables 5a and 5b (pages 12 and 13) along with the three government interoperability maturity levels described in Table 4. As a starting point, we suggest two approaches for applying the *Framework*: 1) focus on a specific policy domain or a level of government, and 2) focus on a specific initiative.

Applying the *Framework* in a specific policy domain or level of government. In the first approach, a government executive can use the framework to assess the overall capability of that policy domain or level of government to improve interoperability. This application of the framework might reveal a gap in the capability of an overall policy domain to collectively make decisions through a joint governance structure such as a governmentwide governance body, yet, identify a variance in capability to measure the performance of their efforts. A review of the capability dimensions and maturity levels in the context of a local, state, regional, or national level or by focusing on a specific policy or program area such as criminal justice or public health can provide a snapshot of a government's current capability to improve interoperability.

Applying the *Framework* in a specific initiative. A second approach for using the framework focuses specifically on a single initiative and is applied by a project manager or executive sponsor to a planned or in-development government interoperability initiative. This use of the *Framework* could help determine if government resources are being used efficiently in developing capabilities that are most relevant to the interoperability initiative. An assessment at this level, for example, might reveal an overall high capability in terms of organizational compatibility, yet, identify that the individual agencies have varying levels of capability in terms of creating a secure environment for information sharing.

Both approaches to using the *Framework* provide new information about the capability of a network of organizations to create interoperable government. This new information can be used to make judgments about the level of maturity held by a network of organizations, and subsequently be used to guide investment decision making about creating new government interoperability capability in that network. Using the *Framework* provides new insight about capability in the specific context of a network and guides decision makers to more effectively make decisions about where to focus and sometimes, refocus, government attention and resources to fully support the vision of better government services and programs delivered

through more efficient and effective partnerships among government, civil society, and the private sector.

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Appendix. Government Interoperability Improvement Framework

Dimension	Description	Level 1	Level 2	Level 3
Capability Dimensions for Developing and Managing Government Interoperability Initiatives				
Governance	The existence of appropriate decision making rules and procedures to direct and oversee government interoperability initiatives that are planned or underway. Also, to ensure that government interoperability investments (in IT and other resources) align with priorities and goals defined in strategic plans or by legislative and executive leadership. Governance structures should support and work closely with legal frameworks to enable new ways of sharing resources including money and data.			
Strategic Planning	The quality and comprehensiveness of strategic plans and strategic planning processes, including resources and integration of planning with other elements of governance and management.			
Business Case Development	The existence of processes and tools to develop a well-reasoned argument designed to convince key stakeholders of the benefits of a particular investment. This includes a problem statement, mission or visions statement, stakeholder analysis, expected benefits and potential risks, cost estimates, and funding sources.			
Project Management	The availability and use of mechanisms for goal and milestone setting, scheduling development and production activities, analyzing resource needs, managing interdependencies among activities and goals, and provisions to anticipate and respond to contingencies.			
Resource Management	The extent of effective and sustainable use of financial, human, and technical resources through budgeting, strategic plans, financial analyses, and accepted financial management procedures and practices.			
Stakeholder Identification & Engagement	The extent of awareness of and interaction with the persons or groups with an interest in the information sharing initiative and capacity to influence it. This dimension is based on stakeholder analyses, staff experience and knowledge, records or reports of participants in making policy and decisions, and membership of advisory or constituent groups.			
Leaders & Champions	The involvement of leaders and champions. Leaders motivate, build commitment, guide activities, encourage creativity and innovation, and mobilize resources; they see the goal clearly and craft plans to achieve it. Champions communicate a clear and persuasive vision for an initiative, provide the authority and legitimacy for action, and build support in the environment.			
Business & Technology Architectures	The degree to which government has developed business and technology architectures that describe the existing service and operational components of organizations and networks of organizations and how they are connected to each other through business processes and technologies.			
Performance Evaluation	The presence of the skills, resources, and authority necessary to observe, document, and measure: (1) how well investments are developed and implemented, (2) whether goals are achieved, and (3) how the performance of the government is improved.			

Dimension	Description	Level 1	Level 2	Level 3
Information Sharing Capabilities				
Collaboration Readiness	The degree to which relationships among information users and other resources support collaboration. Examples include staff, budget, training, and technology that support collaboration as well as prior successes or failures in collaborative activities.			
Organizational Compatibility	The degree to which the work styles and interpersonal relationships, participation in decision-making, levels of competition and collaboration, and styles of conflict resolution support information sharing. Compatibility of cultures may be gauged by the degree of centralization, degree of conformity, deference to authority, adherence to rules, and symbols of status and power.			
Information Policies	The level of development of policies that deal with the collection, use, dissemination, and storage of information as well as with privacy, confidentiality, and security.			
Change Acceptance	The extent of talk and actions expressing positive or negative attitudes toward workplace changes, trust of new tools and techniques, success or failure stories that are widely shared and believed, and enthusiasm for innovations.			
Technology Knowledge	The levels of knowledge about current and emerging technology for information sharing, including technical qualifications and experience of staff, training, records and documentation of technology assets, and the actions of staff in compiling, storing, and sharing such knowledge.			
Data Assets & Requirements	The extent of specification and identification of formal policies for data collection, use, storage, and handling, as found in documentation of databases and record systems; and in data quality standards and dictionaries. It may include procedures for and results of data requirement analyses and data models and modeling techniques.			
Information Systems & Requirements	The degree to which appropriate security protocols for data, applications, systems, and networks as well as policies, training, and management practices are in place.			
Secure Environment	The presence of agreed-upon standards for hardware and software, the extent of connectivity among the persons and organizations seeking to share information, and the experiences of staff with information sharing activities.			
Technology Compatibility	The degree to which relationships among information users and other resources support collaboration; these include staff, budget, training, and technology, and prior successes or failures in collaborative activities.			

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