

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

Policy Area or Discipline	Model	Year Released
Software development and systems engineering	Capability Maturity Model for Software (CMM) , Carnegie Mellon	1986
	Levels of Information Systems Interoperability (LISI) , Carnegie Mellon	1998
	Capability Maturity Model Integration (CMMI) , Carnegie Mellon	2000
Defense	Organizational Interoperability Maturity Model for C2(OIMM) , Australian Defence Science and Technology Organization	1999 and revised in 2003
Criminal Justice	Increasing Information Sharing Effectiveness: A Capability Assessment Model for the Justice Enterprise , Center for Technology in Government	2005
Government Digital Information Preservation	Building State Government Digital Preservation Partnerships: A Capability Assessment and Planning Toolkit, Version 1.0 , Center for Technology in Government	2005
More Generic Government Services (often referred to as e-government)	IT Investment Management Framework (ITIM) , U.S. Government Accountability Office's (GAO)	2004
	Interoperability Maturity Model (EIMM) , European Union	2005
	Government Interoperability Maturity Matrix (GIMM) , 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

Existing interoperability maturity models

Model	Level 1	Level 2	Level 3	Level 4	Level 5
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):

- 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 Models(3)

EIMM (areas of concern)	IMM (goals)	GIMM (interoperability attributes)
<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 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.

(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/>.

(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.