A Conceptual Model of Information Technology Competence for Public Managers: Designing Relevant MPA Curricula for Effective Public Service

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ABSTRACT
This study aims to conceptualize and propose information technology (IT) competence for training Master of Public Administration (MPA) students to succeed in the production and delivery of public service. Defining and assessing student competence is a central challenge to the relevance and accountability of public administration education. This study draws from the literature of psychology, IT management, technology education, and public administration, as well as from practitioners in the public sector, to develop a construct of IT competence for public managers, including general public managers and public IT managers. This conceptualization regards IT competence as multidimensional, encompassing knowledge, skills, and personal attributes that enable public managers be effective. Moreover, this conceptualization articulates the knowledge, skills, and personal attributes relevant to achieving effectiveness at individual, organizational, and professional levels. Emphasizing the perspective of employers of MPA graduates, we also discuss the conceptualization’s implications for MPA curricula and recommend curricular changes.

KEYWORDS
Information technology, public manager competence, MPA curriculum, competence model

The definition and assessment of student competence is a central challenge to the relevance and accountability of public administration education. In response, the Master of Public Administration (MPA) accrediting institution, the Network of Schools of Public Policy, Affairs, and Administration (NASPAA), has urged MPA programs to define and assess student competence. In 2009, NASPAA adopted new accreditation standards, demanding performance measurement throughout the public administration curriculum. These standards now require programs to “engage in ongoing assessment of student learning for all universal required competencies, all mission-specific required competencies, and all elective (option, track, specialization, or concentration) competencies” (NASPAA, Commission on Peer Review and Accreditation, 2014, p. 29). The goal is to engage faculty and educational programs in a conscious, calculated, continuous process to improve learning outcomes.
With widespread technology innovations in the public sector, public managers are increasingly required to be competent in utilizing and managing information technologies effectively. The context of public service has also been modified by technology advancement. For example, Bowman, West, and Beck (2014) contend that IT, new media, and cybersecurity concerns have changed the way public servants work and have raised new and confounding technical and ethical dilemmas for public management. Emergent technologies have constantly redefined ways of organizing work and means of delivering services and, therefore, have redefined the nature of public service. Meeting all these challenges requires a unique combination of values, knowledge, skills, abilities, traits, and behaviors, as well as effective training and educational programs to nurture those competencies.

Although NASPAA has emphasized teaching IT and many MPA programs have incorporated IT training into their curricula, the public sector lacks a conceptual understanding of what constitutes IT competence for general managers and IT managers. Previous studies have articulated the core technical and management knowledge required (Rocheleau, 1998), the need for strategic information resource planning (Brown & Brudney, 1998), the importance of skills in operating in a networked environment (Kim & Layne, 2001), and the need for a more comprehensive “information strategy and management” curriculum (Dawes, 2004). However, the confluence of advancements in technologies, pervasive use of IT in public service, and the focus on public values demands a renewed effort to conceptualize IT competence to deliver on performance in the digital age (Mergel, 2012).

To fill this gap, this research attempts to conceptualize the IT competence for public managers, including general public managers and public IT managers. Defining IT competence demands specificity, especially with NASPAA having removed IT competence from its accreditation standards to focus on five broad universal competencies. Uniquely, our conceptualization addresses (1) IT-related values and attitudes; (2) the ability to operate at organizational and professional levels; and (3) multilevel and multicomponent specifics for training public managers and public IT managers. Our primary focus is on IT competence for public managers, as they constitute the vast majority of MPA students. The distinction of IT competence for public managers versus public IT managers aims to delineate what IT topics should be covered in the MPA curriculum.

We start by presenting the analytical approach we used to develop the conceptual model of IT competence. Then we discuss the general notion of competence and IT competence relevant to MPA education. The subsequent section develops the conceptual framework of IT competence, drawing on the literature of psychology, IT management, technology education, and public administration, as well as on the experiences of practitioners in the public sector. This conceptualization emphasizes the perspective of employers of MPA graduates. Lastly, based on this conceptualization, we discuss implications for MPA curricula and present recommendations both for updating IT competence in MPA programs and for improving IT curriculum design and implementation.

**ANALYTICAL APPROACH TO DEVELOPING A MODEL OF IT COMPETENCE**

This research is intended to build a conceptual model of IT competence for public managers that is grounded both in theory and practice. To that end, we divided our research into two phases: (1) developing a broad conceptual framework based on reviewing the theoretical literature and (2) enriching and refining the conceptual model by drawing on empirical (practical) literature as well as insights from practitioners.

To inform our construction of a valid theoretical framework, we started with an analysis of literature in the disciplines—including psychology, business management, education, and public administration—that had studied
managerial competence. We then specifically focused on the literature of IT competence and its relationship to public management. This phase led to our definition of IT competence for public managers and major dimensions of that competence.

In our second phase, we integrated the theoretical and empirical literature of IT competence and public management, as well as practitioner insights, to finalize the IT competence conceptual model. Empirical studies not only validate the structure of the conceptual framework but also provide additional components to competence model.

Though we identified these two phases, the process of literature review and intellectual construction was more iterative than sequential. Especially in our second phase, based on the feedback from practitioners, we constantly revisited competence literature to sharpen our theoretical thinking and expand and refine the discussion.

It is critical to note that our purpose is to define a competence model and its subcomponents with content validity. We intend to ensure that our model demonstrates an appropriate coverage of the content. Although the resulting model may provide guidance for assessing IT competence, our model is not intended to be a comprehensive measurement instrument for evaluating IT competence in MPA programs.

COMPETENCE AND IT COMPETENCE FOR PUBLIC MANAGERS

The Study of “Competence”
The concept of “competence” was first introduced in the 1970s to refer to a person’s particular set of skills and/or qualities that could be used by the discipline of psychology as better job-performance indicators than standard intelligence tests (McClelland, 1973). It is worth noting that competence enables performance but does not necessarily imply performance, since factors beyond competence (such as effort and supporting resources and conditions) may also affect performance (Bassellier, Reich, & Benbasat, 2001; Klemp, 1979; Schambach, 1994).

Drawing from psychological studies, recent management studies emphasize that competence is inherent in character, which underpins the concept of virtue. As virtue often suggests a trait or quality that promotes moral good, competence encompasses a number of domains —intellectual knowledge, practical skills, personality traits, attitudes, behaviors, values, beliefs, motivations, and social capability—that enable work-related effectiveness. In the field of public administration, virtue has traditionally been a central principle in public service.

The emphasis on competence in recent decades marks a theoretical convergence between the academic fields of moral philosophy and management development (Macaulay & Lawton 2006). The idea of occupational competence has been applied since the U.S. State Department started to require Certificates of Competence under the Foreign Service Act of 1980. Today, almost every public agency has developed various job-specific competencies to guide training, hiring, and evaluation of employee performance. Such occupational competence has an ethical component that speaks to the importance of virtue and morality (Bowman, West, & Beck, 2014; Virtanen, 2000).

IT Competence for Public Managers

Scholarship in business literature on IT competence has a long history. Research efforts studied both the competence of IT professionals (e.g., Bassellier & Benbasat, 2004; Schambach, 1994) and the IT competence of operational managers. For example, Sambamurthy and Zmud (1994, 1997) emphasize the importance of, and offer guidelines for, assessing managerial IT competence in an organization. Moreover, such competence should contain two domains —explicit and tacit IT knowledge, which lead to increased willingness to work with IT people and to lead and participate in IT projects (Bassellier et al., 2001, p. 159).

As early as the 1970s, IT became indispensable to public managers. For example, using a
A longitudinal study of computer use from 1976 to 1988, Kraemer, Danziger, Dunkle, and King (1993) identified that public managers are extremely dependent on IT, and a manager’s style of use is particularly important in accounting for differences in usefulness of computer-based information. Kraemer and Northrop (1989) urged public management programs to include computing curriculum. Recognizing IT as a catalyst for organizational change, Seneviratne (1999) called for “a fundamental restructuring of the public sector to reflect the value systems of the information age” (p. 41) and suggested that public managers needed to become agents of change and to manage the change process by managing technology. The U.S. Government Accountability Office (GAO) (2004a) reported that the federal government faces human capital challenges “in the information technology area, where widespread shortfalls in human capital have contributed to demonstrable shortfalls in agency and program performance” (p. 1. The importance of IT and the need for IT competence have been also stressed in nonprofit organizations (e.g., Hackler & Saxto, 2007).

Despite the enthusiasm about IT, studies also reveal that the majority of information systems developments in the public sector have been unsuccessful (Bussen & Myers, 1997; Collins, 1997; Goldfinch, 2007; Heeks, 2002, 2004; Heeks & Bhatnagar, 1999; Norris & Moon 2005), pointing to special implications for IT competence. For example, Goldfinch (2007) urged public managers to be “a recalcitrant, suspicious, and skeptical adopter of IT” (p. 917). Dawes (2004) argued that today’s public managers need an area of core knowledge, such as information strategy and management, in addition to traditional public administration core competencies.

Responding to the growing importance of IT in government operation, NASPAA (1986) recognized IT as a critical skill/knowledge component in the MPA curriculum. Such recognition occurred against a backdrop of conflicting opinion: many public administration faculty rejected information systems coursework as necessary for MPA programs (Kiel, 1986), while another group of concerned faculty made a conscious effort to elevate the teaching of public management information systems to a required component for accreditation. In 2001, NASPAA’s own technology committee recommended inclusion of IT education as a core component accreditation (Dawes, 2004, p.7). In 2004, NASPAA expanded its IT standard to cover the managerial and policy implications of IT (Park & Park, 2006, p. 1). More specifically, this IT standard (Standard 4.21) designated “information management, technology applications, and policy” as a core curriculum standard for managing public service organizations (NASPAA, Commission on Peer Review and Accreditation, 2008, p.9).

However, the implementation of an IT curriculum has faced many challenges. Studies have found that the pace of IT curriculum development has been very slow, indicating a limited impact of NASPAA standards and guidelines in the United States through the 1990s (Kiel, 1986; Park & Park, 2006). Schools have devoted insufficient educational resources to meeting the challenges of teaching IT use and management (Lan & Cayer, 1994). Moreover, schools have not articulated the specific knowledge and skills needed for meeting NASPAA’s former curriculum standard on information management, technology applications, and policy (Dawes, 2004).

NASPAA’s complete removal of an IT standard in favor of universal required competencies in 2009 leaves a major void in providing guidelines for MPA programs as they attempt to develop their IT competence. The new NASPAA standards require each program to define the five universal competencies based on the program’s mission and context, with no mention of the role of IT in such standards as “to lead and manage in public governance” or “to communicate and interact productively with a diverse and changing workforce and citizenry” (NASPAA, Commission on Peer Review and Accreditation, 2009, pp. 7–8). In addition, NASPAA also removed accredi-
tation-based incentives for MPA programs to devote time and resources to sustain IT competence education.

The gap seems to have widened between the demand for an articulation of IT competence in response to the growing use of IT in the public sector and NASPAA’s removal of any such specific standard. Over the last decade, the use of IT in government has continued to grow. Such use includes, but is not limited to, social media (e.g., Twitter for emergency notification), 311 systems (which provide one-stop city information), mobile device apps (e.g., for traffic updates), data analytic tools to analyze public service issues, and big data for predictive modeling of public service issues (e.g., crime and public health). Moreover, IT functions in government and strategic use of IT have grown and diversified. Individual MPA faculty members have tried to narrow the gap by including up-to-date components in their curricula, such as courses that focus on social media (e.g., Mergel, 2012). Additionally, interest has recently grown in developing a data science track in MPA curricula and offering relevant IT courses in public administration and public policy. Nonetheless, the United States still lacks an articulation of IT competence that could drive and inform MPA program curricula.

CONCEPTUAL FRAMEWORK FOR IT COMPETENCE

Numerous studies across various disciplines reveal that competence is a complex multidimensional concept that encompasses “almost anything that might directly or indirectly affect job performance” (Woodruffe, 1993, p. 29). For the purpose of this research, we define IT competence for public managers as the knowledge, skills, and personal attributes of a public manager that enables him/her to achieve IT effectiveness in fulfilling his/her public service duties. This definition of IT competence implies three dimensions: (1) components, (2) performance levels, and (3) public service duties.

Components of IT Competence

There are three components of IT competence: knowledge, skills, and personal attributes. The knowledge component is of particular interest to public administration educators and researchers. Basselier, Reich, and Benbasat (2001) differentiate IT-related knowledge into both “explicit knowledge of technologies, applications, systems development, and management of IT” and tacit knowledge, “a combination of experience and cognition” (p. 159).

Skills often imply practiced facility in doing something and are largely job-specific. Skills include both abilities, which are IT-specific skills acquired over time, as well as aptitudes, a person’s capacity to obtain additional abilities (Dunnette, 1976). IT skills of managers can be further differentiated into technical skills and managerial skills. While the technical skills refer to the manager’s ability and aptitude acquired through learning and practicing IT in performing a specific job or task, the managerial skills indicate his/her ability and aptitude to make IT-related business decisions and lead subordinates in an organization or in a particular sector to accomplish predetermined goals.

Personal attributes cover a wide range of factors; however, with a specific emphasis on virtue in public administration, here the term refers to an individual’s internalized values, norms, and beliefs about, as well as the person’s manifested attitudes toward, IT and public service. A public manager’s internalized values related to IT competence consist of at least three subcomponents: (1) general public service values pertinent to information and technology use, such as transparency, accountability, democratic governance, privacy, equity, and so on; (2) ethics about IT, the moral principles that guide the use of information technologies in the public sector, which include an individual’s own personal code, any informal code of ethical conduct that exists in the workplace, and exposure to formal professional codes of conduct (Aldridge & Stoker, 2002; Pierce & Henry, 1996); and (3) a worldview concerned with technology and society, especially an individual’s perspective on the role of IT in the welfare of individuals, organizations, and society (Garson, 2006).
The recent emphasis on aligning IT projects with public values has further underscored the importance of the intrinsic values of public managers. The fundamental difference between public sector and private sector IT is the value system (Bretschneider, 1990). As a result, one of the first questions about IT projects should be about the values that such projects are going to create, such as efficiency, effectiveness, transparency, and so on. In addition, such value propositions should guide the design and implementation of public sector IT projects and their evaluation (Cresswell, Burke, & Pardo, 2006). Internalizing these values as part of IT competence fosters alignment of individual public service motivations and the production and delivery of public service to create public values.

Attitudes are feelings, beliefs, and behavior tendencies, which often manifest a person’s internalized values. Attitudes always embody both positive and negative elements, and when a person holds a certain attitude, he/she will demonstrate a tendency to behave in a certain way. A public manager’s attitudes toward IT can include his/her willingness or resistance to learn, acquire IT skills, embrace technical innovation, and debate and advocate for IT-related policies.

Performance Levels of IT Competence
Acknowledging IT competence as an enabler of performance, the performance levels (or foci) of IT competence examine the potential influence of such competence at the individual, organizational, and professional levels. Such distinctions are useful for linking IT competence to performance at various levels and for considering the interactions between factors at these levels.

The individual level of IT competence refers to the personal competence elements that enable a public manager to accomplish his/her assigned duty, including his/her IT-related education and personal experience, technical knowledge and skills for day-to-day tasks, and ability and willingness to overcome personal incompetency (such as resistance to IT and knowledge gaps).

The organizational level of IT competence involves effectiveness in achieving organizational performance goals in any public sector organizational context. The term organization here refers to a large array of organizational forms; these go beyond the traditional hierarchical or silo-structure bureaucracy to include process- or service-oriented enterprise or network-structure entities, such as 311 enterprise systems, public management networks, and virtual organizations. This broad definition reflects the need for information sharing and service integration across jurisdictional boundaries to provide citizen- and customer-centric personalized service. Such competence elements include, but are not limited to, knowledge of the values and impacts of IT on an organization, ability to strategically deploy IT to achieve organizational purposes, and willingness to champion IT innovations to lead organizational change.

The professional level of IT competence focuses on elements that affect the field of public administration in terms of exhibiting leadership in IT-related public policy and management practices. An IT-competent public manager may demonstrate leadership in the profession by providing service to IT-related national associations, advocating IT public policy, and leading IT-related public sector innovation and practices. An example of this could be the leadership provided by a state’s chief information officer (CIO) to establish a consortium for interstate cybersecurity information exchange.

Public Service Duties
Public service duties encompass a wide range of job titles, roles, and responsibilities in public administration. Here, we focus on public managers generally and public IT managers specifically.

Public managers are middle- or upper-level executives in public organizations. These people can be division heads, department chairs, or administrators (elected or appointed) at all levels of government. Although the acquisition, implementation, and maintenance of information systems are usually the responsibility of IT departments, the management of IT in public
sector organizations is often shared between IT professionals and public managers; some functional department managers may even oversee IT professionals. Public managers are expected to communicate their needs to and develop a partnership with IT professionals, to deploy IT strategies, and to assume leadership in IT projects.

Public IT managers are specifically responsible for the IT systems within a public agency. Their responsibilities often involve purchasing hardware and software, overseeing installation, operating backup systems, providing IT infrastructure, and contributing to organizational policy regarding quality standards and strategic planning. Their duties ultimately depend on the organization and how complex its information systems are. A large governmental agency could designate a CIO who has an enterprise and information-resource management perspective, supported by a lower-level operational IT manager and staff members. In a smaller organization, public IT managers can be the director of an IT department or a manager of a small technology office. The relevant titles have continued to expand and include CIO, IT director, IT manager, geographical information system (GIS) director, information system (IS) department head, chief knowledge officer, chief data officer, social media director, and so on.

**IT COMPETENCE MODEL**

**IT Competence for Public Managers**

Given the complexity of the public administration environment, our multidirectional conceptual model goes beyond a typical focus on technical skills or specific job responsibilities to address the increasing importance of IT in organizations, including a broad and holistic view of competence. Table 1 summarizes the components of a public manager’s IT competence based on the conceptual model.

As public sector organizations continuously strive for performance outcomes, public managers are generally expected to be competent as effective workers, managers, and professionals.
As individual workers, IT-competent public managers are expected to go beyond their mandated job responsibilities to possess both explicit and tacit knowledge of information technologies for their daily work assignments. Explicit knowledge refers to formal knowledge that can be readily articulated, codified, accessed, and verbalized; such knowledge enables public managers to communicate with IT professionals. Competent public managers also need to understand technical fundamentals (such as hardware, software, personal computers, client/server computing, the Internet, multimedia, etc.; (Bassellier et al., 2001)) as well as technical concepts (such as information systems, networking, databases, etc.; Dawes, 2004). They are also expected to keep up with current and emerging technologies and applications related to their jobs. Simply knowing of these technologies (know-what) is not sufficient; a public manager also needs to practice or experience them, which constitutes his/her tacit knowledge (know-how).

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explicit knowledge, tacit knowledge is difficult to transfer to a person by means of writing it down or verbalizing it. Tacit knowledge is often acquired through practice or experience. The practice of explicit and tacit knowledge, over time, builds a manager’s IT skills.

At the individual performance level, these skills are generally technical, including both basic computer skills (such as e-mail, word processing, spreadsheets, databases, PowerPoint, telecommunications, etc.; Kraemer et al., 1986) and job-specific computer skills (such as the ability to use the financial management system for public financial managers, the procurement system for procurement officers, GIS for public planners, etc.) Equally important skills include the capacity to acquire additional knowledge and skills and the capability to adapt to future technological changes during a career.

Through the practice of IT knowledge and skills, public managers are expected to form their own worldviews, values, norms, and beliefs about IT, which are externalized in their attitudes and actions toward IT. Competent managers should possess personal IT ethics—for example, respecting proprietary software and protecting information privacy (Henderson & Snyder 1999). These managers would value IT for their jobs, be aware of work-related technical needs, recognize personal limits in competence and expertise, be willing to acquire IT knowledge and skills, and be comfortable with technical changes.

At the organizational level, a competent manager “appreciates technology’s capabilities and uses technology as a lever to deliver outstanding business results” (Smith 1996, p. 39). Explicit knowledge at this level includes system development methods and practices, management of IT, and access to knowledge; tacit knowledge consists of both experience, especially of IT project and management, and cognition, especially of the process view of organizational activities and the vision of IT in the organization (Bassellier et al., 2001). Such explicit and tacit IT knowledge should be integrated with managers’ working knowledge of agency goals, major strategies, priorities, and significant threats and challenges, so as to maintain perspective while developing and framing IT solutions.

Public managers are expected to be able to manage IT programs, lead IT-enabled organizational changes, formulate IT-related organizational standards and policies, develop IT strategies and relocate IT resources, articulate IT vision for the organization, and especially important, align IT vision to organizational mission (Boynton, Zmud, & Jacobs, 1994; Dawes, 2004; Kim & Layne, 2001; Kraemer et al., 1986; U.S. Government Accountability Office [GAO], 1994, 2004a). Dawes (2004) specifically emphasizes analytical skills (such as stakeholder analysis, user needs analysis, business process analysis, information policy analysis, information and work-flow analysis, modeling techniques, risk assessment, etc.) and skills for managing complex projects (such as communication and presentation, negotiation, intra- and interagency coordination, intergovernmental coordination, risk management, etc.). Meanwhile, public managers are supposed to possess the capacity to acquire IT management knowledge and skills in the organizational context. Skills at the organizational level are largely managerial in nature.

In practicing such knowledge and skills, public managers are also expected to follow ethical codes of business conduct—for example, providing quality e-services to the citizenry. They would recognize the role of IT in public organizations (Fountain, 2001) and value IT competence accordingly (Armstrong & Sambamurthy, 1996). Such business ethics and values are revealed by managers’ sensitivity to organizational technical needs, recognition of IT implications to the organization, and willingness to champion/lead technical innovation (GAO, 1994). Being responsive to their constituents and the elected officials overseeing their organizations, public managers are also expected to submit to the worldviews and values of those key stakeholders (even if these worldviews and values are different from their own) who create (or destroy) the organizational culture that defines the use of IT and its ultimate benefit to constituents. An IT-competent
public manager should be invested in (or tolerant of) the organizational culture and stakeholders and work effectively with them to achieve organizational purposes.

At the professional level, an IT-competent manager is expected to positively affect the IT practices and policies in public service, which goes beyond the sphere of a specific organization or program. To achieve this goal, such managers are expected to know peer organizations’ use of IT and best IT practices in the field (GAO 1994, 2004b). Experiences of interorganizational or intersectoral IT projects and management are deemed valuable (Dawes 2004). For example, previous experience in private sector IT projects may enable a public manager to launch a public sector IT innovation. In addition, experience of IT leadership in the field, such as heading a national IT special task force, is an important tacit aspect of professional IT knowledge.

Through practicing professional knowledge, public managers are expected to be able to formulate IT-related professional standards and policies and to advocate or lead IT-related innovations in the profession. They should also possess the capability to acquire additional IT leadership knowledge and skills.

As a public sector professional, an IT-competent manager is expected to recognize and appreciate public service values (such as efficiency, transparency, democracy, accountability, equity, etc.) enabled by IT (Bertot, Jaeger, & Grimes, 2010; Cresswell et al., 2006; Davis, 1999; Dawes, 2010; Dervin, 1994; Hindman, 2008; Jorgensen & Bozeman 2007; Osborne & Gaebler, 1992; Public CIO, 2009; West, 2004) as well as the impact of IT on public service ethics and values (Kernaghan, 2014; Ottensmeyer & Heroux, 1991; Roman, 2013). These managers should consider IT competence valuable to public service and strive for leadership in IT innovation within their profession. In addition, they should advocate for (or be willing to provide expertise to) IT-related policies. For example, these managers may push for IT policy reform or be willing to provide expert opinions on IT policy issues.

Researchers have studied the IT competence of public IT managers, especially that of public CIOs, since the establishment of federal agency CIOs by the Information Technology Management Reform Act (Clinger-Cohen Act) of 1996. The E-Government Act of 2002 strengthened the role of CIOs. While 20 years ago technical expertise was the critical variable for a competent CIO, today’s CIO must possess much broader knowledge and skills to be effective (General Services Administration [GSA], 2008). For example, Sharon Dawes comments that the position of “CIO is not a single role but a combination of roles. It demands a set of competencies that cover more territory than we demand from most other leadership positions” (quoted in GSA, 2008, p. 9). Subsequently, she developed a list of CIO...
competencies that consists of five components: strategic thinking and evaluation, systems orientation, appreciation for complexity, information stewardship, and technical leadership (Dawes, 2004; GSA, 2008). In 2012, the federal CIO Council published its Clinger-Cohen Core Competencies and Learning Objectives, which encompasses 12 areas: policy and organization, leadership and human capital management, process and change management, information resources strategy and planning, IT performance assessment, IT project and program management, capital planning and investment control, acquisition, information and knowledge man-

**TABLE 2. Components of IT Competence for Public IT Managers**

<table>
<thead>
<tr>
<th>Components</th>
<th>Knowledge</th>
<th>Skills</th>
<th>Personal Attributes</th>
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<tbody>
<tr>
<td>Individual</td>
<td>Explicit knowledge: Advanced knowledge of IT; current and emerging technologies and applications in the job area Tacit knowledge: Personal use of computers; experience of information systems</td>
<td>Professional computer skills (skills to resolve job-related technical problems); ability to use specific technologies and applications required by the job; adaptiveness to work-related technical changes; ability to communicate IT concepts to nontechnical colleagues</td>
<td>Personal computer ethics Sensitivity to emerging technical innovation; recognition of personal limits in competence and expertise; willingness to acquire IT knowledge and skills; willingness to provide technical consultation and support to nontechnical colleagues</td>
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<tr>
<td>Organizational</td>
<td>Explicit knowledge: Current and emerging technologies and applications in the organizational business area; system development methods and practices; management of IT access to IT knowledge Tacit knowledge: IT project experience; management of IT; process view of organizational activities; vision of IT in the organization; insights of organizational IT capacity</td>
<td>Ability to manage IT programs as a core manager; ability to coordinate/facilitate IT-related organizational changes; ability to formulate IT-related policies; ability to develop IT strategies and relocate IT resources; ability to articulate IT vision</td>
<td>IT-related business ethical codes of conduct Sensitivity to organizational technical needs; recognition of IT implication to organization; willingness to provide technical consultation and support to other functional units; willingness to champion/facilitate technical innovation; submissiveness to elected officials’ or constituents’ worldviews of IT</td>
</tr>
<tr>
<td>Professional</td>
<td>Explicit knowledge: Current and emerging technologies and applications in public sector; peer organizations’ use of IT; best IT practices in the field Tacit knowledge: Experience of interorganizational/sectoral IT projects; experience of core IT leadership in the public sector</td>
<td>Ability to formulate IT-related professional standards and policies; ability to advocate or lead (as a critical player); IT-related innovations in the profession</td>
<td>Public service values; professional ethical codes of conduct; valuing IT competence for public service Striving for core leadership of IT innovation in the profession; advocacy of IT-related public policies</td>
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*Note. Boldface indicates the different competencies required of public IT managers versus general public managers.*
agement, cybersecurity/information assurance, enterprise architecture, and technology management and assessment (CIO Council, 2012). These competence models indicate that CIOs share many core competencies with other leaders in the public sector.

Although the general framework, as well as the primary elements, of IT competence for public managers essentially apply to public IT managers, there are substantively higher expectations for the latter regarding IT knowledge, skills, and personal attributes as defined by their job responsibilities, especially at the individual and organizational performance foci (see Table 2; boldface indicates the differences). These public IT managers should have much more in-depth knowledge about technical specifics and implementation details of strategic information resource use and cybersecurity issues as well as other areas identified in the most up-to-date Clinger-Cohen training document (CIO Council, 2012).

Perhaps the most significant variation in competence between public IT managers and general public managers is at the individual level. Because technology is essential in IT managers’ routine work responsibilities, these managers are expected to go beyond technical fundamentals to possess a professional-level knowledge of IT (such as IT infrastructure, architecture, system security, application development, etc.; Dawes, 2008) as well as knowledge of current and emerging technologies and applications in their job areas. For example, GIS managers’ knowledge scope may encompass the domains of management sciences, engineering, geography, information systems, cartography, city planning, and so on. They are also expected to have relevant system administration experience, which is often beyond the scope of an operational manager. They need to possess professional IT skills and be able to resolve job-related technical problems. More importantly, they are also expected to be able to communicate technical concepts and be willing to provide technical consultation and support to nontechnical colleagues. They are “likeable,” someone with whom operational managers and staff enjoy working. Compared to operational managers, they are more sensitive to emerging innovations and eager to stay up-to-date on new developments in technology.

At the organizational level, IT managers in public sector organizations have traditionally been placed lower in the organizational structure, assuming supporting roles (Bretschneider, 1990); however, with the rise in the importance of IT for public organizations, especially through the advancement of public CIOs, public IT managers are also expected to play strategic roles, although such strategic roles are often underplayed or underappreciated (Press, 2015). Compared to operational managers, public IT managers are expected to remain knowledgeable about current and emerging technologies and applications relevant to the organization’s business. In addition to the IT vision of the organization, IT managers should also possess insights into the true capabilities of their organization, knowing what is possible or not possible given the organizational purpose, culture, and resources. IT managers are expected to be able to coordinate and facilitate IT-related organizational changes and play a key role in IT project management. In doing so, they need to be able to demonstrate their understanding of the operational mission, strategies, priorities, and cultures. They should be considered an integral part of the organizational management team by the management, workforce, and stakeholders, fully participating and engaging in most issues that affect the whole organization, not just IT issues. To be competent in doing so, IT managers’ managerial skills must range from project management, analytical acumen, problem solving, organizational strengths, and time management to interpersonal, leadership, and communication skills. IT managers should be more sensitive to organizational technical needs and to IT implications for organizations than operational managers and be willing to provide technical consultation and support to other functional units as well as to champion and/or facilitate technical innovations. On one hand, IT managers see the values of innovative solutions and are willing to take risks and push
the organization forward; on the other hand, they are tolerant of more cautious approaches, maintaining an acceptable performance level and accepting slow evolution in response to new products and concepts. Overall, a competent IT manager is expected to be relevant to, supportive of, and accepting of operational agendas and to equate IT success with the success of operational managers.

At the professional level, the difference in IT competence between public managers and IT managers is less conspicuous. To be competent, IT managers need to go beyond knowledge of current technologies and applications and capture the trends of technology development, remaining visionary and proactive toward technical innovations. They should be able and willing to assume core responsibilities in leading and advocating public sector innovations and policies.

**IMPLICATIONS FOR MPA CURRICULA**

The proposed IT competence model for managers in the public sector, while gaining much credence from practice, has several far-reaching implications for MPA curricula. First, the model underscores IT competence as an integral element to public managerial competency. Public organizations have been increasingly relying on managers as co-leaders of IT projects and as cross-functional partners to design and implement them (Chan & Reich, 1999). MPA programs that neglect the importance of IT competence for public managers may fail to prepare students for the practical reality of IT as an integral and strategic element of public service. Although IT competence has been previously articulated for private sector managers (e.g., Bassellier & Benbasat, 2001) and for public sector IT managers (e.g., Dawes, 2008), this research effort calls for (1) reevaluating the role of IT competence in public

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**TABLE 3.**
An Example of IT Course Learning Objectives and Assessment Tools

<table>
<thead>
<tr>
<th></th>
<th>Knowledge</th>
<th>Skill</th>
<th>Value/attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning objectives</td>
<td>Knowledge of information system concepts</td>
<td>Use of computer applications</td>
<td>Articulation/application of IT ethics</td>
</tr>
<tr>
<td>Assessment methods</td>
<td>Quizzes, case analyses</td>
<td>Exercises, hands-on projects</td>
<td>Problem analyses, self-reflection essays</td>
</tr>
<tr>
<td><strong>Organizational</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning objectives</td>
<td>Knowledge of IT-enabled organizational change</td>
<td>Development/implementation of IT/IS strategies</td>
<td>Articulation/application of IT-enabled organization theories and public service values</td>
</tr>
<tr>
<td>Assessment methods</td>
<td>Case analyses, practice-based projects</td>
<td>Practice-based projects</td>
<td>Practice-based IT project analyses, self-reflection essays</td>
</tr>
<tr>
<td><strong>Professional</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning objectives</td>
<td>Knowledge of public sector innovation</td>
<td>Development/implementation of information and/or technology policies</td>
<td>Articulation/application of relevant social theories, worldviews, and public values</td>
</tr>
<tr>
<td>Assessment methods</td>
<td>Case analyses, large-scope service-learning projects</td>
<td>Service-learning projects</td>
<td>IT policy analyses, self-reflection essays, program study portfolios</td>
</tr>
</tbody>
</table>
affairs education and (2) reexamining MPA curricula to meet the challenges facing public managers today.

Second, because MPA programs are required to “engage in ongoing assessment of student learning” (NASPAA, Commission on Peer Review and Accreditation, 2014, p. 29), our holistic IT competence framework provides guidance for designing learning objectives and assessment tools to equip public managers with IT competence (e.g., see Table 3).

Third, the proposed model can be integrated into an existing MPA curricula in various ways. Individual MPA programs can use the proposed model to evaluate their needs for IT competence training and choose the relevant emphasis for their respective student populations. The proposed emphasizes the importance of IT knowledge as well as the value of differentiating various performance levels in designing IT curricula for public managers and public IT managers. Public service values such as equity, transparency, and accountability, as well as concerns about privacy, security, and ethics, should be integral to any IT curriculum. It is critical that MPA curricula emphasize the development of IT competence attributes, such as values and attitudes. There are ample examples of well-trained public managers producing devastating results for communities and for society when they are motivated by distorted values and beliefs (Adams & Balfour, 2009; Keeley, 1983). Because values in the practice of public administration have real consequences for individuals and communities, MPA programs should not neglect IT-related ethics, values, and attitudes for future public managers.

A graduate IT curriculum may consider including modules that systematically introduce IT ethics for individuals and businesses, public service values in relation to IT, and implications of IT for society. Although such a curriculum may not be sufficient to fundamentally establish or transform people’s worldview, values, or attributes, it can at least improve students’ knowledge and awareness of professional ethics, values, and responsibilities. Constant practice and reinforcement of such knowledge in both educational and practical settings will eventually affect students’ beliefs and behavior systems.

The proposed IT competence model also helps address the gap in tacit knowledge and computing aptitude. Most MPA curricula have focused on developing explicit IT knowledge and computer skills and have tended to neglect developing tacit IT knowledge and aptitude as well as IT values and attitudes. Our proposed model is important for MPA curriculum design and related career training because it points to neglected areas.

If tacit knowledge is equally important to explicit knowledge, as the model suggests, MPA curricula need to systematically plan for students’ direct engagement in practical IT projects for both experience and cognition. It is important for students to acquire and practice their knowledge and skills through mechanisms such as real case scenarios, community-based projects, service-learning programs, and so on.

Perhaps even more critical in curriculum design is building students’ IT aptitudes—their capacity to obtain additional abilities in their future careers. This requires that MPA curricula help students lay a solid foundation of IT knowledge as well as develop their learning capabilities for career-long benefits. For example, computer programming knowledge and skills may not be relevant to a non-IT public manager’s job; however, public managers, if equipped with such knowledge and skill, will be able to better understand computer applications and more easily adapt to IT innovations. In addition, knowledge and training from other courses in MPA curricula can enhance IT aptitude. For example, research skills from research methods classes will enable students to search for knowledge of and solutions to IT problems. MPA programs should design specific curriculum components (such as research projects, comprehensive exams, service learning projects, etc.) to encourage students to synthesize and integrate their knowledge and skills across different courses. Such components will enhance students’ experiences through learning.
by doing, which will benefit their future careers, as they will be able to learn continuously in their jobs.

Moreover, the proposed IT competence model can guide MPA programs’ choice of what to emphasize, depending on each program’s student population and target audience. If an MPA program primarily serves students pursuing general public management positions, Table 1’s emphasis for public managers would be more applicable. A more specialized course or module could be developed for students pursuing careers in public IT management (see Table 2).

The fourth implication of the proposed IT competence model for MPA curricula is the most far-reaching. For most MPA programs without an IT concentration or specialization, a core required course laying the foundation for IT competence for general public managers would be productive. The proposed model can guide the development and implementation of such a course. More specifically, this course should articulate public service values and ethics for public managers with regard to information management and deployment of IT. Such articulation should be part of the evaluation framework for making IT decisions throughout the entire course. A discussion about the publicness of public management information systems would be a requirement. Such articulation and discussions could propel public managers to champion IT-enabled innovation to improve public service. In addition, the course should teach ethical principles such as protection of privacy and equity, both of which are likely to guide the development and implementation of government IT projects.

In this course, the technical skills should cover all three performance foci. At the individual level of performance, the course should teach basic computer, network, and applications skills. Students should have opportunities to apply these skills in their course-related assignments and projects. At the organizational level, the course should introduce strategic considerations of the use of information and communication technologies. At the same time, the question of governance and standards should be part of the discussion. A standard management information system (MIS) textbook for business school students can cover these skill areas at both individual and organizational levels. At the professional level, skills to be taught involve articulating public service values and developing policies/standards for managing IT in government. Such policies and standards could be for online privacy, cybersecurity, online transparency, and e-participation.

In addition, this course should build tacit knowledge in addition to explicit knowledge. Explicit IT knowledge concerns both current and emerging technologies as well as methodologies for information system development. A standard MIS text can cover explicit knowledge at the individual and organizational levels. An e-government textbook should supplement the explicit knowledge, focusing on the use of IT for public service and IT leadership in the public sector. The use of public sector cases and the inclusion of best practices and experiences of government technology are a formal way of introducing some tacit knowledge. In addition, engaging students with real projects in the field as part of service learning and pairing them with mentors are ways to create and share tacit knowledge. Moreover, given the rapid development of information technologies, the course focus should be on building the aptitude for lifelong learning of IT knowledge and skills.

This course should support the integration of IT competence into other core courses to achieve universal competence. One of the critical pieces of knowledge for managing 21st century public service organizations is to understand the implications of emerging technologies and the possible ways of leveraging these technologies. For instance, a public finance and budgeting course can highlight the role of information and communication technologies for online financial transparency. An organizational theory core course should discuss the implications of communication technologies for decision making and organizational structure.
For MPA programs with an IT specialization or concentration, the IT curriculum should be composed of several courses, both required and elective. There should also be a course that introduces various aspects of an IT competence model for all MPA students. For those students who choose an IT concentration, there should be more in-depth coverage of technical knowledge and skills. Such coverage should go beyond the individual level to the organizational and professional levels. The specifics, however, will be mostly driven by the strengths and emphases of any one MPA program (these specifics are beyond the scope of this research).

One strategy for enabling MPA programs to offer an IT concentration with the requisite technical knowledge and scope is to partner with other departments, schools, and colleges. The top-ranked universities in information and technology management, according to U.S. News and World Report, all partner with other units (e.g., the Information School, University Technology Research Center, College of Business, and Department of Geography). The proposed IT competence model is more concerned with whether students have the requisite knowledge, skills, and attributes on all three performance levels rather than with what unit provides the training. The home unit of MPA, however, is in a critical position to put all technical knowledge and skills in the public context, articulating public values and advancing public administration professional ethics.

**CONCLUSION**

This research proposes a definition and conceptual model of IT competence for public managers. Our definition and model are based on an extensive review of the literature, both in the domains of public manager competence and IT-specific knowledge, skills, values, and ethics. Our resulting three-dimensional IT competence model contains IT knowledge, skills, and personal attributes of different performance levels for public managers with various service duties.

In addition to the implications for MPA programs detailed above, the proposed model possesses several potentially useful attributes for management. First, it allows identification of the domain of public service duties in IT competence, namely duty-universal and duty-specific IT competence. For example, based on the model, we can easily construct IT competencies for public financial managers, police chiefs, human service officials, and so on that are either unique or common across various functions. Second, the model helps minimize potential misunderstandings likely to arise when people do not clarify the different performance foci in relation to IT competence. For example, a highly competent manager at the individual level (e.g., excellent in using a computer for his/her job) may not be competent at the organizational level (e.g., successful in leading IT-enabled organizational change). Therefore, those of us in the field should not only customize our learning or training programs to address specific needs but also design valid and reliable performance appraisal systems for effective public service. Finally, the model indicates that the path to IT competence requires a broad and integrated approach. Traditionally, public sector management, especially in human resources, emphasizes the individual level of competence in terms of hiring, training, evaluating, and retaining; but this has been insufficient in developing more systematic, large-scale, outcome-oriented IT-enabled change strategies. Concentrating efforts at the individual level and neglecting the organizational and professional ones fails to recognize the interrelationship, interaction, and interdependence among the three levels.

We have attempted to create a construct with high content validity, drawing on both theoretical and empirical literature as well as expert comments. Yet, further empirical investigation of the model’s validity will require more extensive data collection in the field and data analysis. Further refinement of this theoretical construct and the operationalization of IT competence for public managers are necessary. Public manager IT competence is a complex construct. We hope our model will lead to a better understanding of IT in public sector...
organizations as well as the development of appropriate curricula for public administration educational and training programs.

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