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Impacts of organizational assimilation of e-government systems on business value creation: A structuration theory approach

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ABSTRACT

Governments worldwide are eagerly anticipating a digital future with the proliferation of information system applications, but assimilation of such enterprises could be a potentially formidable challenge. Assimilation of e-government systems by organizations is important for business value creation. Despite significant investments in e-government systems, the extent to which organizations have been able to assimilate and leverage these systems varies widely. We develop a theoretical model grounded upon structuration theory and the literature on organizational information systems assimilation to investigate the impact of organizational assimilation of e-government systems on business value creation by conceptualizing the notions of IS in organizations. Based on our model, we argue that the organizational meta-structures of signification, domination, and legitimization determine aspects of organizational e-government systems assimilation behavior that may affect its value creation potential. We experimentally validate our model using a total of 367 surveys collected from public organizations currently utilizing an e-governmental system. Our results largely support the proposed model and shed new light on the factors associated with organizational assimilation of e-government systems. Finally, we isolate the organizational, technological, and inter-organizational factors that shape the meta-structures for the assimilation of e-government system. Our findings indicate that assimilation of e-government systems has a substantial impact on business value creation. We conclude by discussing the theoretical and practical implications of our findings.

1. Introduction

Since the late 1990s, governments at all levels have launched e-government systems with the objective of providing quality electronic information and services to citizens and businesses (Torres et al. 2005). New technologies in the government sector have not only helped to improve service delivery and increase democratization (West 2004), but have also helped to reduce corruption and enhance transparency (Haldenwang 2004) as well as increase national business competitiveness (Srivastava and Teo 2006). The management of e-government systems is thus becoming an essential element of modern governments' (Torres et al. 2005) support of the transition from administration-oriented organizations towards service-oriented organizations (Guo et al. 2009). To ensure fulfillment of the mission of e-government, it is important to assess the effectiveness of e-government and to take necessary actions based on these assessments (Gupta and Jana 2003). The key objective during the post-implementation stage is to assimilate the outcomes of integration of information systems into business routines so that the expected benefits can be realized (Liang et al. 2007). Assimilation is an important construct in the causal chain of influence from the organizational adoption of an information technology to the evidence of its impacts on business performance (DeLone and McLean 2003). However, little is known about the factors that determine the assimilation of e-government systems in organizations and the impact of assimilation on value creation. The prime motivators for the research we present in this paper are these gaps.

Past studies have overlooked the fact that technology assimilation is an ongoing process by focusing on one stage of the assimilation life cycle, such as the decision to adopt a specific IS innovation. Furthermore, the majority of past studies on IS innovation have been anecdotal (Rai et al. 2009). Previous researchers have often approached the subject from the viewpoint of an applied problem, such as user acceptance of e-government systems

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or the avoidance of resistance by users, hence few studies on the post-adoption environment are present in the literature (Ahuja and Thatcher 2005). Most existing studies have relied on social psychological theories that lack the ability to explain why and how systems continue to be used after they are adopted (Guo et al. 2009); little attention has been paid to underlying organizational theories. Increasing evidence also suggests that most traditional models neglect the realities of implementing technology innovations within organizations and fall short in explaining innovation assimilation, and may thus require modification (Fichman and Kemerer 1997, Kamal 2006). Therefore, from a theoretical perspective, a nuanced understanding of the assimilation of e-government systems is necessary.

Past empirical studies of organizational assimilation and value creation have mostly been conducted in the context of e-business (Zhu et al. 2003, 2006) or manufacturing (Choi and Lee 2009), even though IS has had a tremendous impact in public non-manufacturing organizations. Most published e-government studies are either conceptual or case studies (Srivastava and Teo 2010), only limited to analyzing a particular e-government implementation (McHenry and Borisov 2006), and highlighted the paucity of its impact study (Srivastava and Teo 2010). Indeed, past studies have shown that the transference of concepts and practices from the private to the public sectors is problematic and does not always have the intended outcome (Pee and Kankanhalli 2008). This suggests that it is important to recognize the unique aspect of e-government systems in contrast to e-business or manufacturing enterprises of private organizations; in other words, e-government systems should be studied in their own right.

Despite the potential of IS, organizations face significant challenges in assimilating these systems and in obtaining the expected results (Brews 2000). In the case of e-government systems, one of the most important challenges faced is that the adoption and use of the implemented system does not last, and investment may also be ineffective (Chen et al. 2007). In many cases, user acceptance of a new technology is satisfactory at first when this technology is strongly promoted or its use enforced, but declines sharply after this initial stage is over (Zhang et al. 2010). This short life cycle and under-utilization of e-government systems have raised doubts about the value of e-government investments (Wang and Wilson 2005). Specifically, earlier researchers have argued that not all e-government system implementations have been successful. Approximately 60% of e-government system implementations failed or did not yield the expected outcomes (Heeks 2003). Therefore, the assimilation and integration of e-government systems in organizations is a competitive necessity, and there is still much to learn about how best to strategically position e-government systems to ensure the greatest positive effect on an organization's effectiveness.

To overcome these limitations and to improve the explanatory value of organizational assimilation of e-government systems for business value creation, we develop a theoretical model grounded upon structuration theory and the literature on organizational IS assimilation. Our goal in this paper is to synthesize the factors that affect the assimilation of e-government systems and determine the impact of e-government systems on business value creation. Specifically, we focus on identifying factors that can be generalized across e-government systems and determining their assimilation life cycle. Consistent with observations made in past studies of organizational systems, we consider organizational, inter-organizational, and technical factors in this investigation. Research questions addressed in this study are: (1) What organizational, technical, and inter-organizational factors shape the assimilation of e-government systems? (2) In turn, what is the impact of e-government system assimilation by an organization on business value creation?

By addressing these research questions, this paper contributes to e-government system assimilation theory by isolating a parsimonious set of theoretically grounded factors that affect the assimilation of e-government systems in organizations. Furthermore, this paper provides empirical evidence to support the large impact of organizational e-government system assimilation on business value creation. Understanding the key antecedents of assimilation of e-government systems in light of structuration theory will help practitioners to formulate and implement appropriate strategies to cope with the challenges of implementing e-government systems.

The rest of the paper is organized as follows. In the next section, we develop a theoretical framework that integrates structuration theory with the organizational assimilation of e-government systems. In subsequent sections, based on this framework, we consecutively develop a research model, describe instrument development and the data collection method, indicate how we analyzed the data, and present the results of model testing. Finally, we discuss the theoretical and practical implications of our findings, as well as the limitations of our study and directions for future research.

2. Theory

The foundation of our theoretical framework is built on two elements: structuration theory and the literature on organizational IS assimilation. We argue from the perspective of structuration theory that dynamic organizational meta-structures and patterns of human actions retain their influence throughout the life cycle of e-government systems as they are adopted, and evolve continuously. These meta-structures of signification, domination, and legitimization reinforce established structures and patterns of action that reproduce established behaviors or enable the emergence of new structures, and these actions generate assimilation behaviors that may affect value creation. Assimilation can be greatly improved if organizations have high organizational absorptive capacity in terms of facilitating the assimilation of external information and applying this external information to commercial ends (Cohen and Levinthal 1990). Thus, we further argue that organizational absorptive capacity moderates the influence of the organizational meta-structural factors listed above in determining assimilation behavior (see Fig. 1).

2.1. Perspectives on assimilation

Assimilation is defined as the extent to which the use of technology diffuses across organizational work processes and becomes routinized in the activities associated with those processes (Purvis et al. 2001). Therefore, assimilation of e-government systems can be defined as the extent to which an organization uses e-government systems to facilitate business strategies and activities. This definition focuses on the relative success of an organization at incorporating e-government systems into its business strategies and activities and is consistent with earlier treatments of IT assimilation at the organizational level (Armstrong and Sambamurthy 1999).

We identified manifold organizational-level IT/IS adoption models from the literature. Innovation diffusion theory (Rogers 1983) was tapped by several researchers to investigate antecedents of IT adoption (Lewis et al. 2004). Taking this approach to assimilation, Cooper and Zmud (1990) related IT implementation with task and technology characteristics in the context of manufacturing firms (Cooper and Zmud 1990). Researchers, by extending this theory, have also proposed that task, organizational, and environmental characteristics play important roles in technology adoption (Damapour 1991). Furthermore, the technology–organization–environment framework developed by Tornatzky and Fleischer

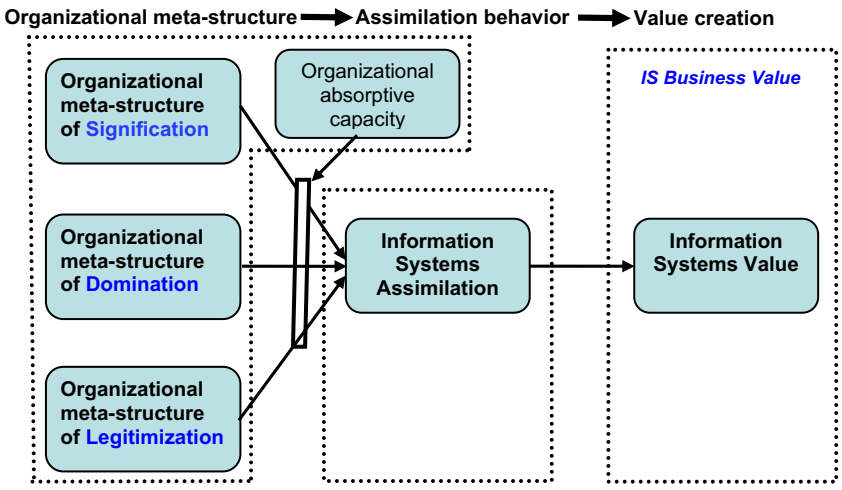

Fig. 1. Conceptual framework.

(1990) states that the decision to adopt a technological innovation by a firm is based not only on the technology, but also on the related organizational and environmental contexts. The technology adoption model social psychological theory (Davis 1989), the IT innovation adoption research model (Agarwal and Prasad 1998), and innovation adoption and implementation model (Gallivan 2001) have also been widely used.

The role of top management has received significant attention in research studies on the organizational determinants of IS assimilation. Chatterjee et al. (2002) developed a model of assimilation of web technologies for shaping e-commerce initiatives based on the structuration theory of technology assimilation. In their model, meta-structuring actions of top management, such as championship, provided strategic rationale for technology investments (Chatterjee et al. 2002). Top management's knowledge about IT and their vision of the role of IT in a firm have been found to impact adoption intentions and lead to successful IS assimilation (Armstrong and Sambamurthy 1999). Others have focused on the level of managerial IT knowledge and organizational structure as predictors of web technology assimilation in the supply-chain management function (Ranganathan et al. 2004).

According to technology assimilation theories, most ITs exhibit an "assimilation gap": their rates of organizational assimilation and use lag behind their rates of organizational adoption (Chatterjee et al. 2002, Fichman and Kemerer 1999). Therefore, lessons learned about the assimilation of prior information technologies could be extended to understand how organizations promote the assimilation of e-government systems. However, the assimilation of e-government systems is more challenging than assimilation of other IS in private organizations because of the different natures and dynamics of these entities.

Consistent with Swanson's (1994) taxonomy of IS innovation, assimilation of e-government systems is a Type III innovation, where the focus is upon the integration of IT in customer-facing strategies and activities at the organizational level (Chatterjee et al. 2002). The emergence of e-government requires the radical transformation of government, including profound changes in the structure, process, culture, and behavior of individuals in the public sector (Irani et al. 2005). In e-government initiatives and e-government assimilation, these transformational efforts usually encompass all the major organizational dimensions including strategy, structure, people, technology, and processes as well as the principal external forces of citizens, suppliers, partners, and regulators (Tung and Rieck 2005). Kamal (2006) suggested through his conceptual model of EAI adoption in an e-government environment that simply acquiring or adopting a technology is not sufficient to realize the anticipated benefits; IT must be deployed and used sophisticatedly by the organization and its intended users (Kamal 2006). Public organizations face challenges such as overcoming resistance to change, security, and possibly a lack of top management support in assimilating this technology (West 2004). Therefore, for government organizations to be successful in assimilating innovations, they need to have a thorough understanding of the relative advantages of the innovations as well as the organization's absorptive capacity, existing organizational operations, managerial capabilities, and information systems business standards relative to the requirements of the work processes (Kamal 2006).

Researchers have suggested that e-government activities spur similar activities in the business sector (Cohen et al. 2002) and that these e-government activities are a follow-on from e-business (Carter and Belanger 2005). The success of e-business can motivate implementation of e-government, which in turn may facilitate implementation of more e-business (Srivastava and Teo 2010). Despite this synergistic relationship, the current literature typically views e-business and e-government activities as inherently different (Srivastava and Teo 2010) and they have different business goals (Chircu and Lee 2003), leading to a gap between IT adoption in private and government sector organizations with regard to provisions made for its assimilation and assessment of its impact (Kamal 2006).

We posit three distinct reasons why the assimilation of e-government systems deserves investigation using an e-government-specific assimilation model. First, the dynamics of e-government assimilation in an organizational are distinct, as it is a Type III innovation that occurs at the organizational level of analysis and firm-wide actions are required to integrate IS into strategies, activities, and processes. In contrast, Types I and II IS innovations operate at different levels of analysis. In fact, limited attention has been devoted to the assimilation of Type III IS innovations as compared to Types I and II (Chatterjee et al. 2002). Assimilation of e-government systems requires the mobilization of attention and coordination of actions across a wider group of stakeholders and inter-organizational factors, including top management, IS executives, members of the IS function, and members of a work group than is the case for the assimilation of individual IS innovations. The intensity of the interactions and collaborations required among these members is much more pronounced for the assimilation of e-government systems than for the assimilation of other IS systems. The prevailing perspectives on technology assimilation

have two implications for our research. First, consistent with the entire portfolio of IS, we conceptualize assimilation of e-government systems along two dimensions: organizational strategies and online business activities such as government to government (G2G), government to citizen (G2C), and government to business (G2B) activities (Wang and Liao 2008). Higher assimilation of e-government systems refers to greater use of these IS in organizational strategies and activities. Higher levels of organizational assimilation will be achieved when a larger proportion of the individual assimilation initiatives are targeted at the enterprise business strategies and value chain activities. Therefore, organizations can foster higher levels of technology assimilation by shaping, influencing, and motivating individual and managerial attention, cognition, and behaviors toward more assimilation initiatives across the enterprise (Chatterjee et al. 2002). Whereas assimilation itself is the cumulative result of actions by individuals and units within the organization, these actions are stimulated by an organizational milieu of norms, values, and rules (Chatterjee et al. 2002).

Second, the weak theoretical perspectives and unique aspects of e-government system assimilation indicate that a different investigative approach is required. Heeks and Bailur (2007) pointed out that e-government research draws mainly from a weak or confused positivism and is dominated by over-optimism, thus there is a paucity of knowledge and practical guidelines for e-government and a lack of clarity and rigor about research methods alongside poor generalizations. Furthermore, the evidence reported in the normative literature suggests that some of the assimilation factors might need to be redefined because public and private organizations differ in several important aspects and it is necessary to make meaningful adjustments to address the specific needs of public organizations (Moon 1999).

Finally, the impact of organizational assimilation of e-government systems on business value creation has received little attention from researchers. We therefore identified a set of factors that have been found to influence assimilation at the organizational level and investigated their effects on business value creation. We then mapped these factors through the lens of structuration theory to develop a model that can be used as a tool to measure the effects of e-government system assimilation on business value creation.

2.2. Structuration theory in conceptualizing IS research

Structuration theory, proposed by Anthony Giddens (1979, 1984), is an attempt to reconcile theoretical dichotomies in social systems such as agency/structure, subjective/objective, and micro/macro perspectives. In this theory, structuration is conceived as a social process that involves the reciprocal interaction of human actors and structural features of organizations (Orlikowski 1992). These structural properties consist of the rules and resources that human agents use in their everyday interactions. These rules and resources mediate human action, while at the same time they are reaffirmed through being used by human actors (Orlikowski 1992). In explaining the modalities of structuration, structuration theory argued that all human interactions are inextricably composed of the structures of meaning, power, and moral frameworks, and that any interaction can be analyzed in terms of these, as the realms of social action and social structure coexist. It recognized three modalities that link the realms of action and social structure: interpretive schemes, resources, and norms (see Fig. 2).

Structuration theory has been used extensively in the IS field since its development. Jones and Karsten (2008) concluded, based on a review of 331 IS articles that have drawn on Gidden's work, that there are significant opportunities for IS researchers to pursue structurational research.

Jones and Karsten (2008) identified three broad arenas of structuration theory application: application of structurational concepts, development and application of IS-specific versions of structuration theory, and critical engagement with structuration theory. Reimers and Johnston (2008) integrated the structuration model with practice theory to investigate the adoption of inter-organizational information systems in particular industry sectors. Their model divides the structures in IS application practice into ideational structures, normative structures, and material structures, and defines different behavior patterns to reinforce and extend the concept of duality (Reimers and Johnston 2008). Another theoretical paradigm influencing IS research is that of Poole and DeSanctis (2004). They modified Giddens's structuration theory to address the mutual influence of technology and social processes; this theory is referred to as *adaptive structuration theory*.

Orliwoski's (1992) duality of technology has been the most influential theoretical paradigm in IS research used to investigate the relationship between information technology and the organization over the last decade. She developed a structural model of information technology based on the assumption of the duality of technology and applied the model to the particular case of information technology. The root of the structuration theory of technology assimilation lies in the basic institutional theory that describes how firms act as institutions in shaping the behaviors and cognitions of individuals within. Institutional theory (Orlikowski 1992, Scott 1995) identifies three ways in which organizations influence individual cognition and behaviors: (1) structures of signification, (2) structures of legitimization, and (3) structures of domination. Orlikowski et al. (1995) argued that individuals utilize these institutional structures of signification, legitimization, and domination to make sense of technology, garner the resources needed to infuse

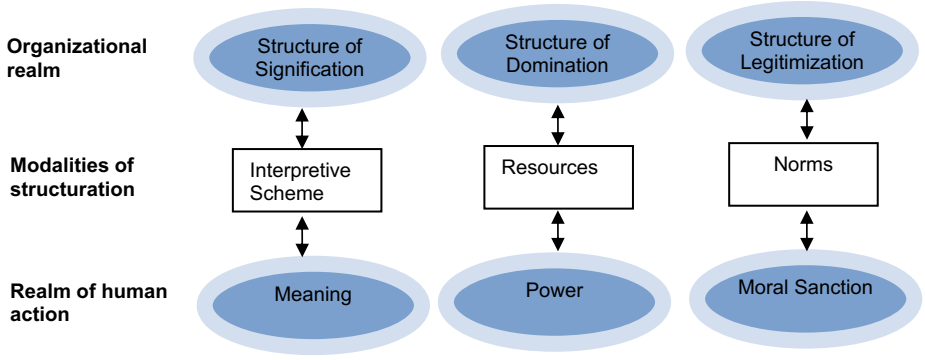

Fig. 2. Interaction between human action and organizational properties as mediated by the three modalities of structuration (adapted from Giddens (1984)).

technology into work processes, business activities, and strategies, and undertake the improvisational actions needed to assimilate the technology. These assimilation actions are referred to as structuring actions. They also argued that top management or organizational human resources could manipulate the institutional structures of signification, legitimization, and domination, and thereby influence, guide, motivate, or alter individual structuring actions. These organizational actions are called meta-structuring actions because they either reinforce the existing institutional structures or alter those structures to create conditions more conducive to technology assimilation.

Structuration theory has also been applied to e-government research to examine the organizational learning process during project implementation (Phang et al. 2008), analyze the dynamics of system procurement and development (Devadoss et al. 2002), analyze the adoption and application practice of e-government systems from an organizational level perspective (Chen et al. 2007), analyze management accounting practices (Coad and Herbert 2009), perform a structural analysis of e-government initiatives (Devadoss et al. 2002), analyze e-government research (Heeks and Bailur 2007), and analyze e-technology and the emergent e-environment (Tassabehji et al. 2007). A recent study of Meneklis and Douligeris (2010) extended the theoretical perspective of e-government through a structurational lens which focused both on evaluation of the results of past implementations and on the processes that enabled these implementations.

2.3. A structuration perspective for e-government system assimilation

We applied the underlying duality of technology concept which is based on Gidden's duality of structure and structuration theory of technology assimilation (Orlikowski 1992, Scott 1995) to gain insight into the structuration of e-government systems so as to understand the relationships between an organization's attributes and its assimilation of e-government systems. The structuration theory of technology assimilation focuses on the relationship between social structure and human actions and suggests that assimilation of e-government system innovations is a cumulative consequence of individual actions, which are shaped by organizational meta-structures (Giddens 1984). These meta-structures reinforce established structures and patterns of action that reproduce established behaviors or enable the emergence of new structures and actions that generate innovative behavior.

The structuration theory of technology assimilation has been used to inform studies related to organizational assimilation of information technology innovations for business processes such as the assimilation of computer-aided software engineering technology (Purvis et al. 2001), Web services (Chatterjee et al. 2002), and the assimilation of electronic procurement innovations (Rai et al. 2006). Recently, Rai et al. (2009) used this theory to investigate the assimilation of electronic procurement innovations and the impact of this assimilation on procurement productivity in buyer organizations; they reported that assimilation of these innovations had a substantial impact on procurement productivity (Rai et al. 2009).

In our context, assimilation of e-government systems emerges from the structuring actions of individuals, whose cognitions and behaviors are influenced by institutional meta-structures. The three key meta-structures of signification, domination, and legitimization (Orlikowski 1992, Scott 1995) exclusively influence the cognitions and behaviors of individuals. Signification is established by meta-structures that provide meaning and promote understanding, thereby serving as cognitive guides for individual action and behavior. Legitimization is established by those meta-structures that validate behaviors as desirable and congruent with the goals and values of the organization. Finally, domination is provided by the meta-structures that enforce established institutional rules to regulate the actions and behaviors of individuals.

Drawing on structuration theory and based on a review of the literature on organizational IS assimilation, we identified the organizational, inter-organizational, and technological factors that represent the meta-structures of signification, legitimization, and domination in an e-government system assimilation context (see Table 1). We now elaborate on our rationale for mapping causal factors to particular meta-structures.

2.4. Meta-structures of signification and notions of e-government systems

Meta-structures for signification are provided by the strategic, relational, and technological contexts in which e-government systems must be interpreted and used. We identified top management leadership as an organizational factor, user support from providers as an inter-organizational factor, and security of the e-government system as a technological factor. Top management leadership provides the strategic rationale for an organization's e-government system initiatives, while user support refers to users' perceptions of technical support from the service providers for e-government system use. Security focuses on the match between the requirements for safeguards and protection and the users' perceptions of these provided by e-government systems.

2.5. Meta-structures of domination and notions of e-government systems

Meta-structures for domination are provided by political support, human resources, and financial commitment to e-government system assimilation and the extent to which IS innovativeness, in general, is desirable and pursued in an organization. Accordingly, we identify top management leadership as an organizational factor and IT sophistication and user IT competence as causal factors through which the meta-structures of domination operate to validate actions and behaviors related to e-government system assimilation. Top management leadership directs political support for e-government system actions, while IT sophistication and user IT competence together reflect organizational readiness to provide technological capabilities and human resources, especially to end-users, thereby promoting the assimilation of e-government systems.

2.6. Meta-structures for legitimization and notions of e-government systems

Meta-structures for legitimization are established by top management imperatives for e-government systems and behavioral regulations associated with e-government system usage. We identify top management leadership as a causal organizational factor and e-government systems standards efficacy as a causal technological factor through which the meta-structures of legitimization operate to regulate e-government system assimilation behaviors.

3. Model and hypotheses

Based on our theoretical proposition that the organizational meta-structures of signification (forming through top management leadership, user support, and security), domination (forming through top management leadership, IT sophistication, and user IT competence), and legitimization (forming through top management leadership and e-government systems standards efficacy) determine organizational e-government system assimilation behavior. Also, further organizational absorptive capacity moderates the

Table 1
Structuration perspective of e-government system assimilation: mapping to factors.

	Definition	Mapping to constructs	Explanation
Structures of signification	Meta-structures related to strategic, relational, signification, and technological contexts yield meaning and understanding, serving as cognitive guides to understand appropriate behavior/actions with respect to e-government system assimilation	Top management leadership	The extent to which top management articulates the strategic context for e-government system deployment, which informs cognition on the business needs of e-government systems
		User support	Perceptions about the technical support from service providers for e-government systems
		Security	Security defines the degree to which e-government systems provide safeguards and protects users. Therefore, it reflects perceptions about the security and protection of e-government systems; in other words, the methods of protecting information and information systems from unauthorized access, use, disclosure, disruption, modification, or destruction to ensure integrity, confidentiality, and availability
Structures of domination	Meta-structures related to political, financial, and technological resources validate behaviors associated with the assimilation of e-government systems as being appropriate and consistent with the goals and values of the organization	Top management leadership	Top management signals political support for the initiative and legitimizes actions and behaviors related to e-government system assimilation by their active involvement in the deployment of e-government systems
		IT sophistication	The sophistication of IT resources and capabilities in the organization is an aggregate signal of the desirability and importance of IT-related innovations for core organizational processes, in this case, e-government system assimilation to fulfill the business mission
		User IT competence	The belief that one is capable of performing in a certain manner to attain certain goals, such as the confidence to use e-government systems
Structures of legitimization	Meta-structures related to goals and organizational standards regulate actions and behaviors for e-government system assimilation	Top management leadership	Top management regulates actions and behaviors for e-government system assimilation by establishing goals for initiatives and standards to monitor them
		E-government systems standards efficacy	Perceptions about e-government system business standards relative to the requirements of the work processes of the organization. e-government systems standards efficacy reflects the perceptual measures of comprehensiveness, flexibility, and enforcement. Comprehensiveness standards provide positive feedback for broader deployment of e-government systems by accommodating for the scope of business activities. Flexibility standards provide positive feedback for broader deployment of e-government systems by accommodating required deviations. Finally, the level of enforcement of formalized tasks and work processes provides a stronger prediction of attitudes toward formalization than the extent of formalization itself
		Organizational absorptive capacity	Organizational absorptive capacity is defined as an organization's capability to "absorb," through its prior related infrastructures to assimilate and use new IT (Cohen and Levinthal 1990, Tippins and Sohi 2003). Here, the related infrastructure refers to organizational prior internal IT knowledge structures, and organizational technological opportunism to attain e-government systems assimilation

influence of organizational meta-structure factors such that their importance in determining assimilation behavior increases with stronger organizational absorptive capacity. We offer a new research model and propose hypotheses concerning e-government system assimilation in an organizational context (see Fig. 3).

3.1. Top management leadership: a key role in all three organizational meta-structures

Information system innovations are resource-intensive and require substantial material and managerial resources (Chatterjee et al. 2002). E-government system assimilation involves managerial factors (Rai et al. 2006) and in general, top management leadership is an important factor (Chatterjee et al. 2002). Top management leadership informs cognition on the business needs of e-government systems through articulating the strategic context for e-government system deployment (Chatterjee et al. 2002, Liang et al. 2007, Rai et al. 2009). Top management leadership is a meta-structuring action because it defines institutional norms and values regarding how managers should engage in structuring actions related to the technology (Chatterjee et al. 2002). As a result, actions by top management can modify prevailing structures, introduce complementary structures to facilitate technology use, and reinforce norms that value the use of the technology (Kwon and Zmud 1987). In the context of e-government system assimilation, we suggest that top management leadership plays a key role in each of the three meta-structuring actions of signification, domination, and legitimization. By articulating a vision and establishing a strategic plan to fulfill the government mission of a digital future, top management can establish a context within which actions and behaviors related to e-government system assimilation assume meaning. Further, top management can legitimize e-government system assimilation by demonstrating their commitment and political support through participation in deployment initiatives.

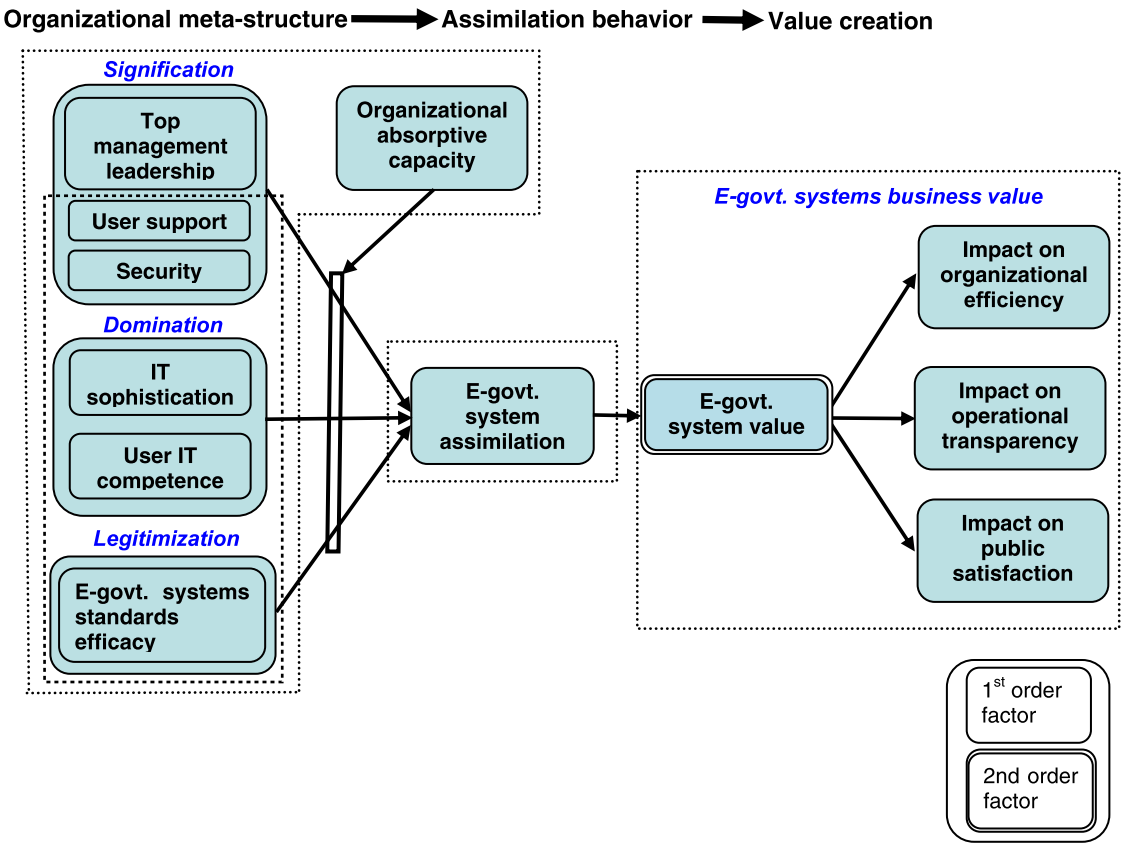

Fig. 3. Research model.

Finally, top management can regulate the pace of e-government system assimilation by establishing goals and targets for assimilation. Throughout the assimilation life cycle of e-government systems, if strong, continuous leadership backing from top management is not provided, it becomes difficult, if not impossible, for organizational members to see how e-government systems are related to the organization's mission and strategic goals, to allocate valuable resources to support e-government systems initiatives, and to overcome inertial routines and establish new ones to actually use e-government systems in daily work. We posit the following hypothesis:

Hypothesis 1 (*The Top Management Leadership Hypothesis*). Top management leadership has a positive effect on e-government system assimilation.

3.2. Meta-structure of signification: user support and security

The meta-structure of signification comprises interpretive schemes of standardized, shared stocks of knowledge that humans draw on to interpret behavior and events, thus achieving meaningful interactions (Orlikowski and Robey 1991). While top management articulates the strategic vision for e-government system deployment, user support from providers and security provide the relational and technological contexts for employees to interpret behaviors and events related to e-government system assimilation.

The role of user support in shaping the cognitions and behaviors of users has received significant attention and become an important dimension of IS success given the importance of user support in the organizational environment where customer service is crucial (DeLone and McLean 2003). User support is defined as perceptions about the technical support provided by IS service providers. User support is an attitude as well as an overall evaluation over the long-term, and properly implementing such service quality features may increase customer satisfaction (Parasuraman et al. 1988, Zeithaml 1988). As a result, the role of user support has become critical to the success of organizations (Landrum et al. 2007).

We expect that user support from the provider plays a key meta-structuring role in signification by shaping the cognitions, actions, and behaviors of users with respect to their day-to-day usage of e-government systems, as well as their limited and broader deployment of e-government system applications. This leads to the following hypothesis:

Hypothesis 2a (*The User Support from Providers Hypothesis*). User support from providers has a positive effect on e-government system assimilation.

Security in e-government systems refers to a set of interpretive schemes for users to structure and understand how sensitive information is protected by the system itself as well as during online communications and transactions. Security is a major concern for organizations that have an IS and internet-enabled transactions (Cooper et al. 1996). It is commonly believed that good security improves trust, and that perceptions of good security will ultimately increase the use of electronic commerce (Kim et al. 2010). A lack of security knowledge and awareness on the part of employees is a major problem from an organization's perspective. Numerous security risks, such as viruses, worms, denial-of-service attacks, stolen passwords, social engineering, and authority and authorization violations, result from a lack of security, and these risks are detrimental to the operation of an organization (Chen et al.

2006). A lack of security awareness can make an organization vulnerable to internal and external threats (Chen et al. 2006).

Security in our context refers to the degree to which e-government systems provide safeguards and protect users during government business processing (Rai et al. 2006). As such, secured e-government systems ensure a reduction of risks, and the deployment of countermeasures leads to greater use of e-government IS.

Thus, security is an important causal factor through which the meta-structure of signification operates. To the extent that organizations perceive e-government system processes to be safeguarded against key security concerns (Parker 2002), the forces of signification should result in greater levels of e-government system assimilation. This leads to the following hypothesis:

Hypothesis 2b (*The Security Hypothesis*). Security has a positive effect on e-government system assimilation.

3.3. Meta-structure of domination: IT sophistication and user IT competence

The meta-structure of domination is embedded in resource allocation, as resources are the means through which intentions are realized, goals are accomplished, and power is exercised (Orlikowski and Robey 1991). While top management leadership represents the political resources associated with e-government systems, IT sophistication and user IT competence together reflect attributes such as organizational readiness that represent technological and human resources. The assimilation of complex IS usually consumes significant resources (Rai et al. 2006).

IT sophistication is a salient phenomenon in the context of IT-based innovation behaviors and is concerned with the existing level of IS usage in the core part of an organization (Rai et al. 2006). In other words, IT sophistication refers to the extent to which an organization is using IT in value-adding ways. A sophisticated IT infrastructure enhances the ability and willingness of business managers to apply IT innovatively (Sambamurthy and Zmud 1996). Therefore, IT sophistication represents the organizational infrastructure of knowledge and information that an organization can use to support decisions and actions related to IS assimilation (Rai et al. 2006). Organizations with high IT sophistication possess superior corporate data resources, information management practices, and resources for the organizational integration of IT innovations (Chwelos et al. 2001). As a result, organizations with high IT sophistication should have the capacity to transform business processes using IS innovations.

User IT competence reflects human resources, especially end-users, who can legitimize IS and support actions related to proper utilization and integration with existing processes (Chwelos et al. 2001) as well as make enhancements during usage. Organizations with competent human resources possess employees with high levels of IS knowledge who can contribute to best information management practices. Therefore, IT sophistication and user IT competence together reflect organizational readiness, and are the key causal factors of the meta-structure of domination; this meta-structure reflects the organization's resources that can use to act on intentions, pursue goals, and exert power related to e-government system assimilation. This leads us to the following hypotheses:

Hypothesis 3a (*The IT Sophistication Hypothesis*). IT sophistication has a positive effect on e-government system assimilation.

Hypothesis 3b (*The User IT Competence Hypothesis*). User IT competence has a positive effect on e-government system assimilation.

3.4. Meta-structure of legitimization: e-government systems standards efficacy

The meta-structure of legitimization is defined by the norms or rules governing sanctioned or appropriate conduct. Process standards are formal rules or policies that govern conduct (Rai et al. 2009). Process standards for inter-organizational business can promote business-to-business integration (Bala and Venkatesh 2007). Gil-Garcia and Martinez-Moyano (2007) analyzed the dynamics of evolution of e-government. He found that public managers exerted pressure in an attempt to solve problems, and that citizens, businesses, and other stakeholders exerted pressure in an attempt to control the actions of the public managers. These forces, which are related to performance and accountability, promote changes in the system of rules governing the design, implementation, and use of e-government initiatives. In particular, they generate a cycle that continually increases technological and organizational sophistication in e-government initiatives and also promote the episodic and evolving adoption of similar features across different levels of government. Finally, these two related evolutionary dynamics and the characterization of e-government using a system of rules and standards have important policy implications (Gil-Garcia and Martinez-Moyano 2007).

E-government systems standards efficacy can be characterized by three components: (1) comprehensiveness, which is concerned with the scope of user requirements for the business process; this can be governed by process standards, (2) flexibility, which is concerned with the range of user behaviors in business processes; this can also be governed by process standards (Rai et al. 2006), (3) enforcement, which is concerned with the actions taken by actors of formalized procedures to ensure compliance; this could affect attitudes toward formalization (Kayworth and Sambamurthy 2000).

An organization, by adopting certain e-government systems standards to govern the e-government business process, indicates that these system standards should be used to execute tasks and that compliance to these system standards is the approved mode of action (Rai et al. 2006). The routines embodied within the system standards thus incorporate norms about the criteria and priorities for conducting tasks, as well as the logic by which tasks are related, which collectively comprise the meta-structure of legitimization (Rai et al. 2006).

To elaborate, comprehensiveness in standards allows these standards to act as coordination mechanisms, and facilitates the establishment of decision-making guidelines and common terms and languages, as well as the identification of responsibilities for tasks across entities (Brown and Sambamurthy 1998). Such standards for organizational business operations should facilitate the integration of processes and technology because they detail interdependent roles and actions (Kayworth and Sambamurthy 2000). Again, flexibility accommodates deviations from anticipated action. As IT infrastructures with flexible standards allow choices to be made from a set of options, flexibility of e-government system standards should extend the range of options that managers have available to adapt to their organization's needs (Kayworth and Sambamurthy 2000). Finally, sanctions are the most effective enforcement mechanism in the e-government context (Kayworth and Sambamurthy 2000). Sanctions refer to specific actions taken to correct deviations in the actions of employees from those prescribed by formalized procedures. Formalized procedures are likely to be ignored or reinterpreted, particularly if they are designed with a coercive logic without high levels of enforcement. In contrast, strictly enforced standards may facilitate higher levels of compliance even if they are designed to be coercive in nature.

Based on the above discussion, the comprehensiveness of an organization's IS culture, an organization's flexibility, and the level

of enforcement are captured by e-government systems standards efficacy, and collectively define the meta-structure of legitimization, which regulates actions and behaviors related to e-government system assimilation. Therefore, we expect that if e-government standards with the above-mentioned attributes are applied, the cognitions, actions, and behaviors related to e-government systems will be positively reinforced, thereby promoting e-government system assimilation. This leads to the following hypothesis:

Hypothesis 4 (*The E-Government Systems Standards Efficacy Hypothesis*). E-government systems standards efficacy has a positive effect on e-government system assimilation.

3.5. E-government system value

E-government system value is defined as the contribution of e-government systems to firm performance (Tallon et al. 2000). This is consistent with e-business value, which depends on the extent to which e-business is used in key activities in the organization's value chain (Zhu and Kraemer 2005). The greater the use of e-business, the more likely the firm is to develop unique capabilities from its core IS infrastructure (Zhu et al. 2004).

A comprehensive model developed by Mahmood and Soon (1991) to measure the potential impact of IT suggested that IT can help firms to improve performance along the value chain by having a positive effect on downstream dimensions (e.g., by offering better services), internal dimensions within the organization (e.g., enhancing internal process efficiency and employee productivity), and upstream dimensions (e.g., improving inter-organizational efficiency and coordination with customers). Following Mahmood and Soon (1991), Tallon et al. (2000) decomposed IT business value into downstream dimensions (sales support, customer services, and market expansions), internal dimensions (internal processes, internal operations, and staff productivity), and upstream dimensions (coordination with suppliers and business partners). Further, Zhu et al. (2006) extended these notions to the e-business environment. In sum, IS leads to value creation within an organization by improving operational efficiency, operational transparency, and public satisfaction, thereby improving organizational performance. The unique characteristics and the value creation of IS are significantly different from pre-internet technologies (Zhu and Kraemer 2005). Recently, Kim et al. (2009) found that the use of ubiquitous computing creates value by enhancing business operations, business processes, and customer satisfaction.

These prior studies motivated us to conceptualize the e-government system business value using three dimensions along the e-government value chain. The unique characteristics of e-government systems allowed us to link the three ways through which business processes may create value, such as impact on organizational efficiency, impact on operational transparency, and impact on public satisfaction. These three dimensions of the e-government system value are grounded in the value chain analysis of Porter (Porter 1985), which has been broadly used in the IS literature to study the business value of IT (Zhu and Kraemer 2005).

Given the increase in organizational efficiency, transparency, and improvements in public services that should result from e-government system assimilation, we posit that organizations with higher levels of e-government system assimilation will have a higher business value. This leads to the following hypothesis:

Hypothesis 5 (*The E-Government System Assimilation Value Hypothesis*). E-government system assimilation has a positive effect on e-government system value.

3.6. The moderating effects of organizational absorptive capacity

Organizational absorptive capacity is defined as the ability of an organization to absorb, assimilate, and use new IT through its prior related infrastructures (Cohen and Levinthal 1990, Tippins and Sohi 2003). In this context, the related infrastructure refers to organizational prior internal IT knowledge structures and technological opportunism. The ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. Cohen and Levinthal (1990) labeled this capability a firm's absorptive capacity and suggested that it is largely a function of the organization's level of prior related knowledge. In particular, prior related knowledge and diversity of managerial backgrounds could influence absorptive capacity at the organizational level (Tippins and Sohi 2003) as well as organizational technological opportunism, which reflects an organization's propensity to respond with agility to signals from the environment, thereby reflecting the organization's absorptive capacity (Srinivasan et al. 2002). The basis of the notion of absorptive capacity is that an organization needs prior related knowledge to assimilate and use new knowledge (Cohen and Levinthal 1990). In the e-government realm, certain aspects of the knowledge ability of the agents are partly manifest in the descriptions of the role that information systems have as components of the environment and the development decisions that are based on such descriptions (Meneklis and Douligeris 2010).

Organizations high in absorptive capacity have the ability, skills, and accumulated knowledge to acquire information about technological opportunities, to invest resources, to exploit resources, and to act proactively to innovate on a consistent basis (Srinivasan et al. 2002). Thus, the ability to assimilate information is a function of the richness of the preexisting knowledge structures. Tassabehji et al. (2007) also posited that there was a need to develop suitable organizational forms comprising both functional and technological specialists.

Organizational absorptive capacity is widely understood to enhance an organization's innovative capabilities (Liang et al. 2007). Again, assimilation can be greatly improved if organizations have prior knowledge that facilitates assimilation of external information and its application to commercial ends (Cohen and Levinthal 1990).

The theory of absorptive capacity also provide a strong basis from which to examine the nature and importance of information exchanges between IT managers, relationships within the firm, and partnerships within the firm (Boynton et al. 1994). Hence, a major component of an organization's absorptive capacity regarding e-government systems can be represented by the conjunction of IS-related and business-related knowledge possessed by and exchanged among IS managers and technical staff in an organizational business unit. Organizations with higher levels of absorptive capacity will tend to be more proactive, exploiting opportunities present in the environment, independent of current performance; in contrast, organizations that have a modest absorptive capacity will tend to be reactive, searching for new alternatives in response to failure.

Collectively, these research streams and the theoretical foundation of absorptive capacity itself suggest that knowledge structures are at the heart of an organization's ability to innovate and adapt to environmental change. It is precisely such knowledge and increased absorptive capacity that enriches the dialogue among IT managers and business units, facilitating innovative IT applications (Lind and Zmud 1991). Together, the diverse studies discussed above that support the theoretical arguments associated with absorptive capacity and its relationship with organization assimilation lead us to argue that organizational absorptive capacity moderates the influence of organizational meta-structure factors

such that the importance of absorptive capacity in determining assimilation behavior increases with stronger organizational absorptive capacity. This leads us to the following hypothesis:

Hypothesis 6 (*The Organizational Absorptive Capacity Moderation Hypothesis*). The relationship between the six identified factors of organizational meta-structures and e-government system assimilation are moderated by organizational absorptive capacity, such that the relationships are stronger for those factors that have stronger organizational absorptive capacity.

4. Methods

4.1. Instrument development

We used a survey method to test the developed model. All measures for constructs were developed through the successive stages of literature review, theoretical modeling, and refinement. All constructs and measures are listed in Appendix A. Because the targeted public organizations that have implemented the Agriculture Integrated Information Excellent System (AgriX) are in Korea, the English questionnaires were first translated into Korean and then a panel of experts in IS research examined the face validity of the items. Some modifications were made to the existing scales to make these more suitable in the context of AgriX assimilation into the public sector. Finally, we retranslated the questionnaires that we used to English. All questionnaire items used a five-point Likert scale, ranging from strongly disagree to strongly agree, except items 1 and 2 concerning e-government system assimilation, which solicited responses as a percentage.

4.2. Measures

4.2.1. Measures of e-government system value

Consistent with the theoretical arguments made earlier, we operationalized e-government system value as a second-order construct manifested in three related dimensions (Mahmood and Soon 1991, Porter 1985, Tallon et al. 2000, Zhu and Kraemer 2005, Zhu et al. 2004). These three related dimensions are impact on organizational efficiency (internal processes more efficient, customer service improved, staff productivity increased), impact on operational transparency (openness to customers improved, user participation in decision-making improved, and user participation in policy-making improved), and impact on public satisfaction (customer visit costs decreased, and coordination with business organizations or customers improved).

4.2.2. Measures of e-government system assimilation

Existing literature severed as a basis for the development of this scale. In particular, the three dimensions of ERP assimilation identified by Liang et al. (2007) together with the IS assimilation dimensions identified by Armstrong and Sambamurthy (1999) and Massetti and Zmud (1996) were used as a guide to construct a three-item scale. However, all four scale items in Massetti and Zmud could not be replicated because of the differing contexts of e-government systems assimilation versus EDI. The volume dimension was measured by asking respondents to indicate the percentage of a subset of business processes that were conducted using AgriX. Diversity in this context is the number of a firm's business functional areas automated by AgriX technology. To capture the general deployment of AgriX, depth was measured by asking the respondents to indicate the vertical impact of the AgriX system on their value chain activities ranging from planning to decision-making.

4.2.3. Measures of independent variables

These measures and their informing sources are shown in Appendix A. We pursued a multi-step process to obtain professional reviews of the survey instrument after the initial creation of the survey. We received feedback about the instructions, specific items used for constructs, and the clarity of the wording used for items. First, three faculty members with extensive experience in survey development examined the instrument. In the next stage, five government officers associated with AgriX inspected the survey to comment on the clarity of questions and instructions. Finally, 41 AgriX users from across Korea participated in the pilot study, and at each stage, we used the feedback to revise and refine the instrument.

4.3. Data collection

Our focus was the effects of organizational assimilation of e-government systems on value creation through e-government system contributions to innovation and performance of business processes at the organization level. To develop a suitable sampling frame, we chose employees of public organizations in Korea that have implemented AgriX. AgriX is an integrated information system for efficient management of agricultural investments and was financed by the Ministry of Agriculture and Forestry (MAF), Government of Korea. The main objectives of AgriX are to make business operations more innovative to increase the satisfaction levels of agriculture and forestry project clients (people working in agriculture, public service employees of municipal and district offices, and employees of MAF) and to reduce the workload of public service employees. AgriX has transformed multi-layered complex offline management of agriculture and forestry projects into an online web format, allowing farmers to submit applications for agriculture-related business without paper work (G2C) and helping government officials deal with a myriad of work, such as reviewing and choosing applications, financing, and reporting through an online system (G2B). Public service employees connect to the system through an electronic authentication process (public key infrastructure) and manage all the related tasks online and also monitor progress in real time. AgriX also acts as an internal system to fulfill the objective of reducing the number of tasks government officials have to perform.

The following is a summary of the major attributes of the system: (1) automatic input of detailed applicant information through linking to the Government for Citizen (G4C) system (AgriX is linked to the G4C Citizen Information Database of the Ministry of Government Administration and Home Affairs), (2) online qualification screening without the requirement for document submission; data sharing with other institutions means that agricultural land records, agricultural land ledgers, and land registers are available in real time, (3) fair financial execution through double-checking in advance; many agriculture and forestry projects are in progress simultaneously, and repeated application is automatically checked in time to block repeated benefits in advance, and (4) understanding of the real time progress of an application and printing of reports (the progress status of projects are available in real-time regardless of time and place). Hence, the status of a project or application can be reviewed easily through inputting related information into the system directly from the upper institutions or MAF. Consequently, transparency is assured and there is no need to make separate reports.

We sent survey questionnaires by e-mail to municipal, county, and district government officials who use AgriX, to cover a wide range of geographical and cultural diversity. These government officials were requested to complete the survey within 15 days and a reminder letter was emailed 10 days after the initial mailing. The risk of inaccuracy in survey responses due to memory-related

Table 2
Sample characteristics ($N = 367$).

Variable	Title	N	Percentage
Gender	Male	265	72
	Female	102	28
	Total	367	100
Age (years)	20–29	105	28.6
	30–39	142	38.7
	40–49	101	27.5
	50–59	19	5.2
	Total	367	100
Education level	High School or less	64	17.4
	College Graduate	45	12.3
	University Graduate	243	66.2
	Graduate School	15	4.1
	Total	367	100
Job experience (years)	5 or less	181	49.3
	6–10	23	6.3
	11–15	67	18.3
	16–20	57	15.5
	21–25	22	6.0
	26–30	16	4.4
	31 or more	1	0.3
	Total	367	100

issues was negligible, because employees in the agriculture office interact continuously with AgriX.

A total of 395 responses were received, representing a response rate of about 10%. This response rate is comparable to that reported for other survey studies of a similar type and scale (Chatterjee et al. 2002). A total of 367 responses were utilized for the analysis excluding 28 responses with missing values, which corresponds to a usable response rate of 92.9%. The characteristics of the sample are summarized in Table 2. The sample covers a wide geographical and cultural diversity and a broad range of organization sizes with different public requirements, and therefore is suitable to examine e-government system assimilation and its impacts.

4.4. Measurement, validity and bias issues

We assessed the research model in a holistic manner using partial least squares (PLS) with PLS-Graph version 3.00. PLS is better suited for explaining complex relationships in general, as it avoids two serious problems: inadmissible solutions and factor indeterminacy (Liang et al. 2007). The item product terms approach of PLS, as suggested by Chin et al. (2003), was used to test the moderating effect.

4.4.1. Measurement model: convergent validity

In Table 3, information about the loadings of the measures of our research model is presented. The reliability of coefficients was greater than 0.7, and each AVE was above 0.50, indicating that the measurements are reliable and that the latent construct can account for at least 50% of the variance in the items. As shown in Table 3, all the individual loadings were in an acceptable range and the *t*-values indicate that they were significant at the 0.01 level.

4.4.2. Measurement model: discriminant validity

Discriminant validity was verified with the squared root of the average variance extracted for each construct higher than the correlations between it and all other constructs. Table 4 shows that each construct shared greater variance with its own block of measures than with the constructs of different blocks of measures, demonstrating sufficient discriminant validity. Further, we constructed a cross-loadings table to assess the validity of our measurement instruments. Each item loading in the table was much higher for its assigned construct than for other constructs, supporting adequate convergent and discriminant validity. Therefore, our measurements satisfy the two criteria for discriminant validity.

4.4.3. Validity of the second-order construct

Model results for the second-order construct of e-government system value are shown in Table 5. The paths from the second-order construct to the three first-order factors were significant and of high magnitude, greater than the suggested cutoff of 0.7. Thus, the constructs developed by this measurement model are robust and can be used to test the conceptual model and the associated hypotheses proposed earlier.

4.4.4. Common method bias and non-response bias

One of the major concerns with self-reported data is the common method bias resulting from multiple sources such as the consistency motif and social desirability (Podsakoff et al. 2003). According to the suggestion of Podsakoff and Organ (1986), we attempted to enforce a procedural remedy by asking the respondent not to estimate e-government system assimilation outcome measures according to personal experience, but to get this information from minutes of organization meetings or documentation. Further, we statistically analyzed the severity of the common method bias. First, a Harmon one-factor test (Podsakoff and Organ 1986) was conducted to mitigate the threat of the common methods bias. We entered all independent variables and dependent variables in an exploratory factor analysis. The data would have a common methods bias problem if a single factor emerged that accounted for a large percentage of the variance in the resulting factors. However, a single factor did not emerge in our analyses and the first factor accounted for 14.2% of the total variance. All items retained in the factor analyses accounted for 72.5% of the total variance. These results indicate that our findings were not affected by common method bias.

Second, following Podsakoff et al. (2003), we included a common method factor in the PLS model. The average substantively explained variance of the indicators was 0.77, while the average method-based variance was 0.019. The ratio of substantive variance to method variance was about 41:1. Further, most method factor loadings were not significant. Given the small magnitude and insignificance of the method variance, we did not consider method bias to be a serious concern.

To evaluate non-response bias, respondents were classified into three groups, or waves, based on when they returned the survey. Analysis of variance (ANOVA) tests were used to evaluate if later respondents differed systematically from earlier respondents with regard to the number of employees in the public organization. This test revealed no significant non-response bias according to organization diversity or size.

4.5. Hypothesis test results

We next examined the significance and strength of each of our hypothesized effects; this analysis was done using two PLS models. The first model examined the main effects specified in Hypotheses 1–5, while the second model added the moderating effects stated in Hypothesis 6. The estimates obtained from PLS analysis of each phase, including standardized path coefficients, path significances, and variance explained (R^2 value) for each dependent variable, are presented in Fig. 4 and Table 6.

Fig. 4 shows the results obtained for the main effects model; all path coefficients were found to be significant, supporting all of the hypotheses. The model explains about 43.9% of the variance in e-government system assimilation and 30.8% of the variance in e-government system value, demonstrating that this model explains a good amount of the variance in e-government system assimilation and e-government system value, respectively.

Table 3
Reliability of constructs.

Constructs	Item	Loading	St. error	*t*-value	Cronbach's alpha	Composite reliability	AVE[a]
Top management leadership					0.949	0.967	0.907
	TML1	0.954	0.006	140.742			
	TML2	0.949	0.007	126.566			
	TML3	0.955	0.005	168.054			
User support					0.841	0.905	0.760
	UST 1	0.875	0.017	51.051			
	UST 2	0.866	0.017	50.418			
	UST 3	0.875	0.015	60.426			
Security					0.879	0.925	0.806
	SCT 1	0.940	0.008	116.077			
	SCT 2	0.906	0.011	78.093			
	SCT 3	0.844	0.019	42.493			
IT sophistication					0.832	0.884	0.605
	ITSop1	0.817	0.022	36.620			
	ITSop2	0.806	0.022	35.420			
	ITSop3	0.835	0.017	46.867			
	ITSop4	0.710	0.035	19.897			
	ITSop5	0.711	0.032	21.599			
User IT competence					0.870	0.912	0.722
	UsrITCp1	0.889	0.015	58.063			
	UsrITCp2	0.844	0.026	32.479			
	UsrITCp3	0.862	0.017	49.859			
	UsrITCp4	0.800	0.023	33.481			
E-government systems standards efficacy					0.833	0.891	0.674
	eGSdEfc1	0.878	0.011	74.173			
	eGSdEfc2	0.871	0.014	60.896			
	eGSdEfc3	0.822	0.021	38.914			
	eGSdEfc4	0.701	0.035	19.555			
Organizational absorptive capacity					0.747	0.841	0.569
	OrgAc1	0.774	0.029	26.710			
	OrgAc2	0.794	0.028	28.019			
	OrgAc3	0.732	0.033	21.613			
	OrgAc4	0.714	0.036	19.449			
E-government system assimilation					0.708	0.839	0.637
	eGassm1	0.849	0.017	47.672			
	eGassm2	0.816	0.019	42.706			
	eGassm3	0.721	0.032	22.356			
Impact on organizational efficiency					0.943	0.964	0.899
	ImOrgEf1	0.936	0.009	102.812			
	ImOrgEf2	0.951	0.007	121.186			
	ImOrgEf3	0.958	0.008	118.704			
Impact on operational transparency					0.897	0.936	0.831
	ImOpTp1	0.859	0.016	53.737			
	ImOpTp2	0.944	0.005	160.931			
	ImOpTp3	0.930	0.009	98.509			
Impact on public satisfaction					0.899	0.952	0.908
	ImpSat1	0.953	0.007	135.488			
	ImpSat2	0.953	0.007	135.488			

[a] Average variance extracted.

Table 4
Correlations among major constructs.

Constructs	TML	UST	SCT	ITSop	UsrITCp	eGSdEfc	OrgAc	eGassm	ImOrgEf	ImOpTp	ImpSat
TML	**0.952**										
UST	0.353	**0.872**									
SCT	0.441	0.657	**0.898**								
ITSop	0.656	0.554	0.610	**0.778**							
UsrITCp	0.228	0.146	0.232	0.365	**0.850**						
eGSdEfc	0.315	0.631	0.578	0.486	0.197	**0.821**					
OrgAc	0.351	0.301	0.287	0.410	0.286	0.201	**0.754**				
eGassm	0.453	0.497	0.530	0.550	0.281	0.462	0.309	**0.798**			
ImOrgEf	0.352	0.450	0.439	0.445	0.119	0.360	0.233	0.379	**0.948**		
ImOpTp	0.410	0.687	0.690	0.620	0.204	0.587	0.281	0.503	0.598	**0.912**	
ImpSat	0.312	0.554	0.523	0.524	0.206	0.527	0.221	0.476	0.516	0.662	**n/a**

Diagonal bold elements are the square root of AVE, and triangular elements are the construct correlations.

Table 5
Measurement model: second-order construct of e-government system value.

Second-order construct	First order constructs	Loadings	*t*-statistic	Composite reliability	AVE	Target coefficient (*t*-ratio)
E-government system value	ImOrgEf	0.850*	–	0.935	0.642	0.92
	ImOpTp	0.893[a]	68.22			
	ImpSat	0.814[a]	43.30			

[a] Path significance: $p < 0.01$.
* The loadings are specified as fixed to make the model identified.

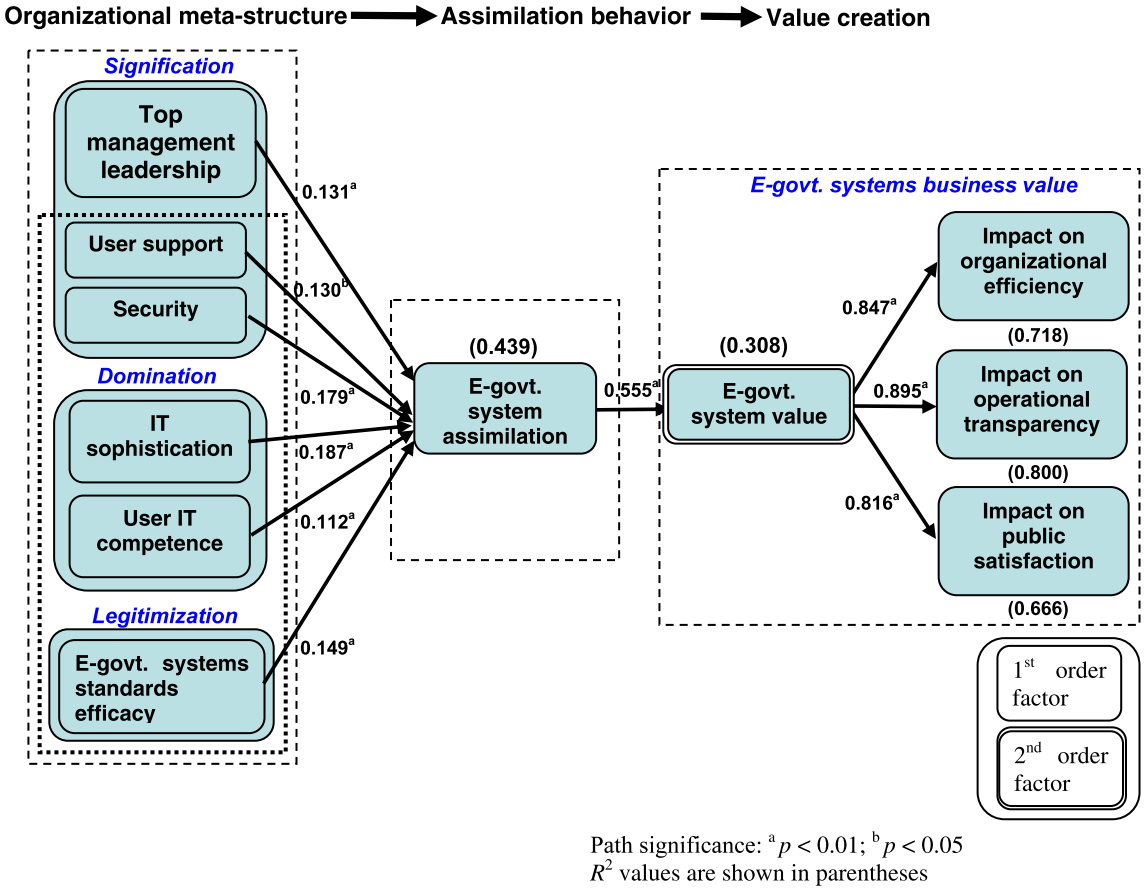

Fig. 4. PLS analysis of main effects.

Table 6
PLS analysis of moderating effects.

Interaction terms	Path coefficient	*t*-Statistic	Support
Top management leadership × organizational absorptive capacity	0.934	1.695[a]	Moderated
User support × organizational absorptive capacity	−0.502	0.782	NS
Security × organizational absorptive capacity	0.656	0.957	NS
IT sophistication × organizational absorptive capacity	−0.212	0.270	NS
User IT competence × organizational absorptive capacity	−0.395	1.022	NS
E-government systems standards efficacy × organizational absorptive capacity	0.964	1.718[a]	Moderated

NS = not significant.
[a] Path significance: $p < 0.05$.

Top management leadership, which plays a key role in all three organizational meta-structures, had a strong and significant effect on e-government system assimilation, thereby supporting the Top Management Leadership Hypothesis (H1). User support and security both had significant effects on e-government system assimilation, demonstrating support for the User Support from Providers Hypothesis (H2a) and the Security Hypothesis (H2b), respectively. IT sophistication and user IT competence both had a significant effect on e-government system assimilation, supporting the IT Sophistication Hypothesis (H3a) and the User IT Competence Hypothesis (H3b), respectively.

E-government systems standards efficacy had a significant effect on e-government systems assimilation, demonstrating support for the E-Government Systems Standards Efficacy Hypothesis (H4). Finally, e-government system value was influenced significantly by e-government system assimilation as expected, demonstrating

support for the E-Government System Assimilation Value Hypothesis (H5). Collectively, the above results demonstrate that the organizational meta-structures of signification, domination, and legitimization determine organizational e-government system assimilation behaviors that affect the value creation potential of e-government systems.

Moderating effects were tested to evaluate the extent to which organizational absorptive capacity moderates the main effects (see Table 6). Following Chin et al. (2003), the interaction terms were modeled in PLS as products of each item belonging to the underlying scales and added to the main effects model in Fig. 4. The main effects of the moderating constructs on e-government systems assimilation were also included in this model to statistically separate the hypothesized moderating effects from all statistically possible main effects. *F*-tests comparing the R^2 values for each dependent variable between the nested main and moderating effects models found the increase in explanatory power to be statistically significant at $p < 0.01$ for e-government system assimilation. This confirmed our expectation that the hypothesized moderating effects would provide a superior explanation of e-government system assimilation over and above their corresponding main effects.

5. Discussion

To understand the factors that determine the effects of organizational e-government system assimilation on business value creation and the moderating role of organizational absorptive capacity on the relationship between organizational meta-structures and e-government system assimilation, we empirically tested a model that we developed based on structuration theory. Our research model extends current structuration theory by conceptualizing e-government system notions in public organizations. Empirical analyses demonstrated several key findings, which are discussed below.

5.1. Factors influencing organizational e-government system assimilation

Our results suggest that top management leadership, user support, security, IT sophistication, user IT competence, and e-government systems standards efficacy influence organizational e-government system assimilation. Therefore, it can reasonably be concluded that these factors are important antecedents of e-government system assimilation with regard to value creation. Further, our results show significant interaction effects between organizational absorptive capacity, top management leadership, and e-government systems standards efficacy, indicating that these should be included as moderating factors.

Our findings indicate that the beliefs of top management play a crucial role in promoting e-government system assimilation. If top management believes in e-government system innovations and communicates a clear vision about the organizational role of e-government, a strong signal is sent to employees to evaluate, implement, and utilize these systems. Top management leadership also provides essential political resources to overcome resistance that typically accompanies organizational innovation (Howell and Higgins 1990). E-government system users and associates can exhibit inertia due to their entrenchment in legacy practices and in political and social influence networks. In effect, clear visioning and strategizing by top management not only legitimizes the use of e-government systems, but also establishes their significance. Furthermore, to the extent that top management calibrates the goals of an organization, actions and initiatives related to e-government system assimilation are regulated.

Thus, by shaping the structures for signification, legitimization, and domination, top management support has a significant effect on e-government system assimilation. This influence mechanism shapes the business value of e-government systems by modifying key perceptions salient to its business value, such as assimilation behavior. Further, our results confirm that the influence route is moderated by organizational absorptive capacity, signifying that organizations with higher absorptive capacities tend to be more influenced by the leadership of top management. In other words, as organizational absorptive capacity increases, the influence of top management leadership on assimilation behavior increases. Rai et al. (2009) found that top management support, a causal factor for the meta-structures of signification, domination, and legitimization, is important for electronic procurement innovation assimilation and the consequent increase in procurement productivity (Rai et al. 2009). The results of this study extend our understanding of the assimilation of e-government systems in public organizations and highlight the moderating role played by organizational absorptive capacity.

The role of user support in shaping user cognitions and behaviors has received significant attention and become an important dimension of IS success (DeLone and McLean 2003). We extend this finding by arguing that user support is crucial for the success of e-government system assimilation. Our results showed a significant positive relationship between user support and assimilation. Further, this relationship was not moderated by organizational absorptive capacity. The possible cause of this finding may be that organizations with higher capacity are less dependent on user support. This explanation is consistent with the fact that the main effect is also weakly significant compared to other variables. However, additional empirical investigation is needed to investigate this relationship comprehensively.

The significant positive relationship between security and e-government system assimilation reflects security concerns when assimilating e-government systems. However, this relationship is not moderated by organizational absorptive capacity. The possible cause of this may be that organizations with higher capacity are less dependent on users' security concerns. We acknowledge that additional empirical investigations are needed to elucidate this relationship.

We found evidence of a positive relationship between IT sophistication and e-government system assimilation, signifying that sophisticated IT resources are key for successful e-government system assimilation. The positive relationship between user IT competence and e-government system assimilation indicates that organizations with highly competent human resources have employees with high levels of IT knowledge who can provide best information management practices. Therefore, IT sophistication and user IT competence together reflect organizational readiness and are key causal factors of the meta-structure of domination, suggesting that IT infrastructure and end-user IT expert resources are critical to infuse business processes into the work routines of public professionals. Further, our results confirm that the influence route between IT sophistication and e-government system assimilation is not moderated by organizational absorptive capacity. This may be due to the fact that the simplicity of user IT competence contributes little to higher absorptive capacity. Further empirical investigation is required to define this relationship.

We found that e-government systems standards efficacy is an important antecedent of e-government system assimilation. Standards embody rules on how e-government systems should be used and establish institutional structures to regulate individual actions and behaviors related to the business process. If e-government system standards are comprehensive, provide flexibility, and enact a good level of enforcement to ensure compliance for day-to-day operations, they not only increase efficiency but also reduce

complexity and uncertainty without establishing rigidity. In effect, they structure actions and regulate the behaviors of individuals involved in business processes to favor e-government system assimilation. These results are consistent with the findings of previous studies, particularly those of Rai et al. (2006), Brown and Sambamurthy (1998) and Kayworth and Sambamurthy (2000). The significant interaction effects of e-government system standards and organizational absorptive capacity on e-government system assimilation show that the established institutional structures of signification regulation actions and behaviors related to the business process and that these structures of signification are extremely important when organizational absorptive are high. In other words, the influence of e-government systems standards efficacy on determining value creation by e-government system assimilation increases with stronger organizational absorptive capacity.

5.2. The effect of e-government system assimilation on business value creation

We found that e-government system assimilation had a significant effect on business value creation. In previous studies, some scholars reported that e-business value depends on the extent to which IS is used in the key activities of an organization's value chain (Zhu and Kraemer 2005). In other words, the greater the use of IS, the more likely the firm is to develop unique capabilities from its core IS infrastructure (Zhu et al. 2004). We extended this literature to the e-government systems value context, arguing that the value of IS depends on the extent to which e-government systems have been assimilated in an organization.

In summary, our major conclusions are that the meta-structures of signification, legitimization, and domination operate through organizational, inter-organizational, and technological factors to influence the assimilation of e-government systems. All three meta-structures operate through top management leadership to impact e-government system assimilation. The meta-structure of signification operates through user support and security to promote the general deployment of e-government system assimilation. The meta-structure of domination, operating through IT sophistication and user IT competence, reflects organizational readiness, which is important in e-government system assimilation. The meta-structure of legitimization, operating through e-government system standards, appears to be influential in facilitating the deployment and adoption of IS. These results are consistent with other studies that reported that the meta-structures of signification, legitimization, and domination play an important role across all IT innovations and are important for assimilation (Rai et al. 2009).

6. Conclusion

We developed and tested an organizational e-government system assimilation model grounded upon structuration theory and the extant literature on organizational IS assimilation. We attempted to explicate what organizational, technical, and inter-organizational factors shape e-government system assimilation, and in turn, define the impact of e-government system assimilation on business value creation. Our theoretical framework reconciled the independent contributions of two streams in the literature: structuration theory on IT assimilation and the effect of IS assimilation on value creation. This research extends and enriches the extant literature on IS assimilation through the inclusion of e-government systems, thereby providing important new insights into e-government system assimilation. We identified three meta-structures and the six factors through which they operate that play a significant role in e-government system assimilation.

6.1. Theoretical contributions

Given the strategic potential of e-government systems for government business innovation, we investigated the effect of organizational assimilation of e-government systems on value creation. We identified a parsimonious set of factors for the meta-structures of signification, legitimization, and domination and examined their impacts on e-government system assimilation. Our study makes the following theoretical contributions.

First, this research extends and enriches the extant literature on IS assimilation through the inclusion of e-government systems, thereby providing important new insights into e-government system assimilation. We mapped the meta-structures of signification, legitimization, and domination to a set of organizational, inter-organizational, and technical factors that we identified through an extensive review of the organizational IS assimilation literature in the e-government context. We found that each of the three meta-structures, and then identified six factors through which they operate, play a significant role in e-government system assimilation.

Second, we investigated the business value of assimilating e-government systems. Our results suggest that e-government system assimilation has a strong relationship with and accounts for a large proportion of business value creation. Therefore, this study contributes to the IS business value literature by providing empirical evidence about the impact of organizational e-government system assimilation on business value creation. While academics have studied assimilation and value creation mostly in the e-business area (Zhu et al. 2003, 2006), we extended these notions to the e-government systems context.

Finally, we made a detailed exposition of structuration theory and illustrated its application to the problem of e-government system assimilation in the organizational context. Although a few prior structuration-based studies have applied this theory, ours is one of the few studies to apply this theory to e-government system assimilation.

6.2. Managerial implications

This research has significant implications for management, especially in the context of IT implementation within public organizations. Governments often invest millions of dollars in new IT with the goal of generating long-term organizational benefits. Nevertheless, such investments are wasted if top management cannot influence organizational users to accept the implemented systems in their everyday work processes. The top management of government organizations can benefit from knowing the structures and factors through which e-government system assimilation processes operate and under what circumstances these processes are likely to succeed or fail. This research offers a useful framework for public managers to assess the organizational, technological, and inter-organizational factors that shape the meta-structures that impact the assimilation of e-government systems. We recommend that public managers should formulate their organization's e-government system assimilation strategy through process changes, technology integration, and personnel training.

Second, top management leadership can support e-government system assimilation by signifying why the change is being undertaken and how it maps to the overall government business strategy and by exerting dominance to overcome inertial forces, thereby legitimizing the use of e-government systems in place of traditional approaches. Moreover, IT sophistication and user IT competence both provide essential resources that can be applied to direct assimilation and overcome resistance and inertia. Finally, practicing public mangers can legitimize assimilation by enforcing a complete set of flexible standards to improve organizational efficiency,

operational transparency, and public satisfaction, thereby enhancing the business value of e-government systems.

Third, our results indicate that both organizational absorptive capacity and the six organizational meta-structure factors are related to e-government system assimilation, hence top management in organizations need to consider their joint impacts. This implies that organizational e-government system assimilation and hence the potential value of IS investment could be affected by both organizational meta-structures and absorptive capacity. The absorptive capacities of an organization condition the effects of organizational meta-structure factors on the use of e-government systems. In particular, organizational capacity levers can be used to effectively manage the meta-structures of signification and legitimization. The significant moderating effect of organizational absorptive capacity points to the need to develop a mosaic of IT-related knowledge in the IT managers and other technical staff, which can be achieved by providing training. Furthermore, the significant moderating effect of organizational absorptive capacity points to the need to develop an organizational culture that views environmental scanning as an important activity and creates incentives to support it.

Finally, our study also has implications for government policymakers. The meta-structures of signification, domination, and legitimization operate through top management leadership reports as a driving force in obtaining e-government system value. This structuration of the dynamic nature of leadership allows decision-makers in government agencies to correct their current operations and develop strategies to address problems and focus on the creation of leadership in the organization. Furthermore, the meta-structure of legitimization that operates through e-government systems standards efficacy emerged as an important factor shaping e-government system assimilation. Government organizations should follow IS standards embodying rules on how IS should be used in organizational business processes. This indicates the need to establish comprehensive, flexible standards, and enforce these standards in an institutional context to support e-government system assimilation and value creation. Governments could potentially accelerate e-government system assimilation by establishing required e-government system standards and laws.

6.3. Limitations and future research

It is important to examine some of the limitations of our approach. In our study, self-reported data were collected, which raises the issue that the common method bias may have affected our results (Podsakoff et al. 2003, Podsakoff and Organ 1986). We enforced a procedural remedy and performed statistical analyses to assess the severity of the common method bias. Our results assured us that a common method bias was not a serious concern in our study. We acknowledge, however, that we did not cross-check the respondents' data with managers. Also, given the constraints on time, cost, and other resources, we did not collect data from customers. Future research should investigate survey responses from both government employees and farmers to validate our findings.

There are some limitations to the sampling approach that we used. Our study utilized a cross-sectional survey design. While this design is suitable to address the questions that we were interested in, a longitudinal research study on e-government system assimilation can generate insights into how different structuration factors change and interact over time, and the effect of these changes on e-government system assimilation. Future studies that adopt a different sampling strategy will be useful to validate our findings.

We focused on governmental organizations because our goal was to examine the role of e-government system assimilation on value creation in an organizational context. Future research should extend the investigation to a greater diversity of organizations to determine the generalizability of our findings. In addition, future research should also examine how the business value contributed by e-government systems is affected by economies of scale and market characteristics. Again, the interaction between user IT competence and e-government system assimilation is not moderated by organizational absorptive capacity. We hypothesize that user psychological traits may impact performance in terms of quality customer service, and urge further investigation of the role of user psychological traits on e-government system assimilation. The generalizability of our findings beyond e-government system assimilation need to be empirically verified, although we predict that the results will be similar for other innovation contexts in terms of the benefits, threats and adjustments required for assimilation of new technologies.

Our theoretical perspective and managerial findings will stimulate researchers to investigate e-government systems in a wide variety of settings using multiple streams of literature to build a cumulative body of evidence that can advance knowledge about organizational assimilation and have significant practical implications for how organizations should manage the assimilation of e-government systems to streamline their business processes.

Appendix A. Questionnaire items used for the study constructs

All items solicited responses on a five-point Likert scale with 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree, with the exception of items 1 and 2 of the e-government system assimilation, which solicited responses on a percentage basis.

Top management leadership (Chatterjee et al. 2002, Liang et al. 2007, Rai et al. 2006)

1. The top management of our organization actively articulates a vision for our organizational use of AgriX.
2. The top management of our organization actively participates in formulating a strategy for organizational use of AgriX.
3. The top management of our organization actively participates in establishing goals and standards to monitor AgriX.

User support (DeLone and McLean 2003, Parasuraman and Zeithaml 1988)

1. When our service provider promises to do something by a certain time, it does so.
2. Service providers provide prompt services to users.
3. Service providers provide individual attention to users.

Security (Rai and Tang 2006)

1. I feel comfortable with the security that AgriX provides to conduct transactions.
2. I feel comfortable that legal structures adequately protect me from problems regarding business operations.
3. In general, AgriX provides a safe environment in which to transact business.

IT sophistication (Armstrong and Sambamurthy 1999, Chwelos and Benbasat 2001)

In my organization, AgriX is important for the fulfillment of the following objectives:

1. Operational cost reductions
2. Improved quality of decision-making

3. Improved service to customers
4. Productivity improvements
5. Improved access to information

User IT competence (Boynton and Zmud 1994, Tippins and Sohi 2003)

1. I have the knowledge to develop and maintain computer-based communication links with our customers.
2. I am knowledgeable about new computer-based innovations.
3. When I use the Internet, I feel it is really easy to use.
4. I am confident to use credit card transactions.

E-government systems standards efficacy (DeLone and McLean 2003, Rai et al. 2006)

1. The e-government business standards for AgriX in our organization for business operations are more or less comprehensive in comparison to other organizations.
2. The e-government business standards for AgriX in our organization address the full spectrum of relevant IS business standards issues.
3. The e-government business standards for AgriX in our organization are typically flexible in how IT can be used.
4. Typically, our organization commonly takes some form of action against those who knowingly fail to comply with e-government business standards for AgriX.

Organizational absorptive capacity (Boynton et al. 1994, Liang et al. 2007, Tippins et al. 2003)

1. Our IS management team is well informed about the business operations of each unit.
2. Our technical support staff is knowledgeable when it comes to AgriX.
3. Our organization actively seeks information on technological changes that are likely to affect our business.
4. Our organization generally responds quickly to technological changes.

E-government system assimilation (Armstrong and Sambamurthy 1999, Fichman and Kemerer 1999, Liang et al. 2007, Massetti and Zmud 1996)

1. Percentage of the organization's business processes that use the AgriX system (%)
2. What percentage of your office hours are spent doing different business functions using AgriX?
3. Our organization uses AgriX systems for its value chain activities ranging from planning to decision-making to meet the organizational business vision.

A.1. E-government system value

Impact on organizational efficiency (Tallon et al. 2000, Zhu and Kraemer 2005, Zhu et al. 2004, 2006)

Comparing before and after the implementation of AgriX, the following objectives were achieved:

1. Internal processes more efficient.
2. Customer service improved.
3. Staff productivity increased.

Impact on operational transparency (Tallon et al. 2000, Zhu and Kraemer 2005, Zhu et al. 2004, 2006)

Comparing before and after the implementation of AgriX, the following objectives were achieved:

1. Openness to customers improved.
2. User participation in decision-making improved.
3. User participation in policy-making improved.

Impact on public satisfaction (Tallon et al., 2000, Zhu and Kraemer 2005, Zhu et al. 2004, 2006)

Comparing before and after the implementation of AgriX, the following objectives were achieved:

1. Customer visit costs decreased.
2. Coordination with business organizations or customers improved.

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