Initial Adoption Versus Institutionalization of E-Procurement in Construction Firms: An Empirical Investigation in Vietnam

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Initial Adoption Versus Institutionalization of E-Procurement in Construction Firms: An Empirical Investigation in Vietnam

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This study explores the factors that impact the initial adoption and institutionalization of e-procurement in construction firms in developing countries. It proposes a research model based on an interaction perspective that is a combination of the technology-organization-environment (TOE) framework and the theory of reasoned action (TRA). Data collected from 112 construction businesses in Hanoi, Vietnam in 2012 were analyzed using partial least square-structural equation modeling (PLS-SEM). The findings show that the government plays an extremely important role in decision-making of both initial adoption and institutionalization of e-procurement in individual construction enterprises. Furthermore, the determinants of initial adoption of e-procurement are very different from those of institutionalization of the technology. The experience of the initial adoption of e-procurement is found not to have any significant effect on the decision of subsequent implementation of the technology. Theoretical implications, practical implications, and limitations of the research are discussed and suggestions for future research are made.

Keywords: Construction Enterprises, Developing Country, E-Procurement, Initial Adoption, Institutionalization, Vietnam

INTRODUCTION

E-procurement is referred to as an advantageous method of procurement of goods, works, and services based on electronic tools, especially the internet, to alter the activities of purchasing; and transforms the purchasing process from a tactical into a strategic activity. The process of e-procurement adoption is progressively iterative and multi-phased, which reflects the evolution in planning, organization, control, and integration of information technology (IT) systems (Niederman, Branchseau, & Wetherbe, 1991). It can be said that the evolution of the strategic role of a specific e-procurement is closely linked to its sophistication. Literature consistently

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Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/ugit.
demonstrates that in order to gain full benefits and maximize potential advantages from the technology, companies must adopt and implement the technology toward a highly sophisticated level in terms of management, functions, and usage (Tran & Huang, 2014).

For the construction industry (CI), in both developing and developed countries, the diffusion and adoption of e-procurement is far below expectations. The implementation of the technology in the sector is lagging behind in scope, degree, and effectiveness as compared to other engineering sectors. Most construction companies adopted the technology only at a very simple level but not an integrated level (Raymond, Flood, & Treffinger, 2008). Take Vietnam as an example; after nearly 10 years of the e-commerce infrastructure development under the master plans by the government, most construction enterprises are still at the first stage of adoption of internet-based B2B e-commerce and e-procurement. The diffusion and the rate of the sophisticated implementation are actually very low and do not match with the remarkable development of the e-business infrastructure (VECITA, 2008; Tran, Vo, & Nguyen, 2011). The low adoption and sophistication rate is a critical issue, since procurement activities account for 40–50% of the cost of all construction and construction expenditure are more than 40% of the GDP (Pham, 2008). In this light, studying the factors that speed up construction companies to move from initial adoption to institutionalization of e-procurement is an important consideration from the perspective of understanding and improving construction e-procurement.

The existing literature significantly improves our understanding of general e-commerce adoption; however, several gaps can be identified. First, although e-commerce adoption is a complex, progressive, and multi-phase process, the majority of previous empirical studies considers adoption as a single decision rather than considering a process-oriented view (e.g., Le, Rowe, Truex, & Huynh, 2012; Teo, Lin, & Lai, 2009). Studies mostly focus on the adoption versus non-adoption decisions and very little attention is paid on the sophistication of the adoption and the post-adoption experiences, such as Molla and Licker (2005), and Saprikis (2013). For instance, with the same level of resources and the same environment, some firms have implemented more sophisticatedly e-procurement applications while others have not. Several enterprises have adopted simple e-procurement innovations and even though they have ample resources, they have not made any subsequent implementations (Ng Kim, 2005). Second, there is a lack of empirical evidence on the institutionalization of e-commerce technologies in developing countries. Innovation adoption and diffusion theories were developed in the context of developed countries; they need to be re-examined in the context of developing countries. These countries are unique in terms of economic, IT infrastructure (ITI), and regulatory conditions. In developing countries, the essential role of institutions such as government has yet to be appropriately determined; research is necessary to identify their interventions on institutionalization of e-commerce technologies. The present study was pursued to contribute to this effort by studying e-procurement adoption and sophistication in the context of Vietnam—a developing economy. Third, a specific review of 2000–2013 e-procurement literature was conducted and it showed that most studies on e-procurement adoption tend to examine manufacturing and service businesses in developed countries (Tran & Huang, 2014). Obviously, their findings cannot be generalized to construction enterprises. The CIs basic characteristics, such as fragmentation in terms of geography, relationships, and information are likely to influence the initial adoption and institutionalization propensity of e-procurement.

Thus, the purpose of our study is twofold: (1) it seeks to fill the void in research on determinants of e-procurement initial adoption (ePIA) and institutionalization in construction
firms in the developing country context; and (2) it seeks to understand the determinants of e-procurement adoption in construction businesses in the specific context of Vietnam. To address these objectives, we developed a conceptual model based on the interactionism perspective that is a combination of the TOE framework and the TRA. We tested the model using survey data collected from 112 construction companies in Hanoi, Vietnam. Data analysis was performed by SEM using the PLS approach.

THE VIETNAMESE CONTEXT—A TRANSITION ECONOMY

E-Commerce in Vietnam

Vietnam is a social-oriented market economy with the fastest development of its IT industry in south-east Asia in recent years. As an integral part of overall economic planning, the Vietnam government has made a strong commitment to e-commerce through a series of national IT plans and programs, especially the two five-year master plans on national e-commerce development for the periods 2006–2010 and 2011–2015 in order to encourage diffusion of IT and e-commerce in both the public and private sectors. To date, many e-government initiatives have been developed, such as the website on public procurement at http://dauthau.mpi.gov.vn, the system of electronic certificate of origin issuance, the system of electronic tax declaration and clearance, and the electronic public procurement pilot system. In the private sector, many enterprises have their own websites to introduce products, services, provide basic company information, and facilitate online sales. Many Vietnamese companies are well aware of the importance of e-commerce in their business and are willing to develop e-commerce to a higher level (VECITA, 2008). Online payment activities are adopted by businesses and people (Le et al., 2012). There have been many e-platforms established, such as Goods Online, and WorldTradeB2B. The e-commerce environment has been improving significantly in terms of ITI, institutional management, and organizational culture.

However, challenges exist. First, the role of the government is contradictory as it is simultaneously supportive and limiting of e-commerce activities. In many cases, the role of the state is restrictive because it tries to control things rather than provide incentives. Second, there have been slackness, ineffectiveness, and lack of IT knowledge of government officials, especially in the adoption of e-commerce. Third, the level and demand for technological innovation are very low. The average expenditure of small and medium enterprises (SMEs) for technological innovation is only 0.2–0.3% of total revenue (Ling, Pham, & Hoang, 2009). Fourth, many firms do not have the capability to adopt new technology due to inadequate labor force, lack of finance, and low managerial skills. Finally, Vietnam lacks an effective legal and regulatory system to manage and guide e-commerce, especially in the areas of taxation, customer protection, intellectual property rights, and e-payment (VECITA, 2008).

Construction Industry (CI) in Vietnam

The Vietnamese CI plays an important role in socio-economic development. Its market structure consists of 41% joint-stock or joint-venture companies, 22% state-owned enterprises (SOEs), and 37% private companies. However, its domestic market is mainly controlled and oriented by
state-owned, large and medium firms, who tend to operate independently and have a priority in terms of the state’s policies related to special credit loans, tax incentives, training assistance, importing equipment, and transferring technologies (Le-Hoai, Lee, & Son, 2009). The industry is criticized as being complicated with burdensome procedures and lacking effectiveness and competitiveness. Most construction firms are SMEs lacking experience and knowledge in complex projects, project management, and financial capability (Ling et al., 2009).

The business culture is also very different from that in developed countries. Inertia and directive working style are still existing in the sector (Le-Hoai et al., 2009). As a result, Vietnamese managers tend to be inflexible and not willing to take risks. The work culture is considered as one of two key influencing factors for competitive advantage in Vietnamese construction firms (Nguyen, Neck, & Nguyen, 2009). With a few exceptions, Vietnamese construction enterprises have only adopted simple e-commerce technologies but not institutionalized the technologies, often due to lack of resources, business culture, and management style (Le et al., 2012). These issues indicate the need for a supporting role from the government and financial institutions to encourage enterprises in adopting e-commerce.

THEORETICAL BACKGROUND

Literature Review

Theories of the adoption of innovation promote four dominant perspectives: managerial, organizational, technological, and environmental imperatives. The technological imperative considers the complexity, compatibility, relative advantage, ease of use, usefulness, and other attributes as key drivers of adoption (Rogers, 1995). The managerial imperative seeks to explain innovation adoption based on the innovativeness attributes of managers, their commitment to the innovation, and IT background (Thong, 1999). The organizational imperative asserts that the internal context of an organization is a key determinant in adoption. It considers specification, functional differentiation, formalization, centralization, readiness, risk-taking propensity, and innovativeness as major factors in adoption (Tornatzky & Fleischer, 1990; Goode & Stevens, 2000). The environmental imperative focuses on external factors, such as government commitment, legal system, pressure of competitors, requirement of partners, institutional forces, and socio-economic factors (Fishbein & Ajzen, 1975). Several studies are based on the interactionism approach that considers all four perspectives and their interaction in a dynamic and unified framework (e.g., Molla & Licker, 2005; Le et al., 2012; Scupola, 2012).

The Extended TOE Framework

A review of the literature reveals the explanatory power of the TOE framework that is based on the interaction perspective. The TOE framework identifies three aspects of a firm that may co-influence the adoption of an innovation (Tornatzky & Fleischer, 1990). These include (1) the environmental context in which a firm operates (related to its industry, competitors, partners, customers, and government); (2) the organizational context (e.g., scope, size, resources); and (3) the technological context that describes both existing and new technologies.
Because the business culture and managerial style of Vietnamese managers are unique and very different from managers in a developed economy, the managerial context (i.e., managers’ characteristics, innovativeness, knowledge of IT) needs to be paid attention in studying the adoption of e-commerce technologies. Therefore, in our study, we use the extended-TOE framework which additionally includes the managerial context.

The TRA

The TRA was developed in an attempt to explain individuals’ behavior through the impact of attitude (Fishbein & Ajzen, 1975). According to TRA, the most important determinant of an individual’s behavior is behavioral intention. Intention is an indicator of a person’s readiness to perform certain behavior and it is considered to be the immediate antecedent of behavior. Behavioral intentions are influenced by personal or attitudinal factors and social or normative factors. Furthermore, a specific behavior toward an object is usually determined by the person’s attitudes and subjective norms (SNs) related to the performance of that behavior rather than by the person’s attitudes toward that object itself. Based on these premises: (1) instead of investigating determinants of decision-making of e-procurement institutionalization, we investigate determinants of an enterprise’s intention to institutionalize e-procurement, and (2) instead of an enterprise’s attitudes and SNs concerning e-procurement itself, their attitudes and SNs concerning institutionalizing e-procurement are key considerations.

THE RESEARCH MODEL

There are two related research questions: (1) What factors influence the initial adoption of e-procurement in construction businesses in the developing countries’ context? and (2) What variables influence the intentions (or propensity) to institutionalize e-procurement in construction businesses in the developing countries’ context? Especially, does initial adoption experience have significant effects on the institutionalization propensity of e-procurement? The first question is concerned with whether a construction enterprise is using e-procurement at the very simple level, and the second question is in relation to why some construction firms implement more sophisticated e-procurement systems than others.

The Conceptual Model

Based on the literature, an integrated model of e-procurement adoption specifically for construction firms in developing countries’ context was developed (Figure 1).

The dependent variable is adoption of e-procurement. For better understanding of adoption, we pay specific attention to two key variables: initial adoption and institutionalization propensity. While initial adoption is an early stage of the adoption process where enterprises only implement e-procurement innovations at the simplest level, institutionalization is a post-adoption stage where enterprises implement e-procurement more sophisticatedly into the business in terms of management, functions, and usage. Institutionalization propensity of e-procurement is defined as an indicator of an enterprise’s readiness to institutionalize e-procurement. Based on a literature
review of e-commerce adoption and integration (Salleh, Jusoh, & Isa, 2010), we operationalized these two variables next.

**E-Procurement Initial Adoption (ePIA)**

An organization is considered to have the initial adoption of e-procurement if it has deployed several simple e-procurement innovations for a small part of their purchases, for example, using static or interactive websites to make promotions, publishing basic company information, receiving queries, and using e-mail entry forms from users.

**E-Procurement Institutionalization Propensity (ePIP)**

An organization is considered to have positive propensity toward the institutionalization of e-procurement if, presently or in the near plan

- a major amount of their purchases is conducted through e-procurement innovations (usage perspective);
- most procurement processes (from informing to payment) are conducted in electronic format (usage perspective);
- their e-procurement system has high interoperability with their internal ITI (functions perspective);
- their e-procurement system has high interoperability with the external ITI through using transactional or integrated websites, and they participate in e-marketplace (functions perspective);
- their e-procurement strategy is consistent with the business strategy, the organizational structure, and the social environment within the enterprise (management perspective).
It is worth noting that we investigate determinants of institutionalization propensity rather than institutionalization itself. Therefore, data from both non-adopters and adopters can be used in this model. This is particularly important as most firms are at the initial adoption stage and very few at the full institutionalization level in developing countries.

Research Hypotheses

Government Leadership Infrastructure (GLI)

Government leadership infrastructure refers to the role of government and its institutions in orienting and improving the development of e-commerce incentive environment. It can be considered under four key facets: strategic directive role (via visions and commitments), practical directive role (via e-Government systems or initiates), national e-commerce supportive role, and international e-commerce supportive role (via specific policies; Molla & Licker, 2005; Ismail & Kamat, 2008).

Literature consistently agrees that the role of government is an important consideration in the adoption and diffusion of innovation in developing countries (Saprikis, 2013). A government can encourage and influence both private and public companies in four different ways. First, it provides a clear and strategic leadership commitment through its e-commerce vision and directives, specific incentives, and actions. Second, the government develops a well-defined legal and regulation infrastructure. It also provides a well-developed ITI, and a supportive and incentive economic environment with IT-based, skilled workforce (Oxley & Yeung, 2001) and IT-oriented culture. Empirical evidence also shows government e-readiness is one of the key factors to determine decision-making of institutionalization of e-commerce (Molla & Licker, 2005). Therefore:

Hypotheses 1A and 1B: Government leadership infrastructure in the domain of IT has significant effects on (a) initial adoption and (b) institutionalization propensity of e-procurement in construction enterprises in developing countries.

Legal and Regulatory Infrastructure (LRI)

LRI represents the role of government in regulating, managing, and monitoring the e-commerce environment and refers to legal regulations that eliminate or reduce risks in e-business transactions. There are four types of risks: traditional risks, e-transactions risks, international e-commerce risks, and industry-specific e-commerce risks (Kog, 2010; Ismail & Kamat, 2006).

Providing a well-defined LRI is one of the critical contributions of government for the development of e-commerce. One of the challenges in developing any e-commerce system is in converting the functionality of the traditional paper-based system to an e-environment while maintaining legal compliance. A well-defined legal framework is positively related to ensuring the security of e-commerce activities, and improves trust in e-transactions (Ng Kim, 2005). Often in developing countries, the law that governs electronic transactions is under-developed and lags behind the technology. In addition, the implementation of e-commerce systems at the more sophisticated level demands even a more well-defined legal and regulatory system. Therefore, we propose:
Hypotheses 2A and 2B: LRI has significant effects on (a) initial adoption and (b) institutionalization propensity of e-procurement in individual construction enterprises in developing countries.

**Information Technology Infrastructure (ITI)**

ITI represents both IT characteristics. Technology infrastructure is required to overcome technological challenges (e.g., interoperability, security, inadequate software, connectivity, and reliability). It includes three key aspects: IT applications and internet infrastructure, B2B e-initiatives, and G2B e-initiatives. Information infrastructure refers to information resources to support the business communication among enterprises as well as between enterprises and public institutions. It includes two aspects: industrial economic information and institutional information (Ismail & Kamat, 2008; Stephen & Brakel, 2006; Tran, Huang, & Zhang, 2013). Literature acknowledges that ITI is an important issue for e-commerce. In developing countries, e-commerce adoption has been generally constrained by the quality, availability, and cost of the ITI, poor industry standards, poor cross-disciplinary communication, and especially lacking is the readiness of institutions to govern and regulate e-commerce (Molla & Licker, 2005). Researchers argue that developing countries need to put in place G2B e-initiatives in order to maximize and encourage e-commerce initiatives in the private sector (Neef, 2001). Therefore:

Hypotheses 3A and 3B: ITI has significantly effects on (a) initial adoption and (b) institutionalization propensity of e-procurement in construction enterprises in developing countries.

**Other Supporting Industries Infrastructure (SII)**

SII refers to the development, service, and cost structure of three supporting industries: telecommunications, financial system, and transportation system for which activities might affect e-commerce initiatives in businesses in developing countries (Molla & Licker, 2005). Along with ITI, these industries are argued as influencing both diffusion and institutionalization of e-commerce technologies in developing countries. These industries create obvious advantages in e-commerce; therefore, the following hypotheses are offered.

Hypotheses 4A and 4B: SII (finance, telecommunication, and transportation) has significant effects on (a) initial adoption and (b) institutionalization propensity of e-procurement in construction enterprises in developing countries.

**Socio-Economic and Knowledge Infrastructure (SEKI)**

SEKI represents social culture, knowledge, and attitudes of the industry toward e-commerce. It includes four facets: (1) industrial economic characteristics (i.e., competitiveness, transparency, stabeleness, trend of collaboration, and cooperation), (2) industrial socio-culture characteristics (i.e., trust, beliefs, concepts, judgments, expectations, and methodologies toward e-commerce) that are shared by people and enterprises within the industry, (3) industrial knowledge characteristics (i.e., perceptions of IT, skilled labor force, technicians, IT-oriented managers) required for the development of e-commerce strategy, and (4) industrial knowledge sharing infrastructure (i.e., initiatives available to share and develop knowledge and positive culture toward e-commerce; Ismail & Kamat, 2008; Zhu, Kraemer, & Xu, 2006).
E-commerce requires a firm to share information with its business partners. Institutionalization of the technology is needed to facilitate streamlining and automating the entire procurement process as well as making order and requisition information available along the entire supply chain. Information sharing among organizations and between businesses with government is indispensable. The industry needs to have enough capability to provide a sustainable skilled labor force (Oxley & Yeung, 2001). All players need to have a positive perception of the role of information and positive attitudes toward IT and e-commerce. Such characteristics are all the more important in developing countries, such as Vietnam, where information sharing is facing the “rigidity” of public administration and even private businesses (Le-Hoai et al., 2009). Empirical research has also shown that information sharing culture is positively related to the adoption of e-procurement (Teo et al., 2009; Le et al., 2012). Therefore:

Hypotheses 5A and 5B: SEKI significantly influences (a) initial adoption and (b) institutionalization propensity of e-procurement in construction enterprises in developing countries.

**Internal Organizational Characteristics (IOC)**

IOC refer to a series of internal factors that differentiate an enterprise with others, such as commitments, policies, business strategy, organizational structure, size, organizational culture, employee’s knowledge and skills, ITI, products and services’ characteristics, etc. (Tornatzky & Fleischer, 1990; Goode & Stevens, 2000).

The literature agrees that top manager’s commitment plays an important role in making a decision of adoption and utilization of e-commerce (Saprikis, 2013). Evidence also shows that qualified employees, hardware and software resources, finances, and a conducive organizational culture affects initial e-commerce and sophistication (Goode & Stevens, 2000). Additionally, organizational structure and governance were empirically identified as significant factors influencing e-commerce (Molla & Licker, 2005).

In CI, previous research has found that industry-specific organizational characteristics have negative effects on adoption. For example, unsuitability of products or services for processing electronically (Grilo & Jardim-Goncalves, 2011), conservative business culture, cyclical variations in workload, fragmentation (Eadie, Perera, & Heaney, 2010); poor inter-operability between different computer applications and organizational management strategies (Stewart, Mohamed, & Marosszeky, 2004) were considered as strong barriers to enterprises in implementing e-procurement. Therefore:

Hypotheses 6A and 6B: IOC significantly influence (a) initial adoption and (b) institutionalization propensity of e-procurement in construction enterprises in developing countries.

**External Business Characteristics (EBC)**

EBC refer to factors related to an enterprise’s external business activities. Four facets are included: business-operating scope (i.e., international versus domestic), IT trend of operating environment, e-commerce state of competitors and partners, and integration in the supply chains (Rogers, 1995; Zhu et al., 2006).

Literature argues that firms’ potential for innovation is a function of their operating environment, including economic, social, and political factors. Rogers (1995) posited that external
communication channels are an important characteristic related to diffusion of innovation. Firms that operate in the e-commerce industry are more likely to adopt and implement more sophisticated technologies due to competitive disadvantage and wanting to catch up with the trends. Molla and Licker (2005) showed that pressures from the external environment (suppliers, clients, competitors, and partners) emerged as the most significant factor affecting institutionalization of e-commerce in developing countries. Additionally, Zhu et al. (2006) revealed that international business scope is positively associated to the extent of e-business use in firms. Therefore:

Hypotheses 7A and 7B: EBC have significant effects on (a) initial adoption and (b) institutionalization propensity of e-procurement in construction enterprises in developing countries.

**Top Managers’ IT Ability and Perception (MAP)**

Top MAP refers to leaders’ characteristics related to IT. Based on literature, we consider top managers’ IT knowledge under four categories: perception of the IT trend of the operating environment, awareness of their enterprise in the domain of IT, knowledge of technologies itself, and IT management knowledge (Rogers, 1995).

The theory of technology diffusion argues that awareness of an innovation, its benefits and risks, and success and failure are important initial factors that may affect the decision to adopt the innovation (Rogers, 1995). Successful implementation depends on the ability to make changes in the organizational structure, business strategy, product characteristics, and business culture. This indicates the importance of the leaders’ awareness of their business in the domain of IT as well as their IT management knowledge on adoption of innovations. Empirical evidence suggests that the knowledge of IT and e-commerce possessed by managers has a significant effect on adoption of e-commerce (Thong, 1999; Le et al., 2012). Additionally, evidence also shows that top managers’ perception of e-commerce trends are likely to influence both initial e-commerce adoption and subsequent utilization (Molla & Licker, 2005).

In the context of Vietnam, a survey conducted in 2007 by the Ministry of Planning and Investment revealed that 43% of SME owners do not have a college degree. This is a potential barrier to access, adopt, and use technology (Le et al., 2012). As a result, we propose:

Hypotheses 8A and 8B: Top MAP significantly influence (a) initial adoption and (b) institutionalization propensity of e-procurement in construction enterprises in developing countries.

**Top Managers’ Leadership Style (MLS)**

According to Bass (1999), there are three leadership styles: transactional, laissez-faire, and transformational. Research demonstrates the benefits of transformational leadership style over two former forms in terms of achieving organizational goals. A good transformational leadership model consists of three factors: individualized consideration, intellectual stimulation, and inspirational-idealized influence.

Leadership determine values, culture, change tolerance, and employee motivation (Bass, 1999), and has a direct cause and effect relationship upon organizations and their success (McColl-Kennedy & Anderson, 2002). Most managers in developing countries tend to focus on loyalty, commitment, regulations, and formal organizational structure rather than on future orientation; they very often accept hierarchical and formal management structures and place less...
emphasis on individual actions and achievement, and are less willing to accept change (Nguyen et al., 2009). We propose that:

Hypotheses 9A and 9B: Top MLS has significant influences on (a) initial adoption and (b) institutionalization propensity of e-procurement in construction enterprises in developing countries.

According to the TRA (Fishbein & Ajzen, 1975), we propose:

Hypothesis 10: Top managers’ attitude toward institutionalizing (A2I) e-procurement has significant influences on the institutionalization propensity of e-procurement in construction enterprises in developing countries.

Hypothesis 11: Top managers’ SN related to institutionalizing e-procurement has significant influences on the institutionalization propensity of e-procurement in construction enterprises in developing countries.

Note that SN refers to top managers’ perception that most referents who are important to their enterprise (e.g., government, partners, competitors, and customers) think that their enterprise should institutionalize e-procurement.

Initial Adoption Experience Versus Institutionalization Propensity of e-Procurement

Implementing e-commerce technologies is an organizational learning process. Learning and integrating e-procurement innovations into the purchasing process is a challenge for organizations. The state of e-procurement in organizations can change over time; firms may move toward more sophistication but may also give up e-procurement in the future. Molla and Licker (2005) surmised that experience with initial e-commerce adoption is likely to have a mediating effect on the degree of institutionalization. Furthermore, we have observed that among adopters of e-procurement in the same operating environment, some firms have implemented e-procurement at a more sophisticated level while others have not. Therefore, we will examine the following hypothesis:

Hypothesis 12: Initial adoption experience of e-procurement has significant effects on the institutionalization propensity of e-procurement in construction firms in developing countries.

RESEARCH METHODOLOGY

Sample

A questionnaire was designed on the basis of a comprehensive literature review of e-commerce and was refined via several pretests, revisions, and pilot tests. Each of the items on the questionnaire was reviewed by an expert panel, which consists of two professors from Hohai University and three Vietnamese e-commerce developers for its content validity. After the questionnaire was finalized, it was translated into Vietnamese language. The survey was then executed in Hanoi, Vietnam.

Hanoi was selected because it is the country’s capital, is an economic and political center in which many construction companies have been using e-procurement innovations at the initial
adoption level. In addition, the operation of a public e-procurement system in Hanoi, which has been recently established and managed by the government, could potentially have a big impact on e-procurement in the near future. This makes Hanoi an appropriate place for our research.

Surveys that are self-administered via post or e-mail gain a very low response rate in Vietnam. Therefore, we administered the survey in person. The survey was performed in two stages. Stage 1 consisted of two phases: (1) a letter and questionnaire were e-mailed by the VINAVICO Construction Consultant and Investment Company in Hanoi to introduce the research project, and (2) calls were made to firms to make an appointment, one week later. In Stage 2, professional staff of VINAVICO visited each enterprise and administered the questionnaire in person.

The Hanoi construction business yellow-page at http://yellowpages.vnn.vn was identified as the sampling frame. Two hundred businesses were selected from the sample frame using a systematic random sampling procedure (i.e., every n-th item). Respondents were key leaders who had an in-depth understanding of their own enterprise, procurement activities as well as the external context in the domain of IT. They included senior managers, procurement managers, IT managers, and marketing managers. Surveys were conducted in May, July, and September 2012. A total of 115 responses were collected. We checked the sample for consistency and dropped invalid responses, resulting in a final dataset of 112 valid cases. Thus, the response rate is 56%. Of the 112 responses, 4 were from senior managers, 61 from procurement managers, 31 from marketing managers, and 15 from IT managers. Five had Ph.D. degrees, 57 had a Master degree; and the remaining had Bachelor degrees. The majority (80%) had at least five years of experience in the CI. There were 38 construction contractors, 54 engineering and architectural design consultants, and 20 suppliers. Most enterprises (97%) had been operating for more than five years. Of those reporting, there were a total of 97 SMEs and 14 large firms; this is similar to the industrial structure in Hanoi. Fifty-seven enterprises had no web sites and the remaining 55 had static or interactive websites.

Measurement Model Identification

The measurement model was built via successive stages of theoretical modeling, statistical testing, and refinement. The measurement items were developed on the basis of a comprehensive review of the literature; as a result 55 items were used. We then tested the reflective constructs using confirmatory factor analysis (CFA) and conducted specific analyses for the formative constructs. Based on these assessments, the measurement model was refined and then fitted again. These constructs and indicators are shown in Appendix A. Constructs are either reflective (Refl) or formative (Form) as shown in Table 1. Our model meets the necessary conditions for formative and reflective constructs as proposed by various researchers (Cenfetelli & Bassellier, 2009).

Measurement Model Validation

We conducted CFA using SEM as implemented in PLS. We assessed individual item reliability, convergent validity, and discriminant validity for the reflectively measured variables, ePIA, and ePIP.
TABLE 1
Variables in the Conceptual Model

<table>
<thead>
<tr>
<th>Independent Latent Variables</th>
<th>Type</th>
<th>Items*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government leadership infrastructure (GLI)</td>
<td>Form</td>
<td>GLI1 to GLI4</td>
</tr>
<tr>
<td>Socio-economic and knowledge infrastructure (SEKI)</td>
<td>Form</td>
<td>SEKI1 to SEKI4</td>
</tr>
<tr>
<td>IT infrastructure (ITI)</td>
<td>Form</td>
<td>ITI1 to ITI5</td>
</tr>
<tr>
<td>Other supporting industries infrastructure (SII)</td>
<td>Form</td>
<td>SII1 to SII3</td>
</tr>
<tr>
<td>Legal and regulatory infrastructure (LRI)</td>
<td>Form</td>
<td>LRI1 to LRI3</td>
</tr>
<tr>
<td>Top managers’ IT ability and perception (MAP)</td>
<td>Form</td>
<td>MAP1 to MAP4</td>
</tr>
<tr>
<td>Top managers’ leadership style (MLS)</td>
<td>Form</td>
<td>MLS1 to MLS4</td>
</tr>
<tr>
<td>Internal organizational characteristics (IOC)</td>
<td>Form</td>
<td>IOC1 to IOC5</td>
</tr>
<tr>
<td>External business characteristics (EBC)</td>
<td>Form</td>
<td>EBC1 to EBC4</td>
</tr>
<tr>
<td>Attitude towards institutionalizing e-procurement (A2I)</td>
<td>Form</td>
<td>A2I1 to A2I3</td>
</tr>
<tr>
<td>Subjective norm related to institutionalizing e-procurement (SN)</td>
<td>Form</td>
<td>SN1 to SN3</td>
</tr>
<tr>
<td>Dependent latent variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-procurement institutionalization propensity (ePIP)</td>
<td>Refl</td>
<td>ePIP1 to ePIP5</td>
</tr>
<tr>
<td>E-procurement initial adoption (ePIA)</td>
<td>Refl</td>
<td>ePIA1 and ePIA2</td>
</tr>
<tr>
<td>A total number of items</td>
<td></td>
<td>49</td>
</tr>
</tbody>
</table>

*Items measured on a 5-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (5).

**Individual Item Reliability and Convergent Validity**

To assess individual item reliability, confirmative factor analysis was conducted to test if all measurement items were appropriate for each construct. All items had factor loadings greater than the cutoff of 0.7 as suggested in the literature (see Table 2). Convergent validity measures consistency across multiple items and was assessed by computing Cronbach’s alpha, composite reliability (CR), and average variance extracted (AVE). Values of these were greater than the thresholds of 0.6, 0.7, and 0.5, respectively (see Table 2). Thus, the measurement scales have good convergent validity and internal consistency.

**Discriminant Validity Analysis**

Discriminant validity refers to the extent to which a variable is different from other variables. It is assessed by an analysis of cross-loadings. The discriminant validity is good if items have a higher correlation with their respective variable than with any other variable. The cross loadings are presented in Table 2. At construct level, discriminant validity is assessed by an analysis of AVE. The discriminant validity is adequate if the square root of AVE of each variable is greater than the correlations among the other constructs. On both accounts, the discriminant validity of the constructs holds.

For the formative construct, we assess the following issues.
### Table 2
Factor Loadings and Key Statistics

<table>
<thead>
<tr>
<th></th>
<th>ePIP</th>
<th>ePIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ePIP1</td>
<td>0.816</td>
<td>0.764</td>
</tr>
<tr>
<td>ePIP2</td>
<td>0.861</td>
<td>0.808</td>
</tr>
<tr>
<td>ePIP3</td>
<td>0.883</td>
<td>0.853</td>
</tr>
<tr>
<td>ePIP4</td>
<td>0.777</td>
<td>0.657</td>
</tr>
<tr>
<td>ePIP5</td>
<td>0.880</td>
<td>0.745</td>
</tr>
<tr>
<td>ePIA1</td>
<td>0.895</td>
<td>0.977</td>
</tr>
<tr>
<td>ePIA2</td>
<td>0.897</td>
<td>0.976</td>
</tr>
<tr>
<td>ePIA3</td>
<td>0.838</td>
<td></td>
</tr>
<tr>
<td>AVE</td>
<td>0.703</td>
<td>0.953</td>
</tr>
<tr>
<td>CR</td>
<td>0.921</td>
<td>0.976</td>
</tr>
<tr>
<td>Cronbachs Alpha</td>
<td>0.894</td>
<td>0.951</td>
</tr>
</tbody>
</table>

**Multicollinearity**

Collinearity is a risk to the stability of formative indicator weights and challenges the structural predictive capability of the formative construct. The greater the level of multicollinearity among the indicators, the more likely many of the indicators will have low or non-significant path weights. To assess multicollinearity, variance inflation factor (VIF) was calculated. Statistical theory suggests that multicollinearity is not a concern if the VIF is less than 3.33 (Cenfetelli & Bassellier, 2009). In this study, most VIF scores were less than the threshold, and only a few were close to the threshold.

**Formative Indicators’ Weights and Loadings**

To assess the formative indicators’ weights and loadings, a bootstrap analysis was performed with 200 subsamples and path coefficients were re-estimated using each of these samples. If a specific item has both non-significant weight and loading, implying that the item is not absolutely as well as relatively important, then it should be removed from the instrument (Cenfetelli & Bassellier, 2009). All items had significant weights and loadings except one (SEKI4), which was dropped.

**Nomological Network Effects**

According to Cenfetelli and Bassellier (2009), construct portability is an important issue informative measurements. A shortage of portability negatively influences the results of the model. A construct has good portability if its indicator weights change very little when it is used in different nomological networks. We changed the nomological network by removing ePIP and replacing it with a reflective construct (enterprise’s attitude toward e-procurement [ATP] in Appendix A). Basically, ePIA and ATP are positively correlated. The revised model showed no major change in the relative magnitudes of the indicator weights.
EMPIRICAL ANALYSIS

The model was tested using PLS, results are presented as in Figure 2. We chose PLS because our research is still at an early stage and the proposed model has not been tested in the literature. Also, PLS is appropriate for handling both reflective and formative constructs (Chin, 1998).

The explanatory power of the structural model can be evaluated by examining the amount of variance ($R^2$) in the dependent variables. The $R^2$ of ePIA and ePIP are 0.96 and 0.92, respectively, meaning that about 96 and 92% of the changes to the initial adoption and institutionalization propensity of e-procurement are due to the 11 latent variables. The significance of the $R^2$ values was also assessed by conducting $F$-tests. The values are $F = 101$ with $p = 0.000$ for $R^2 = 0.92$ and $F = 169$ with $p = 0.000$ for $R^2 = 0.96$. Thus, the explanatory power of the model is statistically significant; demonstrating the predictive relevance of the structural model.

Paths of the Structural Model

Each hypothesis was tested by looking at the sign, size, and statistical significance of the path coefficient between the independent and dependent variable. The bootstrap function in SmartPLS 2.0 M3 was used with 200 re-samples. Ten of the 21 paths are statistically significant (see Table 3). For ePIA, six of the 11 TOE factors—GLI, LRS, ITI, SII, EBC, and MLS—have significant paths. It means that Hypotheses 1A, 2A, 3A, 4A, 7A, and 9A are supported. For institutionalization propensity (ePIP), four of the 11 TOE factors—ITI, IOC, MAP, and SN—have
significant paths. Thus, Hypotheses 3B, 6B, 8B, and 11 are supported. It is very worth noting that Hypothesis 12 is not supported. It means that ePIA does not significantly influencing on ePIP.

**DISCUSSION**

Our study makes two notable points: (1) the determinants of initial adoption of e-procurement are very different from those of institutionalization of technology; (2) experience with initial adoption of e-procurement does not have any significant effect on institutionalization propensity of the technology in construction firms in the developing countries’ context. These findings are now discussed in detail.

**E-Procurement Initial Adoption**

**Environmental Context**

First, LRI is the most significant factor in the entry-level adoption of e-procurement in Vietnamese construction enterprises. This result is consistent with previous empirical findings (Molla & Licker, 2005). In Vietnam, the legal framework for e-commerce is weak in the areas of taxation, customer protection, intellectual property rights, e-payment, public security, and human-resource development and does not take sufficiently into account the needs of private enterprises and rural users (Tran, Huang, & Drew, 2014). Our finding gives empirical support to qualitative research that identifies many legal obstacles to e-commerce, such as inadequate legal protection for online transactions, unclear business laws, and security and privacy concerns (Ismail & Kamat, 2006; Kog, 2010). By implication, this result points to the need for establishing a broad legal and institutional framework that makes a trustworthy e-marketplace.
EMPIRICAL STUDY ON ADOPTION OF CONSTRUCTION E-PROCUREMENT IN VIETNAM

Government leadership infrastructure also emerged as a significant contributor to the entry-level adoption of e-procurement. This is consistent with previous empirical findings by Zhu et al. (2006) and Molla and Licker (2005). Most Vietnamese construction enterprises are SMEs and lack financial, human, and technological resources (Phan & Luu, 2012). They have a limited control over their environment and trend to avoid risk taking and IT adoption (Le-Hoai et al., 2009). Therefore, e-commerce policies and regulations by the government that pays special attention to the SMEs become critically necessary. Furthermore, the competitive environment in Vietnam is determined by the relationship between business and government. Business managers look to the government for direction and are less willing to accept changes on their own (Nguyen et al., 2009). Thus, there is a big demand for the pioneering role of government in this area.

Both technology and information infrastructure and SEKI were found to have significant impact on initial adoption. The results support other empirical findings in developing countries (Le et al., 2012). In Vietnam, the information infrastructure is poor and the information sharing culture is facing “rigidity” in the public sector and even in private businesses (Le-Hoai et al., 2009).

SII (i.e., finance, telecommunication, and transportation) was not found to influence initial adoption of e-procurement. While contrary to expectations, the result is consistent with the finding of Molla and Licker (2005) which found that supporting industries’ e-readiness does not affect initial adoption of e-commerce in developing countries. This finding can be explained by the fact that in Vietnam, e-commerce legal system and ITI are not well developed and they become the overwhelming challenge than anything else.

Organizational Context

EBC is a major factor affecting initial adoption of e-procurement in Vietnamese construction firms. As enterprises operate in global supply chains and their suppliers and clients increasingly tend to use the technology to coordinate supply chains, they feel pressured to adopt e-procurement because of either perceived value (network benefits) or fear of market displacement. This result is consistent with previous empirical findings (Molla & Licker, 2005; Zhu & Kraemer, 2005).

IOC in terms of commitment, structure, business model, culture, etc. does not have any significant influence on ePIA. While consistent with the finding of Molla and Licker (2005), the finding is at odds with several other studies (Goode & Stevens, 2000; Grilo & Jardim-Goncalves, 2011). It should be noted that these previous studies were conducted based on a macro rather than a process view of adoption. Actually, as discussed later, our study found that IOC do have an impact on post-adoption, i.e., institutionalization propensity of e-procurement.

Managerial Context

Top MLS has the most significant effect on initial adoption of e-procurement. The top managers’ transformational leadership style (i.e., individualized consideration, intellectual stimulation, and inspirational-idealized influence) will more will more likely result in the adoption decision. This is consistent with the empirical finding of Thong (1999) where they found that the CEO’s innovativeness was a significant influencing factor of IS adoption in small businesses. On the other hand, top managers’ IT ability and knowledge does not have a significant influence on initial adoption. This result is not completely consistent with previous findings (Jackson,
E-Procurement Institutionalization Propensity

**Environmental Context**

Only ITI has significant effect on the institutionalization of e-procurement adoption. It confirms the important role of B2B and G2B initiatives and is consistent with previous studies (Molla & Licker, 2005). In Vietnam, many challenges related to ITI exist, such as the low quality, poor availability, and high cost of the internet, poor industry standards, and dismal cross-disciplinary communication. By implication, governments need to put in place G2B e-initiatives and provide supporting policies across industries and SEMs in order to further develop e-commerce initiatives in both private and public sectors.

The remaining external factors did not appear to have any significant effect on the institutionalization of e-procurement. In a similar vein, Saprikis (2013) found that the partners’ pressure and supporting industries did not influence the post-adoption stage of e-reverse auction use and institutionalization of e-commerce. However, Molla and Licker (2005) found that government commitment, legal system, and external market forces were significant in the institutionalization of e-commerce. Possible explanations are that these factors are necessary but not sufficient after the adoption stage and the overwhelming significance of the supportive ITI may have diluted this result. These findings empirically support the argument that the factors that affect initial e-commerce adoption are different from those that of institutionalization. Thus, while initial adoption requires more environmental supports, institutionalization focuses on the development of ITI because of its scope and integration issues.

**Organizational and Managerial Contexts**

IOC and top managers’ IT ability and knowledge in terms of e-procurement, business, and environment were found to have significant effects on the institutionalization propensity of e-procurement. As mentioned above, these factors did not significantly influence the initial adoption of e-procurement. Clearly more organizational support, commitment, and resources are required to institutionalize and gain more value from e-commerce technologies.

**Technological Context**

SN was found to have significant effect on institutionalization propensity of e-procurement. It means that a decision about employing sophisticated features will depend much on the perceived desires of the firm’s business partners, and especially the government. On the other hand, attitude toward the institutionalization of e-procurement did not have a significant effect. This implies that the perception of potential benefits (i.e., the strategic role, cost reduction, and competitive advantage) is not likely to pull enterprises into institutionalizing the technology. In Vietnam, most
enterprises are still at the entry-level of adoption and consider e-procurement as a tactical rather than strategic tool to improve purchasing activities (VECITA, 2008).

**Initial Adoption Versus Institutionalization Propensity**

The experience with initial e-procurement adoption did not have a significant effect on institutionalization propensity of e-procurement. This is an interesting finding. Thus, there appears to be no casual relation between entry-level adoption and institutionalization. This finding refutes the claim by several researchers (that has not been empirically tested) that experience with initial e-commerce adoption is likely have a mediating effect on the degree of institutionalization in developing countries (Molla & Licker, 2005). This finding helps explain why among adopters of e-procurement within the same operating environment; some firms have implemented e-procurement at the more sophisticated level while others have not.

**IMPLICATIONS AND LIMITATIONS**

**Theoretical Implications**

The study has several theoretical contributions. First, it provides rigorous definitions of initial adoption versus institutionalization of e-procurement based on literature review and distinguishes between the two. It views institutionalization from three perspectives: the breadth of use for different value chain activities, the depth of use for each activity, and the degree of interoperability. Second, the study empirically validates the TOE framework and the theory of TRA for e-commerce technology adoption in developing countries. It combines two these theories into a single model. Third, it provides empirical evidence to show that the determinants of initial adoption are different from that of institutionalization. We find that while initial adoption requires more environmental supports, institutionalization focuses more on the development of ITI.

The study confirms that the process-oriented or a staged view is a necessary and effective approach to investigate the adoption of e-commerce technologies in developing countries. Our investigation shows that LRI, ITI, EBC, top MLS, government directions and supports, and SEKI play a critical role on the initial adoption of e-procurement. In addition, the institutionalization of e-procurement depends mainly on ITI, IOC, MAP, and managers’ attitude toward institutionalizing the technology.

**Practical Implications**

The study offers much guidance in enhancing the adoption and institutionalization of e-procurement in construction enterprises. First, the government has a stronger impact on initial adoption than institutionalization in terms of commitments and supportive policies, providing legal and regulatory framework, and developing IT and SII. However, in order for firms to implement sophisticated e-procurement, the government needs to pay specially attention to the development of ITI. These may include clear and comprehensive commitment to e-commerce, development of e-government initiatives, international e-commerce incentives, and
special policies and incentives for SMEs. Furthermore, the government may need to promote the development of common standards that are extremely crucial for interfacing systems and institutionalizing e-procurement.

At the firm level, the role of top managers is critical in adopting e-procurement. Top managers’ transformational leadership style can lead to their enterprise’s entry-level adoption of e-procurement. For further refinement and institutionalization, senior managers need to have a good IT background, change management ability, and knowledgeable of the environment and future IT trends.

The study shows that an important determinant of successful institutionalization of e-procurement is the compatibility between the technology and IOC. It means that not all construction enterprises can successfully institutionalize e-procurement even if they have the resources. A successful e-procurement implementation must be based on a well-formulated strategy that embedded the technology properly into the business strategy.

Finally, the study showed that SN is positively associated to the more sophisticated implementation of the technology. A strong implication is that the government and state-owned and large enterprises, who are leaders in the market in Vietnam, need to play a pioneering role toward institutionalization—beyond the simple adoption. These efforts will benefit the entire industry as it begins to reap the full benefits of the technology.

Limitations and Further Research

Due to the CI focus, the generalizability of our results is limited. The size of data was small with 112 respondents. The PLS approach can largely solve the problem; however, a larger sample size should be collected to test whether the results are replicable. The research instrument, although rigorously validated, has not been tested for test–retest reliability and external validity; further validation may be useful. The study treated the four groups of respondents (construction contractors, architectural consultants, engineering consultants, and suppliers) as a homogenous group. Future studies can break out the results by each group. Lastly, our study has examined both initial adoption and institutionalization. A majority of IS studies examines only adoption. Future research will benefit from focusing on institutionalization of e-commerce.

CONCLUSIONS

This study was pursued to investigate the determinants of initial adoption and institutionalization propensity of e-procurement in construction enterprises in a developing country. Our findings study can be summarized with four conclusions.

1. In developing countries’ context, the government plays an extremely important role in both initial adoption and institutionalization of e-procurement in construction enterprises. While LRI has the most significant effect on initial adoption, ITI is significant in institutionalization.
2. While EBC and top MLS have significant effects on entry-level adoption, IOC and top MAPs have significant effects on institutionalization;
3. SNs influence significantly e-procurement institutionalization. This finding can help explain partly the argument that given the same level of organizational resources and operating environment, why several firms have implemented more sophisticated e-procurement innovations than others.

4. The experience of the initial adoption does not have a significant effect on institutionalization. In other words, institutionalization has its own set of factors independent of adoption that needs to be carefully managed.

ACKNOWLEDGMENT

The help from VINA VICO Construction Consultant and Investment Company, Hanoi for surveying is specially appreciated.

FUNDING

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REFERENCES


### APPENDIX A

#### THE INSTRUMENT ITEMS

<table>
<thead>
<tr>
<th>Measurement Items/Survey Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Internal organizationnal characteristics (IOC)</strong></td>
<td>Tornatzky and Fleischer (1990), Niederman et al. (1991)</td>
</tr>
<tr>
<td>IOC1: Our top managers commit strongly on IT; especially, we have a specific IT steering committee for managing various aspects of business-IT fit</td>
<td></td>
</tr>
<tr>
<td>IOC2: Business model and strategy are suitable to accommodate e-commerce innovations</td>
<td></td>
</tr>
<tr>
<td>IOC3: The organizational culture of our enterprise is IT-based oriented</td>
<td></td>
</tr>
<tr>
<td>IOC4: Most information within our organization is processed electronically</td>
<td></td>
</tr>
<tr>
<td>IOC 5: Our organizational structure is flexible enough for changes management</td>
<td></td>
</tr>
<tr>
<td><strong>External business characteristics (EBC)</strong></td>
<td>Rogers (1995)</td>
</tr>
<tr>
<td>EBC 1: The operating environment is dynamic with a trend of strong cooperation and collaboration</td>
<td></td>
</tr>
<tr>
<td>EBC 2: The target market of our enterprise is wide both domestic and international, which are incentive and supportive strongly to apply e-procurement tools</td>
<td></td>
</tr>
<tr>
<td>EBC3: Our main competitors and partners are using sophisticatedly e-procurement innovations</td>
<td></td>
</tr>
<tr>
<td>EBC4: Our enterprise’s business activities are strongly integrated within supply chain</td>
<td></td>
</tr>
<tr>
<td><strong>Managers’ IT ability and perception (MAP)</strong></td>
<td>Rogers (1995)</td>
</tr>
<tr>
<td>MAP1: Managers are well aware of all aspects of e-procurement in benefits, challenges, and roles</td>
<td></td>
</tr>
<tr>
<td>MAP2: Our managers are well aware of operating environment in terms of the business trends, barriers, and supports in the domain of e-procurement in the industry</td>
<td></td>
</tr>
<tr>
<td>MAP3: Managers are good aware of business in internal resources and external business characteristics</td>
<td></td>
</tr>
<tr>
<td>MAP4: Our managers have IT and changes management ability</td>
<td></td>
</tr>
<tr>
<td>MLS1: Managers have a strategic-oriented leadership style; they envision a desirable future and plans, set high standards of performance, and shows determination and confidence.</td>
<td></td>
</tr>
<tr>
<td>MLS2: Our managers have an IT-oriented leadership style; they direct the business and employees become more innovative and creative</td>
<td></td>
</tr>
<tr>
<td>MLS3: Our managers have an individualized style; they pay attention to the needs and development of employees, and delegate assignments as opportunities for growth</td>
<td></td>
</tr>
<tr>
<td>GLI1: We believe that government has a strong strategic commitment to general e-commerce across the nation with a comprehensive vision, effective actions plans, and incentive policies</td>
<td></td>
</tr>
</tbody>
</table>

(Continued)
## APPENDIX A
(Continued)

<table>
<thead>
<tr>
<th>Measurement Items/Survey Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLI2: We believe that government is effectively playing its pioneering role in facilitating the market demand for e-commerce through e-government initiatives (e.g., public e-procurement, public websites); reengineering in state organizations is being undertaken; officials are well trained and have positive attitudes toward public e-services</td>
<td></td>
</tr>
<tr>
<td>GLI3: Government has been making many efforts to the development of e-commerce toward the regional and international scope; many internationally bilateral and multi-parties agreements that related to legal issues, standards, security, etc. have been signing</td>
<td></td>
</tr>
<tr>
<td>GLI4: Government has paid especially attention on the development of e-commerce in SMEs</td>
<td></td>
</tr>
<tr>
<td><strong>Legal and regulatory infrastructure (LRI)</strong></td>
<td></td>
</tr>
<tr>
<td>LRI 1: We believe that the present paper-based procurement legal system is well-defined to address traditional legal risks (e.g., corruption, bureaucracy, fraudulent, intellectual properties rights, etc.)</td>
<td>Kog (2010), Ismail and Kamat (2006)</td>
</tr>
<tr>
<td>LRI 2: We believe that the present e-procurement legal system is well-defined to address e-transactions risks (e.g., software agents contracting, authentication, online security, privacy, etc.)</td>
<td></td>
</tr>
<tr>
<td>LRI 3: The present e-commerce legal and regulatory system is unified with international legal defines</td>
<td></td>
</tr>
<tr>
<td>LRI 4: The present e-commerce legal and regulatory system takes sufficiently into account the needs of both public versus private enterprises and large versus SMEs as well in the industry</td>
<td></td>
</tr>
<tr>
<td><strong>Information technology infrastructure (ITI)</strong></td>
<td></td>
</tr>
<tr>
<td>ITI1: Supporting IT applications and internet is available and good enough to support well e-procurement activities regarding to interoperability, security, and standardization in the industry</td>
<td>Ismail and Kamat (2008), Stephen and Brakel (2006)</td>
</tr>
<tr>
<td>ITI2: We believe B2B e-initiatives have been developed well (websites, e-marketplaces, e-hubs, etc.)</td>
<td></td>
</tr>
<tr>
<td>ITI3: We believe that e-government initiatives have been developed well (e.g., public e-communication, e-bank system, public e-certificate service, e-tax declaration and clearance, and public e-procurement)</td>
<td></td>
</tr>
<tr>
<td>ITI4: Across-industrial information sources are available, transparency, and accessible equally</td>
<td></td>
</tr>
<tr>
<td>ITI5: We believe that public administration institutions have established e-databases of economic and administration information; they are available and fair for enterprises</td>
<td></td>
</tr>
<tr>
<td><strong>Supporting industries infrastructure (SII)</strong></td>
<td></td>
</tr>
<tr>
<td>SII1: We believe that national financial system are improved and institutionalized enough to handle e-commerce; SII2: We believe that telecommunications system is improved and institutionalized well to support e-commerce; SII3: Transportation system is improved and institutionalized well to support e-commerce</td>
<td>Molla and Licker (2005)</td>
</tr>
</tbody>
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(Continued)
### Measurement Items / Survey Questions

<table>
<thead>
<tr>
<th>Socio-economic and knowledge infrastructure within the industry (SEKI)</th>
<th>SEKI1: We believe that socio-cultural environment is now very incentive and supportive for e-procurement because of improved trust on e-transactions; improved e-payment activities; enhanced active style of working and managing within the industry SEKI2: We believe that enterprise community in the industry is well aware of short-time versus long-term benefits; has positive attitudes toward e-commerce; has enough skilled labor force, technicians, and managers that required for the development of e-commerce strategy SEKI3: We believe that economic environment is very good in terms of competitiveness, transparency, stableness; and has a strong trend of collaboration and cooperation SEKI4: We believe that the economic environment is IT-oriented strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude toward institutionalizing e-procurement (A2I)</td>
<td>A2I1: We believe that the institutionalization will bring fully cost advantages of e-procurement A2I2: We believe that the institutionalization will make strategic long-term benefits for our enterprise A2I3: We believe that the institutionalization will make strong competitive advantage to our enterprise</td>
</tr>
<tr>
<td>Subjective norm related to the institutionalization (SN)</td>
<td>SN1: We think that our main business partners seem to want us to institutionalize e-procurement. SN2: We think that our main competitors seem to want us to institutionalize e-procurement SN3: We think that government seems to want our enterprise to institutionalize e-procurement</td>
</tr>
<tr>
<td>E-procurement initial adoption (ePIA)</td>
<td>ePIA1: Our enterprise has been implementing one or several e-procurement innovations separately for a small part of the total purchases ePIA2: Our enterprise has been using the static or interactive websites to make promotions and publish basis company information or receive queries, e-mail, and form entry from users</td>
</tr>
<tr>
<td>E-procurement institutionalization propensity (ePIP)</td>
<td>eP11: Implement major amount of our purchases through e-procurement innovations eP12: Implement most procurement processes (from informing to payment) in electronic format eP13: Improve higher interoperability between e-procurement innovations together and with other IT systems eP14: Improve higher interoperability between e-procurement innovations with external IT infrastructure through transactive or integrated websites, and participating e-marketplace eP15: Implement e-procurement innovations more consistent with our business strategy, organizational structure, and social environment within our enterprise</td>
</tr>
</tbody>
</table>

**References**

- Ismail and Kamat (2008), Zhu et al. (2006)
- Fishbein and Ajzen (1975)
- Molla and Licker (2005), self-developed
<table>
<thead>
<tr>
<th>Measurement Items/Survey Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>An enterprise’s attitude towards e-procurement itself (ATP)</td>
<td>ATP1: I think that our enterprise considers e-procurement is as a long-term strategic rather than a short-term operational decision  &lt;br&gt; ATP2: I think that our enterprise considers e-procurement is one of the most important strategies for the development of our enterprise</td>
</tr>
</tbody>
</table>

*Note.* Manifest variables measured on a five-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (5).

**AUTHOR NOTES**

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