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Assessing organizational readiness for E-bidding in construction: An e-readiness framework and policy recommendations

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Abstract: In the context of digital transformation and the mandatory application of e-bidding under Vietnam's 2023 Bidding Law, assessing the organizational readiness of construction enterprises has become increasingly critical. This paper proposes a theoretical framework of E-Readiness encompassing four key dimensions: technological infrastructure, human resources and training, internal processes, and organizational culture. Based on exploratory research involving six enterprises and a pilot survey with 15 bidding officers, the study utilizes qualitative thematic analysis and descriptive statistics to refine and validate a set of readiness indicators tailored to the Vietnamese construction sector. The findings reveal significant disparities in organizational readiness levels, particularly in staffing and internal procedures. Policy recommendations are proposed to support a tiered implementation strategy aligned with varying levels of E-Readiness, aiming to enhance the effectiveness and sustainability of e-bidding adoption in the industry.

Keywords: *Capacity assessment, Construction enterprises, Digital transformation, E-bidding, E-Readiness framework, Organizational readiness, Procurement management.*

1. Introduction

In the context of Vietnam's national digital transformation agenda, the modernization of public procurement processes - particularly through electronic bidding (e-bidding) - has become a strategic priority aimed at enhancing transparency, reducing transaction costs, and improving public investment efficiency [1, 2]. The National E-Procurement System (e-GP), which includes modules such as planning, public notice, bid submission, evaluation, and electronic contract awarding, has been in operation since 2009 and has gradually expanded its scope. According to the Ministry of Planning and Investment, as of 2024, over 90% of mandatory construction-related bidding packages are conducted through e-bidding in terms of quantity. However, the average value per package remains low and is mostly concentrated in provinces and cities with strong technological capabilities [3].

Beginning January 1, 2025, pursuant to the Bidding Law No. 22/2023/QH15, all state-funded bidding packages - including those in construction - will be mandatorily processed via the e-GP system [4]. This regulatory shift imposes significant transformation pressures on construction enterprises, particularly small and medium-sized enterprises (SMEs), which account for a large proportion of the entire industry [5]. While legally positioned as a "catalyst" to improve the efficiency of the construction market, the implementation of e-bidding has exposed numerous challenges in practice, ranging from technological infrastructure and human resources to internal processes and organizational culture [6]. The World Bank [7] reported that in Vietnam, more than 35% of e-bidding submissions were rejected

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due to minor technical errors such as incorrect file formats, invalid digital certificates, or late submissions [7].

In this context, a key question arises: *"How prepared are Vietnamese construction enterprises for e-bidding, and what conditions are required for successful implementation?"* Addressing this question goes beyond traditional technology acceptance models such as TAM [8] or UTAUT [9]; it necessitates a more comprehensive approach focused on assessing internal organizational capacity. According to the OECD [10] successful adoption of e-government systems depends not only on technical factors but also on institutional alignment and the readiness of participating organizations to undergo transformation [10]. Several international studies have employed the concept of "E-Readiness" to evaluate organizational preparedness for mandatory technology implementation, encompassing aspects such as IT infrastructure, governance processes, workforce capabilities, organizational culture, and leadership commitment [11, 12].

In Vietnam, recent studies - such as Van Tam, et al. [6] - have preliminarily quantified factors influencing the effectiveness of e-bidding in the construction sector. However, a clear assessment framework for organizational readiness is still lacking [6]. This gap is critical, as varying levels of readiness directly shape how enterprises should be targeted with training, policy support, and implementation strategies. Developing a dedicated E-Readiness index for Vietnamese construction enterprises - grounded in robust theoretical foundations and practical field research - is essential to advancing a more comprehensive and effective digital transformation in the sector.

Accordingly, this study aims to propose and preliminarily validate a model for assessing organizational readiness (E-Readiness) of construction enterprises in the context of e-bidding implementation in Vietnam. The proposed framework consists of four key dimensions: (1) technological infrastructure, (2) human resources and training, (3) internal processes, and (4) innovation-oriented organizational culture. Based on this framework, the paper analyzes the current state of readiness, classifies enterprises by readiness level, and offers policy recommendations tailored to each group.

2. Theoretical Foundation and Proposed Framework

The concept of organizational e-readiness has emerged in response to growing efforts by governments worldwide to mandate the adoption of information and communication technologies (ICT) in public administration, particularly within e-government, digital governance, and public procurement systems [13]. E-readiness refers not only to an entity's technical preparedness but also encompasses a broader set of foundational organizational capacities - such as internal processes, managerial support, leadership commitment, and an innovation-driven culture - that collectively determine the organization's ability to effectively adopt and utilize digital technologies [14].

In the construction sector, particularly in civil works procurement, organizational readiness plays a critical role in determining whether a company can effectively access, operate, and leverage the National E-Procurement System (e-GP). As noted by Lou, et al. [12] construction enterprises in developing countries often face implementation challenges due to deficiencies in technological infrastructure and a lack of standardized procedures [12]. Unlike individual-centric models such as the Technology Acceptance Model (TAM) [8] or the Unified Theory of Acceptance and Use of Technology (UTAUT) [9], the e-readiness framework adopts a systems-level organizational perspective, enabling a more holistic assessment of a firm's preparedness. This systems approach facilitates the development of targeted policy interventions based on the specific readiness levels of enterprises.

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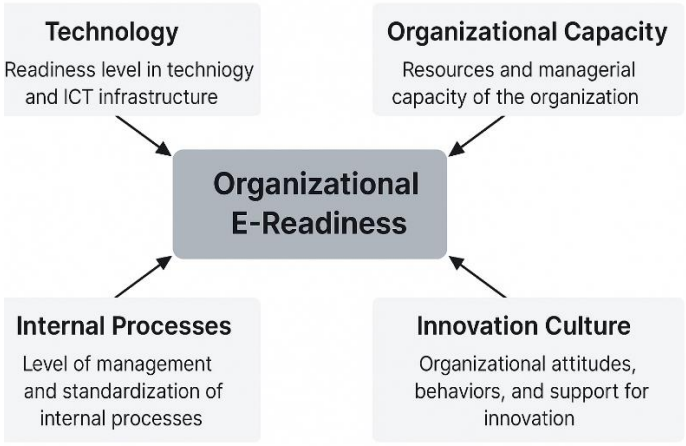

Figure 1.
Proposed Model of Organizational E-Readiness Components.

Drawing on the theoretical foundations established by UNDESA [2] the World Bank [1], the OECD [10] and sector-specific studies such as Affendy, et al. [15] and Van Tam, et al. [6] this study proposes a model for assessing organizational e-readiness comprising the following four key components:

(1) Technology Infrastructure (TECH): This includes essential elements such as hardware systems, application software, stable internet connectivity, digital certificates, and interoperability with the national e-GP system. These are fundamental prerequisites for ensuring the secure and seamless operation of the electronic bidding process [16].

(2) Human Resources and Training (HR): This dimension captures the quantity, quality, and experience of personnel responsible for e-bidding, their participation in relevant training programs, and familiarity with e-procurement procedures. A lack of specialized personnel is one of the main reasons why many firms are disqualified due to technical errors [6].

(3) Process Maturity (PROC): This reflects the extent to which internal processes - such as bid preparation, review, archiving, task assignment, and progress monitoring - are standardized and digitized. Empirical research indicates that firms with well-defined internal processes tend to achieve significantly higher success rates in e-bidding [15].

(4) Organizational Culture and Leadership Commitment (CULT): This component reflects an enterprise's readiness for innovation, attitudes toward technology adoption, involvement of senior leadership, and long-term commitment to digital transformation. A passive culture and resistance to change are common barriers, particularly among small-sized firms [17].

Based on these four dimensions, the proposed E-Readiness assessment model is illustrated in Figure 1. Each component is operationalized through both qualitative and quantitative indicators - such as the number of e-bidding participations, staff trained, average bid preparation time, and IT investment level. The aggregated score determines a firm's readiness level, which is categorized into three tiers: low, medium, and high. This tiered approach enables the development of targeted training programs, technical support mechanisms, and legal frameworks tailored to each readiness group, rather than applying a one-size-fits-all model.

3. Research Methodology

This study adopts a mixed-methods approach, with a primary focus on qualitative inquiry supplemented by descriptive quantitative data. The objective is to develop an assessment framework for organizational e-readiness tailored to Vietnamese construction enterprises, particularly in preparation

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for the mandatory nationwide implementation of e-bidding from 2025. The methodological process is divided into three phases: theoretical synthesis, exploratory fieldwork, and indicator refinement.

3.1. Phase 1: Theoretical Synthesis and Development of Measurement Indicators.

The author reviewed academic literature and policy documents related to e-readiness in the fields of construction, e-government, and digital transformation. Core references included reports by UNDESA [2], the OECD [10], the World Bank [1] and recent empirical studies in developing countries, notably those by Lou, et al. [12] and Affendy, et al. [15]. Based on this synthesis, an initial set of 16 indicators was identified across the four dimensions of the proposed e-readiness framework: Technology Infrastructure (TECH), Human Resources and Training (HR), Process Maturity (PROC), and Organizational Culture and Leadership (CULT).

3.2. Phase 2: Exploratory Fieldwork and Expert Consultation

Six construction enterprises were selected for preliminary field investigation across three distinct localities with varied industry contexts and firm sizes: Hanoi (a major urban center with general contractors), Bac Giang (a rapidly industrializing province), and Ha Nam (a locality with a high concentration of small, local contractors). The sample included four medium-sized firms (50–200 employees) and two small-sized firms (fewer than 50 employees), comprising both private enterprises and joint-stock companies. A key selection criterion was that each firm had at least one year of experience participating in e-bidding, ensuring the reliability of insights provided.

Two focus group discussions were conducted, centering on the following thematic areas: (1) challenges in operating the e-GP system; (2) internal procedures for bid preparation; (3) level of technological readiness; (4) leadership attitudes toward digital transformation; and (5) proposed improvement strategies. Thematic analysis revealed that two initial indicators were removed due to limited practical relevance (e.g., "the proportion of internal documents stored on a centralized digital management system"), while three were revised for greater clarity - for instance, "average training hours per year" was redefined as "whether the firm organized e-bidding training in the past 12 months (yes/no)."

3.3. Phase 3: Scale Construction and Enterprise Classification.

Based on the refined set of indicators, a 5-point Likert scale (1 = not ready at all; 5 = fully ready) was applied to each indicator. The total readiness score for each enterprise could range from 16 to 80. Enterprises were then classified into three readiness tiers:

- Tier I – Low Readiness: Total score < 40
- Tier II – Moderate Readiness: $40 \leq$ score < 60
- Tier III – High Readiness: Score ≥ 60

Each group exhibits distinct organizational constraints and thus warrants different policy interventions, ranging from basic training support, upgrades in ICT infrastructure, to improvements in internal management systems. This classification system facilitates more targeted and effective policymaking, as opposed to uniform, one-size-fits-all solutions.

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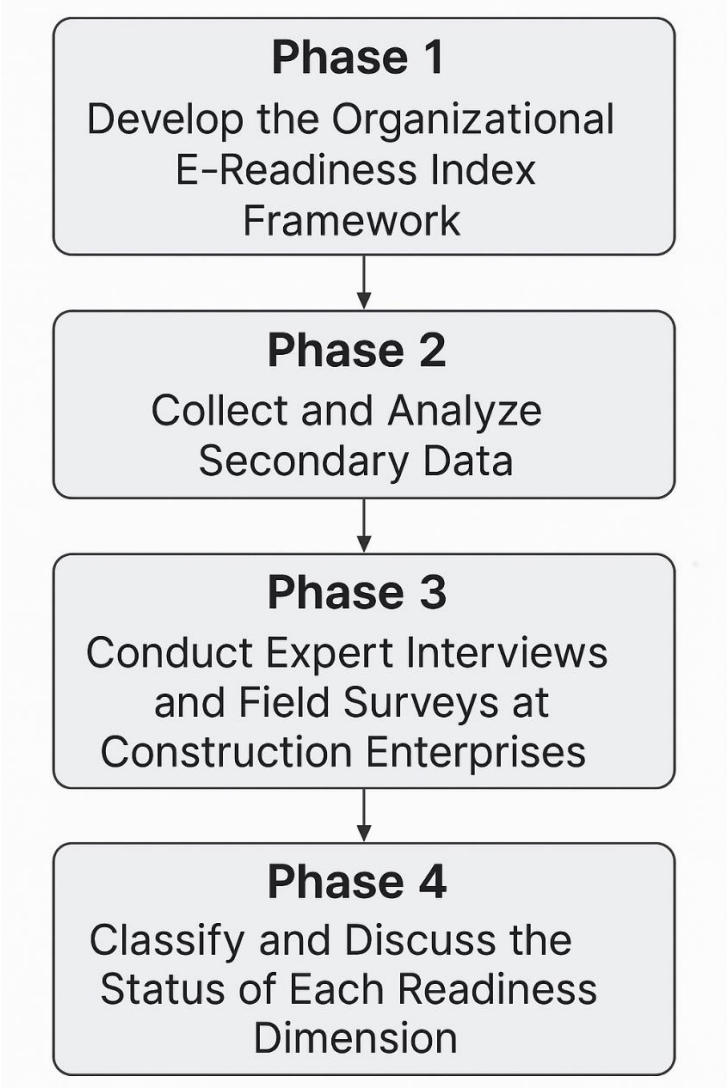

Figure 2.
Stages in Developing the Organizational E-Readiness Assessment Framework.

Within the scope of this study, the findings are exploratory and primarily intended to provide a preliminary foundation for building the assessment framework. In subsequent research, the author plans to conduct a large-scale survey and validate the reliability of the proposed measurement scale using Exploratory Factor Analysis (EFA) and Structural Equation Modeling (SEM).

4. Preliminary Discussion of Key Organizational Dimensions

Based on preliminary survey findings and expert interviews in the construction sector, the four dimensions in the proposed E-Readiness model reveal significant disparities among firms in terms of their ability to access and implement electronic bidding systems. Organizational readiness reflects not only differences in technical capacity but also variations in institutional maturity, spanning from human resource development to internal process standardization and leadership culture. These dimensions are not isolated; rather, they are interdependent and form a cohesive organizational system that is unique to each enterprise.

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Technological infrastructure, the first dimension under consideration, demonstrates a clear asymmetry between larger and smaller firms. While most enterprises possess basic facilities such as computers, internet connectivity, and digital signatures, only a minority have implemented specialized software to assist with bid preparation, document management, or error checking. Enterprises that have participated in Official Development Assistance (ODA) projects or receive foreign investment often integrate technology into long-term strategies. In contrast, smaller local firms tend to invest at the minimum level required to meet legal compliance. This results in continued reliance on manual processes, which increases the risk of technical errors and reduces efficiency when engaging with the national e-GP system. Maepa, et al. [16] confirmed a strong correlation between IT investment and the effectiveness of bid submission [16]. Notably, regulatory inconsistencies - such as those between the 2023 Bidding Law and implementation guidelines like Circular No. 08/2022/TT-BKHĐT-create further complications for enterprises seeking appropriate technological solutions.

Human resources and training represent the most differentiated dimension across firms. Nearly half of the surveyed enterprises do not have a dedicated e-bidding unit, leading to staff working in dual roles and lacking sufficient digital skills. The absence of structured training programs results in procedural inconsistencies, particularly in critical steps such as file encryption, digital signing, and electronic document handling. Some firms are unaware of government-provided training opportunities or lack the financial resources to participate. Van Tam, et al. [6] found that technical errors, rather than construction-related competencies, are the leading cause of e-bid disqualification [6]. These insights highlight the need to design training programs that align with firms' varying readiness levels.

With respect to internal processes (PROC), many enterprises lack standardized procedures for bid preparation, including checklists, role definitions, and task assignments, resulting in excessive reliance on individual experience. Additionally, internal document management systems remain inconsistent between digital and physical formats. This is due, in part, to the absence of a unified legal framework for document retention standards, duration of archiving, and the legal validity of digitally signed technical documents. Furthermore, there are no clear guidelines on integrating hand-signed technical drawings into the digital submission workflow. As a result, many firms must print and scan files repeatedly, increasing the likelihood of submission errors. These issues not only pose operational risks when personnel changes occur but also limit the scalability of bidding activities. Affendy, et al. [15] proposed a "minimum effective process" framework as a viable solution for small construction enterprises [15]. Preliminary data also show that firms with internal manuals or documented procedures typically score 10–15% higher on E-Readiness indices than those without.

Organizational culture and leadership commitment form the final dimension - although difficult to quantify, it has a decisive influence on all other dimensions. Enterprises with proactive leadership - who remain informed of legal developments and actively support the adoption of e-bidding - demonstrate smoother implementation processes. In contrast, passive leaders often delay action until more detailed regulations are issued. The lack of coordination among laws, implementing decrees, and technical support tools has fostered a common culture of delay and inertia, impeding innovation. Naji, et al. [13] emphasize the role of leadership style at strategic level in digital transformation among construction firms [13] and Garengo and Betto [17] argue that organizational culture significantly shapes technological risk tolerance and innovation speed [17].

It is evident that legal barriers - including misalignment between primary legislation and sub-regulatory guidance, absence of formalized support tools, and gaps in handling hybrid documentation - have had a direct impact on all four dimensions of the E-Readiness framework. As such, assessments of organizational readiness must consider both endogenous capacity and exogenous institutional conditions, thereby enabling more targeted and realistic policy interventions.

Overall, firms with high readiness tend to simultaneously possess robust ICT foundations, specialized personnel, standardized internal workflows, and active leadership. Conversely, low-readiness firms face challenges across multiple dimensions. Identifying and analyzing the interplay of these organizational factors is not only academically meaningful but also provides a solid foundation for

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designing tiered policy support strategies. This approach enhances the efficiency of public assistance programs, prevents resource fragmentation, and promotes substantive digital transformation in the domain of construction bidding.

5. Policy Implications

Based on the practical findings and theoretical framework presented, promoting the effective and sustainable implementation of electronic bidding (e-bidding) in construction cannot rely solely on mandatory technological requirements. Rather, a comprehensive and synchronized policy ecosystem is needed - one that addresses organizational bottlenecks within enterprises. To achieve this, the policy system must shift from a one-size-fits-all approach to a tiered strategy, moving from general support to targeted interventions aligned with each enterprise's organizational readiness level.

A critical first step is the development and issuance of a specialized E-Readiness Index tailored to construction enterprises. This index should be built on quantitative foundations and structured along multiple dimensions that reflect key factors such as technological infrastructure, human resource capacity, process standardization, and leadership commitment. Clearly quantifying these dimensions will allow for the classification of enterprises into readiness levels - from low to high - thereby providing a scientific and objective basis for policy support. The Ministry of Finance (MOF) should serve as the coordinating agency, working in collaboration with the Ministry of Construction (MOC), industry associations, and technical universities to ensure comprehensiveness and practical relevance in the development of this index.

In parallel, training and capacity-building programs should be tailored to different tiers of enterprise readiness. For low-readiness firms, priority should be given to foundational skills, including system navigation on the e-GP platform, electronic submission procedures, troubleshooting, and cybersecurity. For firms with moderate readiness, training should focus on internal process governance, personnel delegation, and optimizing bidding performance. Enterprises with high readiness should receive advanced training oriented toward strategic thinking - such as building integrated management systems and adopting high-tech solutions like ERP, BIM, or big data analytics for digital contract and bid management. This tiered approach ensures optimal allocation of training resources, prevents fragmentation, and enhances enterprises' ability to absorb and apply knowledge effectively.

To enable internalization of digital processes, standardized toolkits must be provided. These should include standardized bidding/proposal templates, submission checklists, detailed user manuals for the e-GP system, and software to automate technical procedures. The dissemination of these toolkits should be carried out through construction-specific business support centers and integrated into national digital transformation initiatives. These tools not only help reduce time and errors in procedural execution but also form the basis for process alignment between enterprises and government systems.

Concurrently, public-private partnerships (PPPs) should be strengthened to facilitate knowledge and technology diffusion. Industry associations, specialized universities, and technology firms can collaborate to establish pilot models, offer consultancy services, and provide on-site training for small and medium-sized construction enterprises. This not only relieves pressure on public authorities but also fosters a dynamic knowledge-sharing network that is adaptable to local conditions and varying enterprise sizes.

Finally, the monitoring and feedback system should be designed to be dynamic and real-time. Periodic evaluations of e-bidding performance - particularly for new entrants or firms with high bid rejection rates - can help identify obstacles early and enable timely policy adjustments. Embedding feedback mechanisms directly into the e-GP system enhances transparency and enables government agencies to fine-tune policy design based on actual implementation conditions. From an organizational standpoint, this two-way feedback loop fosters a culture of continuous improvement and supports the development of a fair, efficient, and sustainable public procurement environment.

Overall, the supporting policy framework for e-bidding must shift its focus from "mandating compliance" to "empowering organizations", from "rigid uniformity" to "readiness-based flexibility", and

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from "technical enforcement" to "organizational capacity development". This is not only an immediate solution for legal compliance, but also a long-term strategy to enhance the competitiveness and adaptive capacity of Vietnam's construction enterprises in the digital era.

6. Conclusion

The implementation of electronic construction bidding under the 2023 Bidding Law is not merely a legal mandate but also a substantive test of the organizational capacity of construction enterprises. Drawing upon a preliminary survey and the theoretical E-Readiness framework, this study highlights substantial disparities in readiness levels across firms - particularly in areas such as human resources, internal processes, and organizational culture. To prepare for the full enforcement of mandatory e-bidding by 2025, several urgent actions must be prioritized:

First, conduct a comprehensive assessment of internal organizational capacity based on the four key E-Readiness dimensions: TECH (technological infrastructure), HR (human resources and training), PROC (internal process maturity), and CULT (organizational culture and leadership commitment). This forms the foundation for classifying firms by readiness level and designing tailored support interventions for each group.

Second, establish regional e-bidding support centers across Vietnam's three major economic zones (North, Central, and South). These centers should serve as hubs for consultancy, training, and technical assistance, particularly for small and medium-sized enterprises (SMEs). A tripartite collaboration between government agencies, industry associations, and technical universities is recommended to ensure both specialization and broad outreach.

Third, develop an open-access digital learning repository, including tutorial videos, step-by-step system guides, standardized bid document templates, and a comprehensive FAQ database. This open educational resource will empower firms to self-learn, self-assess, and reduce reliance on external service providers.

Fourth, promote a tripartite coordination mechanism in policy implementation: (1) Enterprises must take proactive steps to evaluate and enhance their internal capacities; (2) Industry associations should play a bridging role by disseminating best practices and facilitating peer learning; and (3) Government agencies must establish an enabling legal framework, provide practical support tools, and ensure transparent oversight. This approach not only aligns with Vietnam's institutional context but also enhances the effectiveness and efficiency of public support mechanisms.

Given the limited scale of the pilot study and its descriptive nature, this research serves primarily as a conceptual and methodological foundation. Future research should expand to large-scale surveys and employ quantitative methods to empirically validate the E-Readiness model. This will support the refinement of the assessment framework and provide stronger empirical evidence to inform policy formulation and enterprise-level interventions in the long term.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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