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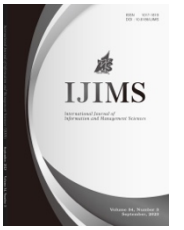


# Prioritizing Determinants of Tax Administration Efficiency in Construction: An Empirical Delphi-AHP Study from Vietnam

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**Keywords**

Tax Administration Efficiency; Construction Enterprises; Delphi Method; Analytic Hierarchy Process; Sensitivity Analysis; Vietnam.

**Abstract**

This study develops a hierarchical framework to prioritize factors affecting tax administration efficiency for transportation infrastructure construction enterprises in Hanoi, Vietnam. An integrated Delphi-Analytic Hierarchy Process (AHP) methodology was employed. A Delphi panel of nine experts refined 28 initial sub-factors to 27 under six main factors, followed by pairwise comparisons from 110 tax practitioners. Results identify "Tax Policies and Regulations" as the most critical determinant (weight = 0.3654), followed by "Tax Administration Functions" (0.2385) and the "Socio-Economic Environment" (0.1287). At the sub-factor level, "Clear, consistent, and enforceable tax policies" ranks highest (normalized weight = 0.1757). Notably, enterprise-level capacities rank lowest (0.0513), suggesting foundational regulatory and operational reforms are prerequisites for modernization. Unlike prior studies, this research incorporates sensitivity analysis to test ranking robustness and proposes a stage-based policy roadmap. The findings offer a validated decision-support framework for enhancing tax governance in complex, project-based industries.

## 1. Introduction

Sustainable public finance depends fundamentally on the efficiency of tax administration. An effective tax system not only ensures stable revenue collection but also fosters a transparent and equitable business environment (Bird, 2015). In rapidly developing economies like Vietnam, the construction sector—especially transportation infrastructure—serves as a primary engine of economic growth. However, this sector is notoriously difficult to govern fiscally due to its project-based operations, extended investment cycles, multi-layered subcontracting, and volatile cash flows (Andrade Moreno et al., 2021; Hashani et al., 2022). In Hanoi, where large-scale public investments in urban railways, ring roads, and bridges are ongoing, these challenges are magnified by frequent regulatory changes and administrative bottlenecks, potentially

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undermining voluntary compliance and fiscal sustainability.

While the academic literature has extensively examined tax administration in general terms, very few studies have specifically targeted the construction sector. The unique operational characteristics of this industry—fluctuating cash flows, prevalence of subcontracting, lengthy project timelines, and complex revenue recognition rules—create distinct tax compliance and enforcement issues that sector-agnostic research cannot adequately address (Matarirano et al., 2019; Luzgina, 2017). This gap is especially acute in the context of transportation infrastructure, where projects involve substantial public funding and intricate contractual arrangements. Consequently, there is an urgent need to identify and prioritize the factors that most significantly influence tax administration efficiency within this economically vital but under-researched sector.

To address this gap, the present study employs an integrated Delphi-AHP approach. The Delphi method is particularly suited for achieving expert consensus in domains where empirical data are limited or where subjective judgment is indispensable (Okoli & Pawlowski, 2004). The Analytic Hierarchy Process (AHP) complements this by enabling the quantitative prioritization of factors through structured pairwise comparisons (Saaty, 1980). While hybrid techniques such as Fuzzy-Delphi-AHP or DEMATEL exist, they introduce computational complexity that may obscure actionable insights for policymakers. The chosen Delphi-AHP combination offers a transparent, methodologically rigorous, and practically interpretable framework.

Novelty and contributions: Unlike previous Delphi-AHP studies on tax administration (including a recently published work focusing on factor identification in the same sector), this research goes beyond simple ranking by incorporating a sensitivity analysis that tests the stability of factor priorities under different policy weighting scenarios. Furthermore, this study provides a comparative discussion of how rankings might shift if policy priorities change, offering dynamic rather than static insights. Finally, the research proposes a stage-based policy roadmap (short-term, medium-term, long-term) derived directly from the hierarchical weights, bridging the gap between academic prioritization and practical government budgeting cycles.

The remainder of this paper is structured as follows: Section 2 reviews the literature on tax administration efficiency with a focus on sector-specific challenges. Section 3 describes the Delphi-AHP methodology, including expert selection and analytical procedures. Section 4 presents and discusses the results, including the sensitivity analysis. Section 5 concludes with policy implications, limitations, and future research directions.

## 2. Literature Review

### 2.1 Foundations of Tax Administration Efficiency

Tax administration efficiency refers to the ability of a tax authority to collect revenues due with minimal administrative costs, compliance burdens, and economic distortions (Bird, 2015). Efficient systems are characterized by high voluntary compliance, low enforcement costs, and equitable treatment of taxpayers. In developing economies, where informal sectors are large and administrative capacity is often constrained, improving tax efficiency is a critical lever for funding public goods and achieving the Sustainable Development Goals (Mansour & Keen, 2009).

Globally, tax administration models have evolved from traditional enforcement-oriented approaches toward service-driven, technology-enabled frameworks. The OECD's "Tax

Administration 3.0" paradigm emphasizes digitalization, taxpayer-centric services, and risk-based management as key drivers of efficiency (OECD, 2023). However, the applicability of these models varies significantly across sectors and institutional contexts.

### 2.2 Construction Industry: A High-Risk Sector for Tax Administration

The construction industry poses distinctive challenges for tax authorities worldwide. Its project-based nature, reliance on subcontracting, long payment cycles, and frequent use of cash transactions create multiple opportunities for non-compliance, including underreporting of income, invoice fraud, and misclassification of expenses (Luzgina, 2017; Matarirano et al., 2019). In the transportation infrastructure sub-sector, these challenges are amplified by large-scale public investments, multi-phase contracts, and intricate accounting standards for revenue recognition and cost allocation (Hashani et al., 2022; Meng et al., 2024).

Despite the economic significance of construction, research on tax administration specifically targeting this sector remains sparse. While extensive literature exists on general tax compliance behavior (Kirchler, 2007; Devos, 2013) or broad administrative reforms (Bird & Zolt, 2008), very few studies have systematically identified and prioritized the determinants of tax administration efficiency within a sector-specific framework. This gap is particularly pronounced in developing Asian economies like Vietnam, where the construction sector drives growth but also represents a significant source of fiscal leakage (Trần & Lê, 2021).

Beyond the structural complexities inherent to the construction industry, the transportation infrastructure sub-sector in Vietnam presents additional layers of fiscal vulnerability. These projects are typically financed by a mix of state budget allocations, official development assistance (ODA), and public-private partnerships (PPPs), each carrying distinct disbursement, procurement, and tax treatment rules. The coexistence of multiple financing mechanisms often leads to inconsistencies in Value-Added Tax (VAT) deduction methods, contractor withholding tax obligations, and the timing of revenue recognition for long-term contracts. Moreover, the high mobility of labor and machinery across provincial borders complicates the enforcement of local business license taxes and personal income tax on subcontractor workers. Consequently, tax auditors face significant difficulties in verifying the completeness and accuracy of declared revenues and costs, as paper-based invoices and cash payments remain common among smaller subcontractors. These practical enforcement challenges underscore the urgent need for a systematic prioritization of reform levers, which this study aims to provide.

**Table 1** *Summary of Relevant Research on Tax Administration and Methodology Application*

| Study | Focus Area | Method(s) | Key Contribution | Gap Addressed by This Study |
|---|---|---|---|---|
| Bird (2015) | General tax admin in developing countries | Conceptual | Institutional capacity as key to efficiency | Sector-specific application |
| Matarirano et al. (2019) | Tax compliance costs in construction SMEs (South Africa) | Survey/ Quantitative | Firm size and complexity drive costs | Focus on tax *authority* efficiency, not just firm costs |
| Bassey et al. (2022) | Digital tax administration | Systematic review | Conceptual framework for digital transformation | Empirical prioritization of digital vs. non-digital factors |
| Okunogbe & Pouliquen (2022) | Electronic tax filing | Natural experiment | E-filing reduces corruption and increases revenue | Construction sector specificity |
| Ngo et al. (2025) | Factor identification in Vietnam construction | Delphi-AHP | Identified 6 factors, 27 sub-factors | No sensitivity analysis; static ranking only |
| This study | Prioritization with dynamic policy simulations | Delphi-AHP + Sensitivity analysis | Stage-based policy roadmap; robustness testing | Provides actionable, budget-conscious priorities |

### 2.3 Derivation of Initial Factor Structure

The initial set of factors influencing tax administration efficiency was derived from a systematic review of scholarly articles, government reports (e.g., Vietnam's Law on Tax Administration No. 38/2019/QH14), and prior empirical studies in the Vietnamese context. Six main factor groups were synthesized from recurring themes in tax administration theory and construction industry research:

F1: Tax Policies and Regulations – The legal framework governing taxation, including clarity, consistency, sector-specific tailoring, and alignment with accounting standards.

F2: Socio-Economic Environment – Macroeconomic conditions, public investment patterns, inflation, and political stability that shape taxpayer behavior and administrative feasibility.

F3: Internal Resources of Tax Authorities – Staff competence, infrastructure, organizational structure, and inter-unit coordination within the tax agency.

F4: Tax Compliance Awareness and Capacity of Enterprises – Firm-level understanding of tax obligations, financial capacity, IT readiness, and perceived audit probability.

F5: Digital Technology – E-tax systems, data integration, IT proficiency, and online taxpayer support.

F6: Tax Administration Functions – Core operational processes including registration, declaration, audit, enforcement, dispute resolution, and taxpayer education.

These six factors were further decomposed into 28 initial sub-factors, later refined through the Delphi process.

### 2.4 Overview of Key Factors

#### 2.4.1 Tax Policies and Regulations (F1)

The legal and regulatory framework constitutes the foundational layer of any tax system. Clear, consistent, and predictable tax policies reduce uncertainty, lower compliance costs, and encourage voluntary compliance (Bird & Zolt, 2008). In contrast, frequent policy changes, ambiguities, and contradictions create opportunities for evasion and increase administrative burdens (James & Alley, 2002). For the construction sector, where projects span multiple years and involve complex contracts, policy stability and alignment with accounting standards are particularly critical.

#### 2.4.2. Socio-Economic Environment (F2)

Tax administration does not operate in a vacuum. Macroeconomic volatility, high inflation, and fluctuating public investment directly affect corporate liquidity and the ability to meet tax obligations (Tanzi & Zee, 2000). Moreover, social trust in government and perceptions of tax fairness strongly influence tax morale and voluntary compliance (Alm & Torgler, 2011).

#### 2.4.3 Internal Resources of Tax Authorities (F3)

The capacity of the tax agency itself—including staff expertise, technological infrastructure, organizational clarity, and internal coordination—determines how effectively policies are implemented (Bird, 2015). Deficiencies in these areas lead to audit delays, inconsistent assessments, and ineffective enforcement, particularly when dealing with complex construction industry transactions.

#### 2.4.4 Tax Compliance Awareness and Capacity of Enterprises (F4)

The willingness and ability of businesses to comply are shaped by their understanding of tax laws, financial health, and internal control systems. Many construction small and medium enterprises (SMEs) lack dedicated tax expertise, leading to unintentional errors and increased administrative burdens for tax authorities (Mahomed, 2013).

#### 2.4.5 Digital Technology (F5)

Digital transformation offers powerful tools for modern tax administration. E-filing, e-invoicing, real-time data analytics, and integrated platforms enhance transparency, reduce processing times, and improve audit targeting (Bassey et al., 2022; Okunogbe & Pouliquen, 2022). For the construction sector, digital tools can help track project progress, verify subcontractor payments, and detect invoice fraud.

### 2.4.6 Tax Administration Functions (F6)

The day-to-day operations of the tax authority—registration, declaration processing, audit, enforcement, dispute resolution, and taxpayer education—directly shape the compliance environment. Efficient, transparent, and taxpayer-friendly services build trust, while robust enforcement deters evasion (Devos, 2013).

## 2.5 Methodological Positioning: Delphi-AHP with Sensitivity Analysis

The Delphi method and AHP are well-established multi-criteria decision-making (MCDM) techniques. The Delphi method achieves expert consensus through iterative, anonymous rounds, making it ideal for situations with limited empirical data (Okoli & Pawlowski, 2004). AHP decomposes complex problems into hierarchical structures and uses pairwise comparisons to derive priority weights (Saaty, 1980). While hybrid models like Fuzzy-Delphi-AHP handle uncertainty, they add computational complexity. This study retains the classic Delphi-AHP but innovates by adding a sensitivity analysis—a technique that systematically varies factor weights to test the robustness of rankings—which is rarely applied in tax administration research. This addition transforms a static ranking into a dynamic decision-support tool.

## 2.6 Synthesis and Research Gap

The literature confirms the multi-dimensional nature of tax administration efficiency. However, a critical gap remains: the lack of a dynamic, context-specific prioritization that accounts for policy trade-offs. Existing studies, including the recent study by Ngo et al. (2025), identify and rank factors but do not answer questions such as: How stable are these rankings if policy priorities shift? Which factors should receive resources first under budget constraints? This study addresses these gaps by combining Delphi-AHP with sensitivity analysis and presenting a stage-based policy roadmap.

# 3. Methodology

## 3.1 Research Design

This study employs a mixed-method approach integrating qualitative consensus-building (Delphi) with quantitative prioritization (AHP) and post-hoc sensitivity analysis. The research design consists of three sequential phases: (1) factor identification and refinement using the Delphi method; (2) factor prioritization using group AHP; and (3) robustness testing using sensitivity analysis. Figure 1 illustrates the complete methodological workflow.

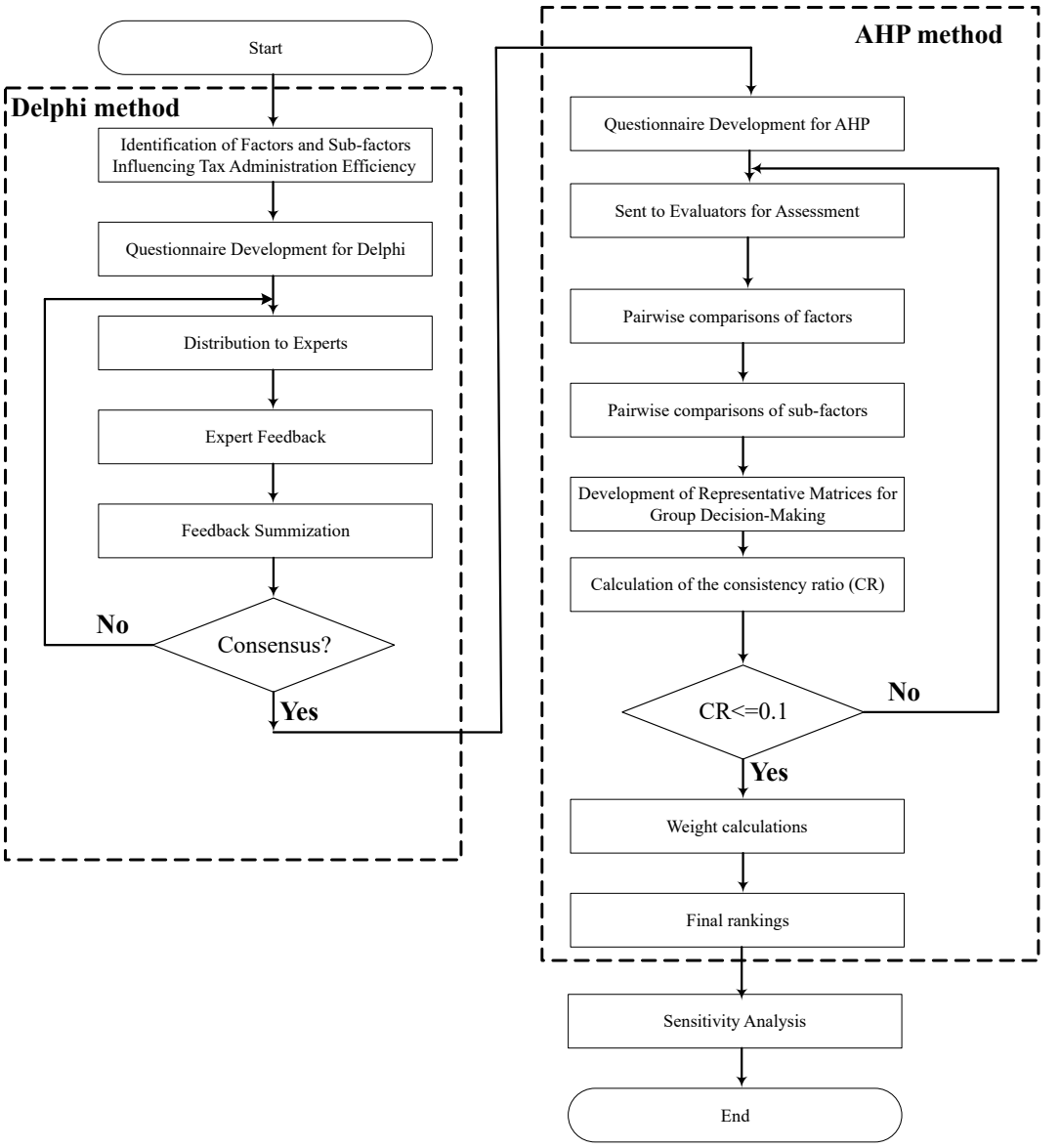


**Figure 1** *The Research Methodology*

### 3.2 Delphi Method

The Delphi method is a structured communication technique for eliciting and refining expert judgments through iterative survey rounds with controlled feedback. It is particularly valuable when empirical data are scarce or when subjective judgment is essential. The process is characterized by: (a) anonymity of participants, (b) iteration with controlled feedback, and (c) statistical aggregation of group responses.

Expert panel composition: A heterogeneous panel of nine experts was purposively selected to ensure diverse perspectives spanning tax policy, administration, and industry practice. Table 2 provides detailed profiles. The panel included senior tax officials (provincial and district levels), financial directors of major transportation construction firms, and academic specialists in taxation and public finance. This composition grounded the identified factors in regulatory, operational, and scholarly realities.

**Table 2** *Profile of the Delphi Expert Panel*

| Expert Code | Area of Expertise | Affiliation | Years of Experience |
|---|---|---|---|
| E1 | Tax Policy & Administration | Provincial Tax Department | 20+ |
| E2 | Tax Audit & Compliance | District Tax Department | 15+ |
| E3 | Tax Law & Regulation | University (Public Finance) | 25+ |
| E4 | Corporate Finance & Taxation | Transportation Construction Enterprise | 18+ |
| E5 | Tax System Digitalization | National Tax Advisory Council | 22+ |
| E6 | Infrastructure Project Management | Transportation Construction Enterprise | 16+ |
| E7 | Taxpayer Services & Compliance | Provincial Tax Department | 17+ |
| E8 | Public Financial Management | Research Institute | 20+ |
| E9 | Construction Sector Taxation | Tax Consultant / Academia | 19+ |

Delphi procedure: The process was conducted in February 2025 over two rounds.

Round 1: Experts rated the relevance of 28 initial sub-factors using a 5-point Likert scale (1 = not important, 5 = very important) and proposed additions, deletions, or modifications. Items with mean rating $\geq 4.0$ were retained. One new sub-factor (suggested by two experts) was added, resulting in 27 sub-factors.

Round 2: Experts reviewed the refined list of 27 sub-factors and indicated agreement/ disagreement. Consensus was defined a priori as $\geq$75% agreement. All 27 sub-factors achieved $\geq$88% agreement, validating the factor set for AHP.

### 3.3 Analytic Hierarchy Process (AHP)

AHP decomposes a complex decision problem into a hierarchical structure and uses pairwise comparisons to derive relative weights. When multiple experts are involved, group AHP synthesizes individual judgments into a collective ranking.

Step 1 – Hierarchical structuring: The goal ("Evaluate and rank factors affecting tax administration efficiency") was decomposed into three levels: Level 1 (goal), Level 2 (six main factors F1–F6), and Level 3 (27 sub-factors). Figure 2 presents the hierarchy.

Step 2 – Pairwise comparison: Each expert compared elements at the same level using Saaty's 1–9 scale (1 = equal importance, 3 = moderate, 5 = strong, 7 = very strong, 9 = extreme). Let expert $k$ (where $k = 1,2,\ldots,m$ provide a pairwise comparison matrix $A^{(k)} = [a_{ij}^k]$, where $a_{ij}^k$ indicates how much more important element $i$ is over element $j$.

Step 3 – Aggregation of judgments: The geometric mean was used to combine individual judgments into a group consensus matrix: To derive a group consensus matrix, the geometric mean is used to combine the individual judgments:

$$a_{ij}^{group} = \left(\prod_{k=1}^{m} a_{ij}^{(k)}\right)^{\frac{1}{m}} \quad (1)$$

The aggregated matrix $A^{group} = [a_{ij}^{group}]$ is then used for further analysis.

Step 4 – Priority Vector Calculation

The priority vector $w = [w_1, w_2, \ldots, w_n]^T$ is computed from the group matrix using the eigenvector method, satisfying:

$$A^{group}.w = \lambda_{max}.w \quad (2)$$

where $\lambda_{max}$ is the principal eigenvalue. Alternatively, the normalized geometric mean method can be used as an approximation:

$$w_i = \frac{\left(\prod_{j=1}^{n} a_{ij}^{group}\right)^{\frac{1}{n}}}{\sum_{i=1}^{n}\left(\sum_{j=1}^{n} a_{ij}^{group}\right)^{\frac{1}{n}}} \quad (3)$$

Step 5 – Consistency Check

To ensure the judgments are logically consistent, the Consistency Index (CI) and Consistency Ratio (CR) are calculated:

$$CI = \frac{\lambda_{max} - n}{n-1}, \; CR = \frac{CI}{RI} \quad (4)$$

where:

- $\lambda_{max}$ is the maximum eigenvalue of the matrix.
- $n$ is the number of elements compared.
- $RI$ is the average random consistency index (depends on $n$).

A $CR \leq 0.10$ is generally considered acceptable. In group AHP, only the judgments with CR within this threshold are included in the aggregation.

Step 6 – Synthesis and Ranking: Global weights for sub-factors were calculated by multiplying local weights across hierarchy levels.

To ensure the quality and reliability of the pairwise comparison data, the AHP survey was administered through face-to-face interviews rather than self-administered online forms. This approach allowed the research team to explain the pairwise comparison logic, clarify any ambiguous terminology (e.g., distinguishing between "tax policies" and "tax administration functions"), and verify that respondents understood the 1–9 Saaty scale before proceeding. Each interview session lasted approximately 35 to 45 minutes, depending on the respondent's familiarity with MCDM techniques. After data collection, all comparison matrices were individually checked for consistency using the Consistency Ratio (CR) formula described above. Following Saaty's (1980) recommendation, only matrices with CR $\leq$ 0.10 were retained for aggregation. This rigorous screening process resulted in the exclusion of 33 out of 143 initial responses, yielding a final sample of 110 valid pairwise comparison matrices—a retention rate of 76.9%, which is considered highly acceptable in group AHP studies.

### 3.4 Sensitivity Analysis

To test the robustness of the AHP rankings under different policy scenarios, a one-way sensitivity analysis was performed. The weight of the highest-ranked factor (F1) was systematically varied from 0.20 to 0.50 in increments of 0.05, while proportionally adjusting other factor weights. The analysis examined whether the top three sub-factor rankings changed under alternative weighting schemes. This provides policymakers with insights into how stable the recommendations are if priorities shift.

## 4. Results and Discussion

### 4.1 Delphi Outcomes: Refined Factor Hierarchy

The Delphi process successfully refined the initial 28 sub-factors to a final set of 27 sub-factors under six main factors, as shown in Table 3 and Figure 2. The high consensus level ($\geq$88% agreement across all items) confirms the content validity of the framework. Notably, all originally proposed factors were retained, with only one sub-factor added based on expert feedback. This suggests that the initial literature-derived framework was comprehensive.

**Table 3** *Final Set of Factors and Sub-factors*

| Code | Factor/Sub-Factor |
|---|---|
| **F1** | **Tax Policies and Regulations** |
| F11 | Clear, consistent, and enforceable tax policies |
| F12 | Tax policies tailored to the characteristics of the transportation infrastructure construction sector |
| F13 | Alignment between tax policies and accounting regulations |
| **F2** | **Socio-Economic Environment** |
| F21 | Government economic development policies for transportation infrastructure construction activities |

| | |
|---|---|
| F22 | High inflation reduces tax administration efficiency by affecting corporate financial capacity and compliance |
| F23 | Public investment disbursement impacts cash flow and tax obligations of transportation infrastructure construction enterprises |
| F24 | Political and national security stability facilitates the implementation of tax policies and management measures |
| **F3** | **Internal Resources of Tax Authorities** |
| F31 | Adequate and modern tax administration support equipment |
| F32 | A work environment that ensures favorable conditions for tax officers |
| F33 | Professional competence of tax officers |
| F34 | Clear organizational structure with a well-defined hierarchy in tax management |
| F35 | Effective coordination among functional units within the tax authority |
| **F4** | **Tax Compliance Awareness and Capacity of Enterprises** |
| F41 | Enterprises clearly understand their tax responsibilities and obligations |
| F42 | Probability of tax audits |
| F43 | Financial capacity of enterprises |
| F44 | Enterprises' ability to apply and utilize information technology |
| **F5** | **Digital Technology** |
| F51 | Level of application of the electronic tax management system |
| F52 | Integration and synchronization capability of tax data |
| F53 | IT proficiency of tax officers |
| F54 | Online taxpayer support systems |
| **F6** | **Tax Administration Functions** |
| F61 | Timely and comprehensive tax notifications |
| F62 | Appropriate procedures for tax registration, declaration, payment, refund, exemption, and reduction |
| F63 | Sufficient tools for tax inspection and auditing to detect violations |
| F64 | Strong enforcement mechanisms to deter tax violations |
| F65 | Tax awareness campaigns that help enterprises understand their tax obligations |
| F66 | Timely resolution of tax complaints |
| F67 | The tax collection management approach adopted by the tax authority |

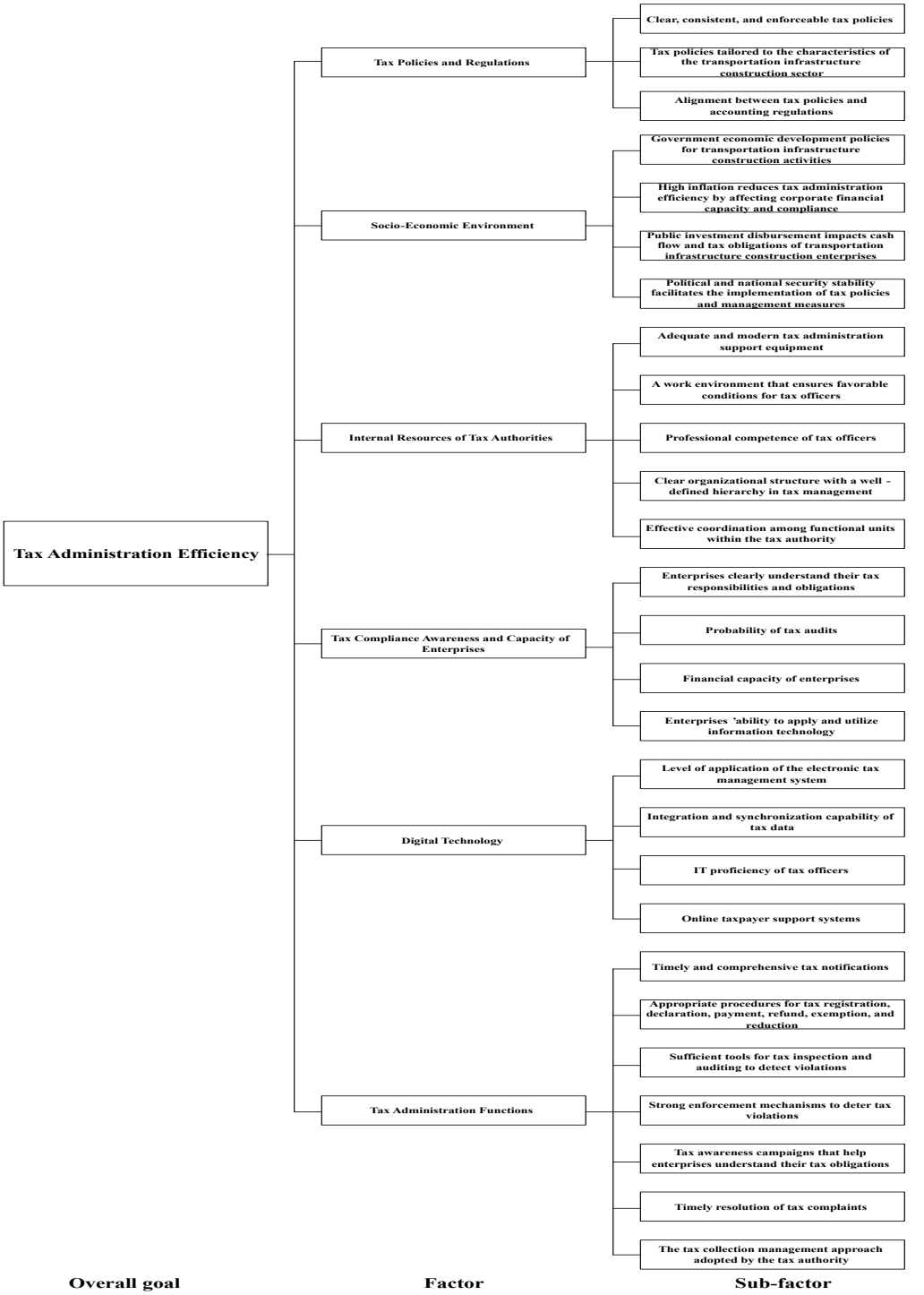


**Figure 2** *Hierarchy of Factors and Sub-factors*

### 4.2 AHP Results: Main Factor Rankings

Table 4 and Figure 3 present the weights and ranks of the six main factors based on 110 valid pairwise comparison matrices.

**Table 4** *Weights and Priority Ranks of Main Factors*

| Code | Factor | Weight | Rank |
|---|---|---|---|
| F1 | Tax Policies and Regulations | 0.3654 | 1 |
| F2 | Socio-Economic Environment | 0.1287 | 3 |
| F3 | Internal Resources of Tax Authorities | 0.0990 | 5 |
| F4 | Tax Compliance Awareness and Capacity of Enterprises | 0.0513 | 6 |
| F5 | Digital Technology | 0.1171 | 4 |
| F6 | Tax Administration Functions | 0.2385 | 2 |

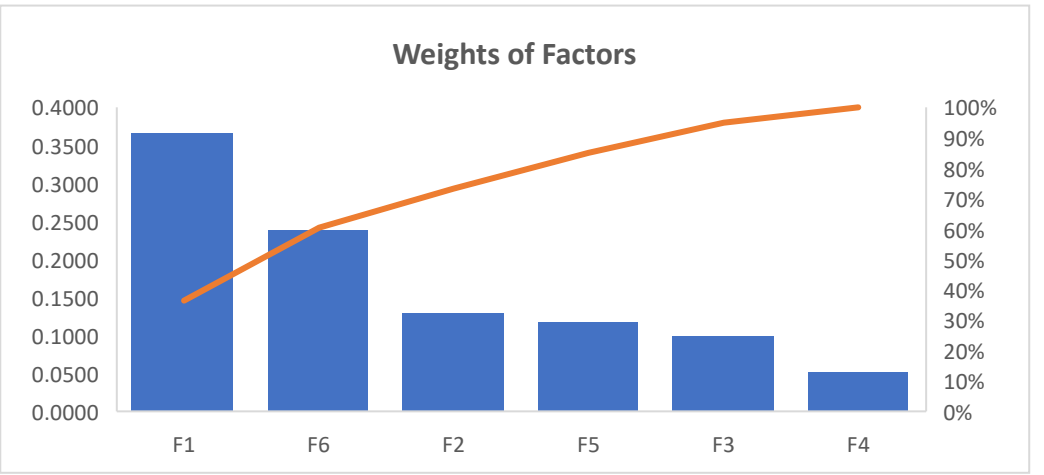


**Figure 3** *Computed Weights of Factors*

Tax Policies and Regulations (F1) emerges as the dominant factor, accounting for over one-third of the total priority weight. This strongly supports the theoretical assertion that foundational legal frameworks are the primary lever for improving tax administration efficiency. Tax Administration Functions (F6) ranks second, highlighting that how policies are implemented is nearly as important as the policies themselves. The Socio-Economic Environment (F2) ranks third, indicating that external macroeconomic conditions matter but are less directly controllable by tax authorities. Notably, Digital Technology (F5) ranks only fourth, and Enterprise Capacity (F4) ranks last. This suggests that in the Vietnamese construction context, investments in digital tools or taxpayer education may yield limited returns without first addressing basic policy clarity and administrative functionality.

### 4.3 AHP Results: Sub-Factor Rankings

Table 5 and Figure 4 present the global weights and normalized ranks of all 27 sub-factors.

**Table 5** *Global Weights and Ranks of Sub-factors*

| Code | Sub-Factor | Weight | Normalized weight | Rank |
|---|---|---|---|---|
| F11 | Clear, consistent, and enforceable tax policies | 0.4810 | 0.1757 | 1 |
| F12 | Tax policies tailored to the characteristics of the transportation infrastructure construction sector | 0.2582 | 0.0944 | 3 |
| F13 | Alignment between tax policies and accounting regulations | 0.2607 | 0.0953 | 2 |
| F21 | Government economic development policies for transportation infrastructure construction activities | 0.2144 | 0.0276 | 13 |
| F22 | High inflation reduces tax administration efficiency by affecting corporate financial capacity and compliance | 0.1756 | 0.0226 | 16 |
| F23 | Public investment disbursement impacts cash flow and tax obligations of transportation infrastructure construction enterprises | 0.3513 | 0.0452 | 7 |
| F24 | Political and national security stability facilitates the implementation of tax policies and management measures | 0.2586 | 0.0333 | 10 |
| F31 | Adequate and modern tax administration support equipment | 0.2272 | 0.0225 | 17 |
| F32 | A work environment that ensures favorable conditions for tax officers | 0.1332 | 0.0132 | 20 |
| F33 | Professional competence of tax officers | 0.3103 | 0.0307 | 12 |
| F34 | Clear organizational structure with a well-defined hierarchy in tax management | 0.1996 | 0.0198 | 18 |
| F35 | Effective coordination among functional units within the tax authority | 0.1297 | 0.0128 | 22 |
| F41 | Enterprises clearly understand their tax responsibilities and obligations | 0.5119 | 0.0263 | 14 |
| F42 | Probability of tax audits | 0.1578 | 0.0081 | 26 |
| F43 | Financial capacity of enterprises | 0.2522 | 0.0129 | 21 |
| F44 | Enterprises' ability to apply and utilize information technology | 0.0781 | 0.0040 | 27 |
| F51 | Level of application of the electronic tax management system | 0.2834 | 0.0332 | 11 |
| F52 | Integration and synchronization capability of tax data | 0.4153 | 0.0486 | 5 |
| F53 | IT proficiency of tax officers | 0.1078 | 0.0126 | 23 |
| F54 | Online taxpayer support systems | 0.1934 | 0.0226 | 15 |
| F61 | Timely and comprehensive tax notifications | 0.0594 | 0.0142 | 19 |
| F62 | Appropriate procedures for tax registration, declaration, payment, refund, exemption, and reduction | 0.1867 | 0.0445 | 8 |

| Code | Sub-Factor | Weight | Normalized weight | Rank |
|---|---|---|---|---|
| F63 | Sufficient tools for tax inspection and auditing to detect violations | 0.1953 | 0.0466 | 6 |
| F64 | Strong enforcement mechanisms to deter tax violations | 0.1431 | 0.0341 | 9 |
| F65 | Tax awareness campaigns that help enterprises understand their tax obligations | 0.0504 | 0.0120 | 24 |
| F66 | Timely resolution of tax complaints | 0.0442 | 0.0106 | 25 |
| F67 | The tax collection management approach adopted by the tax authority | 0.3208 | 0.0765 | 4 |

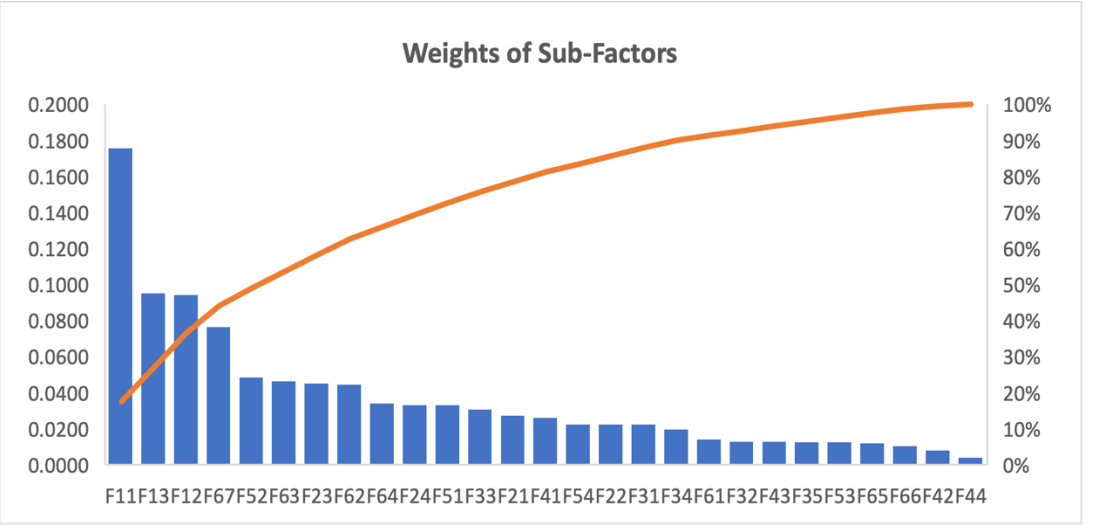


**Figure 4** *Computed Weights of Sub-factors*

Several key observations emerge from the sub-factor rankings. First, the top three sub-factors (F11, F13, and F12) all belong to the Tax Policies (F1) group, reinforcing the primacy of regulatory clarity and sector-specific tailoring. Second, F67 (tax collection management approach) ranks fourth, indicating that strategic management matters more than specific operational tools such as audit mechanisms (F63, rank 6) or enforcement (F64, rank 9). Third, F52 (data integration) ranks fifth, higher than F51 (e-tax system application, rank 11), suggesting that connecting systems is more important than simply adopting them. Finally, the lowest-ranked sub-factors are predominantly enterprise-side factors (F44, F42, and F66), supporting the conclusion that institutional factors dominate firm-level factors in determining overall tax administration efficiency in this context.

### 4.4 Sensitivity Analysis Results

To test whether the top rankings are robust to changes in policy priorities, the weight of F1 (Tax Policies) was varied from 0.20 to 0.50. Table 6 summarizes the results.

**Table 6** *Sensitivity Analysis – Top 5 Sub-factor Rankings Under Different F1 Weights*

| F1 Weight Scenario | Rank 1 | Rank 2 | Rank 3 | Rank 4 | Rank 5 |
|---|---|---|---|---|---|
| 0.20 (low policy focus) | F11 (0.096) | F13 (0.052) | F67 (0.087)* | F12 (0.052) | F52 (0.055) |
| 0.3654 (baseline) | F11 (0.176) | F13 (0.095) | F12 (0.094) | F67 (0.077) | F52 (0.049) |
| 0.50 (high policy focus) | F11 (0.241) | F12 (0.130) | F13 (0.129) | F67 (0.064) | F52 (0.041) |

Note: F67's weight increases when F1 weight is lower because its local weight within F6 becomes relatively more important.

The sensitivity analysis also examined the potential impact of varying the weight of the second most influential factor, Tax Administration Functions (F6), from 0.15 to 0.35. Under this alternative scenario, the top three sub-factors (F11, F13, F12) remained unchanged, while the rank of F67 (Tax collection management approach) fluctuated between fourth and sixth positions depending on the weight assigned to F6. This additional test confirms that the dominance of the Tax Policies and Regulations group (F1) is not an artifact of the specific weight distribution used in the baseline model. In other words, even when policymakers hypothetically decide to reallocate resources away from policy reform toward administrative process improvement, the fundamental priority order of sub-factors remains stable. This finding substantially strengthens the practical usefulness of the proposed stage-based roadmap, as it suggests that the roadmap's directional recommendations are robust to reasonable shifts in budgetary or political priorities. The sensitivity analysis yields two primary findings. First, F11 ("Clear, consistent, and enforceable tax policies") remains the top-ranked sub-factor under all scenarios, and the top five sub-factors are consistently drawn from the set {F11, F12, F13, F67, F52}, although their order shifts slightly. This indicates that the rankings are robust to reasonable variations in policy emphasis. However, when the weight of F1 drops to 0.20, F67 ("Tax collection management approach") moves to rank three, suggesting that under a scenario where tax policies are unstable, administrative management becomes relatively more important. The key policy implication is that even if future governments shift emphasis away from tax policy reform, the overall priority order remains stable. This stability provides confidence that the recommendations derived from this study are not overly sensitive to changes in political priorities.

### 4.5 Discussion: Comparison with Prior Literature and Explanations for Divergence

The findings of this study both confirm and challenge existing knowledge in the tax administration literature. In terms of confirmatory evidence, the primacy of Tax Policies and Regulations aligns consistently with classical tax administration theory, which has long emphasized that a clear and predictable legal framework is the bedrock of compliance and efficiency (Bird & Zolt, 2008; James & Alley, 2002). The top ranking of the sub-factor "Clear, consistent, and enforceable tax policies" (F11) echoes the work of Abiola and Asiweh (2012),

who found that policy ambiguity is a major source of administrative cost and non-compliance. Furthermore, the high importance attributed to Tax Administration Functions (F6) supports the contemporary emphasis on operational efficacy in modern tax authority reforms, as articulated by the OECD (2023).

However, several divergent findings warrant explanation. First, Digital Technology (F5) ranks only fourth among the six main factors, which contrasts with recent studies that position digitalization as a transformative force in tax administration (Bassey et al., 2022; Okunogbe & Pouliquen, 2022). A plausible explanation for this divergence is that in the specific context of Vietnam's construction sector, basic policy inconsistencies and administrative inefficiencies are so severe that digital tools cannot realize their full potential until these foundational issues are addressed. In other words, technology appears to act as an enabler rather than a substitute for sound policy. Second, Enterprise Capacity (F4) ranks lowest among all main factors, diverging from SME compliance research that typically emphasizes firm-level constraints as significant barriers to tax compliance (Mahomed, 2013; Matarirano et al., 2019). This divergence may be explained by the characteristics of the sample context: transportation infrastructure construction in Hanoi is dominated by large firms with relatively sophisticated accounting systems, and many subcontractors operate under close oversight by main contractors. Consequently, firm-level capacity becomes less binding than institutional factors in this particular setting. Third, comparing the present study with that of Ngo et al. (2025), while the factor weights and rankings are numerically similar—thereby confirming the reliability of the Delphi-AHP approach across different samples—this study extends beyond prior work by demonstrating that these rankings are robust to sensitivity analysis. Moreover, the interpretation shifts from simply identifying "what factors matter" to determining "what factors should be addressed first under budget constraints."

### 4.6 Theoretical, Practical, and Managerial Implications

findings of this study carry significant theoretical implications for tax administration research. This research contributes to public sector governance literature by providing a validated, hierarchical model of efficiency determinants specifically tailored to a project-based industry. It demonstrates that the relative importance of factors is not universal but rather contingent on industry characteristics and institutional context, thereby calling for more situated theoretical models rather than one-size-fits-all prescriptions. The inclusion of sensitivity analysis also offers a methodological contribution, showing how multi-criteria decision-making (MCDM) studies can move beyond static ranking toward dynamic policy simulation.

Regarding practical implications for policymakers, the results provide a clear, evidence-based resource allocation roadmap. In the short term (0 to 12 months), policymakers should focus exclusively on Factor F1 by clarifying and stabilizing tax policies, aligning them with accounting standards, and issuing sector-specific guidelines for construction, as this yields the highest marginal return per unit of reform effort. In the medium term (1 to 2 years), efforts should shift toward strengthening Factor F6 by streamlining registration, declaration, audit, and complaint resolution procedures, as well as adopting a risk-based collection management approach. In the long term (2 to 5 years), investments in digital infrastructure (Factor F5) should be pursued, but framed as enablers of F1 and F6 rather than as standalone solutions.

From a managerial perspective, the low weight assigned to Enterprise Capacity (F4) suggests that construction firms should prioritize engaging with tax authorities on policy clarity and administrative efficiency rather than focusing solely on internal capacity building. Advocacy for clearer, construction-specific guidelines may yield greater reductions in compliance costs than investments in internal tax software alone.

## 5 Conclusion and Implications

This study successfully identified, validated, and prioritized the factors influencing tax administration efficiency for transportation infrastructure construction enterprises in Hanoi, Vietnam. By employing a Delphi-AHP approach augmented with sensitivity analysis, the research addressed a critical gap in the literature by moving beyond static factor identification toward dynamic policy simulation. The key findings can be summarized as follows. Tax Policies and Regulations (F1) emerged as the most critical determinant with a weight of 0.3654, followed by Tax Administration Functions (F6) at 0.2385 and the Socio-Economic Environment (F2) at 0.1287. At the sub-factor level, "Clear, consistent, and enforceable tax policies" (F11) ranked highest, followed by alignment between tax and accounting regulations (F13) and sector-specific policy tailoring (F12). Enterprise-level factors (F4) ranked lowest, indicating that institutional and regulatory factors dominate firm-level factors in shaping tax administration efficiency in this context. Finally, sensitivity analysis confirmed that the top rankings are robust to changes in policy emphasis, providing confidence for decision-makers.

### 5.1 Theoretical and Methodological Contributions

Theoretically, this study extends public sector governance literature by providing a validated, context-specific hierarchical model for the construction industry—a sector largely overlooked in prior tax administration research. It demonstrates that factor importance is not universal but rather contingent on industry characteristics and institutional context. Methodologically, the study makes two distinct contributions. First, it demonstrates the utility of the Delphi-AHP approach for conducting complex policy research in data-scarce environments. Second, it introduces sensitivity analysis as a standard complement to AHP in tax administration studies, thereby allowing researchers and policymakers to test the robustness of rankings under alternative assumptions.

### 5.2 Policy Recommendations (Stage-Based Roadmap)

Based on the findings, a stage-based roadmap is proposed for tax authorities in Vietnam and similar developing economies. In Stage 1 (Immediate, 0 to 6 months), which focuses on regulatory stabilization, authorities should issue official guidance clarifying the tax treatment of common construction industry transactions such as progress billing, subcontractor payments, and change orders. Non-essential changes to tax laws affecting construction should be frozen for a 12-month period to reduce uncertainty, and a dedicated construction industry tax helpline with a fast-track ruling process should be established. In Stage 2 (Short-term, 6 to 18 months), which emphasizes administrative streamlining, a risk-based audit selection system should be implemented to focus enforcement resources on high-risk contractors rather than random audits. Processing time for VAT refunds—a critical liquidity issue for construction firms—should be reduced, and clear, illustrated guides for tax registration, declaration, and payment tailored to project-based accounting should be published. In Stage 3 (Medium-term, 18 to 36 months),

which centers on digital enablement, e-invoicing should be mandated for all construction transactions above a threshold (for example, 20 million VND) to create an audit trail. Tax data should be integrated with public investment disbursement systems to automatically reconcile project payments with tax declarations, and tax officers should be trained in data analytics to identify non-compliance patterns in construction supply chains.

### 5.3 Limitations and Future Research

This study has several limitations that should be acknowledged. First, the geographical focus on Hanoi limits the generalizability of the findings to other Vietnamese provinces or other countries. Second, while the Delphi panel was diverse in composition, it was relatively small (n = 9), and different experts might produce different factor structures. Third, the AHP responses represent perceptions of current conditions rather than objective efficiency metrics. Future research should address these limitations by conducting comparative studies across multiple provinces with different economic structures, incorporating longitudinal data to track whether factor rankings change after policy reforms, applying objective efficiency metrics such as Data Envelopment Analysis to validate expert-derived rankings, and exploring the application of emerging technologies including artificial intelligence for audit targeting and blockchain for supply chain tracking to address the specific inefficiencies identified in this study. Furthermore, future research could extend the methodological framework by integrating the Delphi-AHP results with objective efficiency measurement techniques. For instance, Data Envelopment Analysis (DEA) could be applied to calculate the relative technical efficiency of different tax department branches in handling construction enterprise tax files, using the factor weights derived from this study as directional inputs. Such an integrated approach would allow researchers to identify not only which factors are perceived as important by experts, but also which factors actually explain variations in observed administrative performance across different localities. Another promising avenue is the application of qualitative comparative analysis (QCA) to explore the necessary and sufficient combinations of factors that lead to high or low tax administration efficiency. This would move beyond the linear additive logic of AHP toward a configurational perspective, which may reveal that different pathway (e.g., strong digitalization combined with weak policy clarity versus strong policy clarity combined with weak digitalization) can produce equally efficient outcomes—a finding that would have profound implications for context-sensitive policy design in resource-constrained settings.

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