

# DETERMINANTS OF SUSTAINABLE TAX MANAGEMENT IN INFORMATION TECHNOLOGY ENTERPRISES: A HYBRID SEM-ANN APPROACH

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## Abstract

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This study investigates the determinants of tax management effectiveness in Vietnam's information technology (IT) enterprises. Drawing on a multi-theoretical framework, a research model was developed incorporating seven factors: cost of tax compliance, firm size and transparency, legal risk awareness, clarity of tax laws, professional competence of tax officers, digitalization of tax administration, and audit transparency and fairness. Data collected from 402 finance and tax professionals in Hanoi-based IT firms were analyzed using a hybrid structural equation modeling (SEM) and artificial neural network (ANN) approach. The SEM results confirmed that all seven factors have a significant positive impact on tax management effectiveness, with clarity of tax laws and audit transparency and fairness exhibiting the strongest path coefficients. The ANN analysis further validated these findings and provided a robust ranking of predictor importance, identifying audit transparency and fairness as the most critical determinants, followed by the cost of tax compliance and clarity of tax laws. This study underscores the paramount importance of a transparent, fair, and clear regulatory environment, complemented by digital transformation and firm-level capabilities, for enhancing tax governance. This research fills a gap in the literature by being among the first to apply a hybrid SEM-ANN methodology to this context, offering a more nuanced understanding of non-linear interactions among determinants. The findings contrast with prior studies that emphasized firm-level factors by highlighting the primacy of institutional and regulatory factors — particularly audit transparency and legal clarity — in driving sustainable tax management practices. The hybrid SEM-ANN methodology demonstrates superior capability in capturing the complex, non-linear relationships influencing tax management, offering valuable theoretical and practical implications for policymakers, tax authorities, and business leaders in Vietnam's digital economy.

**Keywords:** Tax Management Effectiveness, Information Technology Enterprises, SEM, ANN, Tax Digitalization, Audit Transparency

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## 1. INTRODUCTION

The information technology (IT) sector has emerged as a critical driver of economic growth and digital transformation in Vietnam, contributing significantly to the nation's gross domestic product and export revenue. As this sector expands rapidly, the complexity of its business models — spanning software development, digital services, outsourcing, and cross-border transactions — presents unique challenges for tax governance and compliance. Effective tax management is essential not only for ensuring fiscal sustainability but also for fostering a transparent and equitable business environment conducive to long-term investment (Organisation for Economic Co-operation and Development [OECD], 2022).

In Vietnam, the tax landscape for IT enterprises is shaped by a specific regulatory framework, including incentives outlined in Decree No. 13/2019/ND-CP for science and technology enterprises. However, the practical application of these regulations often encounters obstacles. Ambiguities in interpreting tax laws, the administrative burden of compliance, and the rapid digitalization of tax administration processes pose significant operational challenges for firms (European Chamber of Commerce in Vietnam [EuroCham], 2021; PricewaterhouseCoopers [PwC], 2024). Moreover, the increasing integration of global supply chains and digital service delivery heightens exposure to tax risks, particularly in areas such as transfer pricing and value-added tax (VAT) on cross-border services (OECD, 2023b).

While prior research has explored broad determinants of tax compliance, few studies have specifically examined the multifaceted factors influencing tax management effectiveness within the dynamic context of Vietnam's IT industry. Existing literature often relies on traditional statistical methods, such as structural equation modeling (SEM), to test hypothesized relationships. However, these methods may not fully capture non-linear and complex interactions among predictors (Hayat et al., 2022). To address this gap, a hybrid analytical approach combining SEM and artificial neural networks (ANN) has been recommended, as it leverages the strengths of both techniques — SEM for theory testing and ANN for robust predictive modeling and variable importance detection (Rahman & Hossain, 2025; Sun et al., 2024).

Therefore, this study aims to identify and analyze the key determinants of tax management effectiveness in Vietnamese IT enterprises. The proposed research model investigates the impact of seven factors: cost of tax compliance, firm size and transparency, legal risk awareness, clarity of tax laws, professional competence of tax officers, digitalization of tax administration, and audit transparency and fairness. By employing a robust hybrid SEM-ANN methodology on a sample of 402 professionals in Hanoi-based IT firms, this research seeks to provide nuanced insights. The findings are expected to offer valuable theoretical contributions and practical implications for policymakers, tax authorities, and business leaders striving to enhance tax governance and support the sustainable growth of Vietnam's digital economy.

This study addresses the following main research question:

*RQ: What are the key determinants of sustainable tax management effectiveness in Vietnam's IT enterprises, and how do they interact in a complex, non-linear manner?*

The scholarly relevance of this paper lies in its integration of institutional theory, compliance economics, and technology adoption into a unified framework, and in its application of a hybrid SEM-ANN approach — a methodological advancement that captures both linear and non-linear effects. The results contribute new insights by identifying audit transparency and fairness as the most critical predictors, a finding that diverges from prior studies, which often emphasized firm size or compliance costs as primary drivers.

The structure of the paper is as follows. Section 2 overviews the relevant literature. Section 3 describes the research methodology. Sections 4 and 5 present the study's findings and discuss them. Section 6 provides the conclusion.

## 2. LITERATURE REVIEW

### 2.1. Theoretical foundation

The conceptual framework of this study is anchored in a multi-theoretical perspective that integrates elements from institutional theory, the economic theory of compliance, and technology adoption models. Institutional theory posits that organizational behavior, including tax practices, is significantly shaped by external pressures from regulatory, normative, and cognitive structures (Scott, 2005; Dacin et al., 2002). In the context of taxation, this implies that the clarity and stability of tax laws (the regulatory pillar), the professional competence and fairness of tax authorities (the normative pillar), and the shared awareness of legal risks among firms (the cognitive pillar) collectively establish the institutional environment that influences corporate tax management strategies.

Complementing this, the economic theory of compliance, notably articulated by Becker (1968), suggests that firms weigh the costs and benefits of tax compliance against the risks of non-compliance. This cost-benefit calculus is reflected in factors such as the cost of tax compliance and the firm's legal risk awareness. While compliance costs are often perceived as a burden, they can also drive investments in more sophisticated and effective tax management systems (Eichfelder & Vaillancourt, 2014). Similarly, a heightened awareness of the legal and financial repercussions of non-compliance incentivizes firms to adopt more robust and defensible tax positions (Kirchler, 2007).

Furthermore, the rapid digitalization of tax administration introduces a technological dimension that can be understood through the lens of technology acceptance models (Davis, 1989). The perceived usefulness and ease of use of digital tax platforms are critical for their adoption, which in turn streamlines compliance processes, enhances data accuracy, and reduces administrative burdens (OECD, 2023a). This digital transformation fundamentally alters the interaction between taxpayers and the tax authority, potentially increasing transparency and efficiency.

Finally, the constructs of firm size and transparency, and audit transparency and fairness, draw from the literature on corporate governance and tax morale (OECD, 2022; Torgler, 2005). Larger firms, under greater scrutiny, are often compelled towards greater transparency, which can underpin more effective tax management. Simultaneously, a perception of fairness and transparency in

the audit process fosters trust in the tax system, encouraging voluntary compliance and long-term, strategic tax planning over short-term evasion tactics (EuroCham, 2021). Therefore, the proposed model synthesizes these diverse theoretical streams to provide a comprehensive framework for analyzing the determinants of tax management effectiveness in Vietnam's dynamic IT sector.

**Table 1.** Constructs and their items

No.	Construct	Code	Measurement item	Source
1	Cost of tax compliance (CTC)	CTC1	Costs for tax compliance software and digital tools specific to our IT business operations (e.g., software for managing VAT on exported software services) are significant.	Eichfelder and Vaillancourt (2014), Sandford et al. (1998)
2		CTC2	The manpower and time costs for handling complex tax issues related to research and development (R&D) expenditures and software intellectual property are high.	Eichfelder and Vaillancourt (2014), Tran-Nam et al. (2016)
3		CTC3	The cost of consulting services to interpret tax incentives for IT enterprises (e.g., under Decree No. 13/2019/ND-CP) is considerable.	Decree No. 13/2019/ND-CP (2019), Grant Thornton (2023)
4	Firm size and transparency (FST)	FST1	Our company's scale of revenue from core IT activities (software, digital content) is large.	OECD (2022), Grant Thornton (2023)
5		FST2	Our company transparently discloses revenue streams from different IT services (e.g., outsourcing, product development) in financial reports.	OECD (2022), EuroCham (2021)
6		FST3	Our company has a specialized team to manage transfer pricing and cross-border transactions, which are common in the IT sector.	OECD (2022), KPMG (2026)
7	Legal risk awareness (LRA)	LRA1	We are highly aware of the legal risks associated with incorrectly applying tax incentives for software products and IT parks.	Decree No. 13/2019/ND-CP (2019), PwC (2024)
8		LRA2	Our company is conscious of the compliance risks related to VAT treatment for digital services provided to overseas clients.	Interesse (2024), OECD (2023a)
9		LRA3	We prioritize ensuring that our tax positions on R&D cost capitalization and amortization are legally defensible.	Grant Thornton (2023), PwC (2024)
10	Clarity of tax laws (CTL)	CTL1	Regulations guiding the determination of "software products" eligible for preferential corporate income tax (CIT) are clear.	Decree No. 13/2019/ND-CP (2019), PwC (2024)
11		CTL2	Guidelines for fulfilling tax obligations for revenue from digital advertising and platform-based services are consistent and easy to follow.	Andres et al. (2022a), OECD (2023b)
12		CTL3	The procedures to certify IT enterprises for tax incentives (as per Decree No. 13/2019/ND-CP) are straightforward and well-documented.	The authors' formulation
13	Professional competence of tax officers (PCT)	PCT1	Tax officers demonstrate a good understanding of the business models and revenue recognition methods common in the IT industry.	Supriyatin et al. (2019), EuroCham (2021)
14		PCT2	Tax officers provide accurate guidance on applying VAT and CIT for revenue from offshore software development projects.	Supriyatin et al. (2019), Grant Thornton (2023)
15		PCT3	The tax authority's approach to auditing expenses related to cloud infrastructure and subscription-based services is reasonable and informed.	Supriyatin et al. (2019), PwC (2024)
16	Digitalization of tax administration (DTA)	DTA1	The e-tax system (etaxvn.gdt.gov.vn) seamlessly integrates with our internal accounting and enterprise resource planning systems.	The authors' formulation
17		DTA2	The digital tax portal provides a secure and reliable API for automated data submission.	General Department of Taxation (2024)
18		DTA3	Digitalization allows for the electronic resolution of tax procedures for exporting IT services, reducing processing time significantly.	Interesse (2024)
19	Audit transparency and fairness (ATF)	ATF1	The criteria for selecting IT enterprises for transfer pricing audits are transparent and publicly communicated.	EuroCham (2021)
20		ATF2	The process for determining the arm's length price for intra-group software and service transactions is fair and consistent with OECD guidelines.	OECD (2022)
21		ATF3	Conclusions from tax audits regarding the eligibility of our R&D activities for incentives are clearly documented and explained.	Grant Thornton (2023)
22	Tax management effectiveness (TME)	TME1	Our company effectively optimizes its tax liability by fully utilizing all available incentives for the IT industry.	PwC (2024)
23		TME2	We successfully manage the tax risks associated with our international operations and cross-border service provision.	Heering et al. (2025)
24		TME3	Our tax planning strategies for new business lines (e.g., AI-as-a-Service (AIaaS), blockchain) are robust and proactive.	OECD (2024a, 2024b)
25		TME4	The tax department provides accurate and timely information that supports strategic decision-making for our IT projects.	Supriyatin et al. (2019)
26		TME5	The overall cost of tax management (compliance + planning) as a percentage of revenue is efficient and justifiable.	Eichfelder and Vaillancourt (2014), Tran-Nam et al. (2016)

## 2.2. Research hypotheses

The relationship between the cost of tax compliance and tax management effectiveness is nuanced. While compliance costs are often perceived as a financial burden, they can also function as a catalyst for strategic improvement. Significant expenditures on specialized software, expert manpower, and consulting services for interpreting complex regulations, such as those governing R&D and software intellectual property, may compel firms to establish more sophisticated and systematic tax management processes. This strategic investment can lead to greater optimization and long-term efficiency, potentially offsetting the initial financial outlay (Eichfelder & Vaillancourt, 2014; Tran-Nam et al., 2016). Therefore, the following hypothesis is proposed:

*H1: The cost of tax compliance has a positive and significant impact on tax management effectiveness.*

Firm size and transparency are anticipated to be significant contributors to effective tax management. Larger IT enterprises typically command greater resources, enabling them to invest in dedicated tax departments staffed with qualified professionals. Moreover, their heightened visibility to regulators, investors, and other stakeholders creates a powerful incentive to adopt transparent financial reporting and accountable tax strategies. This commitment to transparency and the capacity for robust internal governance are fundamental to developing sustainable and effective tax management practices (OECD, 2022; Grant Thornton, 2023). Consequently, the following hypothesis is proposed:

*H2: Firm size and transparency have a positive and significant impact on tax management effectiveness.*

A firm's legal risk awareness is expected to positively influence its approach to tax management. A profound understanding of the potential legal sanctions, financial penalties, and reputational damage resulting from non-compliance or aggressive tax positions motivates a precautionary stance. This awareness encourages the adoption of robust, defensible tax positions and proactive compliance measures, thereby reducing exposure to disputes and enhancing the overall reliability and effectiveness of the firm's tax function (Kirchler, 2007; PwC, 2024). Thus, the following hypothesis is proposed:

*H3: Legal risk awareness has a positive and significant impact on tax management effectiveness.*

The clarity of tax laws is a fundamental environmental factor shaping tax management. Ambiguous or frequently changing regulations create uncertainty, complicating compliance and strategic planning. Conversely, clear, consistent, and

well-communicated tax rules, such as those defining eligible software products for incentives under Decree No. 13/2019/ND-CP, reduce interpretative arbitrage and administrative burdens. This clarity provides a stable foundation for confident and precise tax planning and compliance (Interesse, 2024; Decree No. 13/2019/ND-CP, 2019). Accordingly, the following hypothesis is proposed:

*H4: Clarity of tax laws has a positive and significant impact on tax management effectiveness.*

The professional competence of tax officers plays a critical role in facilitating effective tax management at the firm level. When tax officials possess a sound understanding of industry-specific business models, such as revenue recognition for software services, and can provide accurate, consistent guidance, it reduces bureaucratic friction. This competence minimizes disputes stemming from misinterpretations and fosters a more cooperative and predictable tax environment, which directly supports corporate tax management effectiveness (Supriyatin et al., 2019; EuroCham, 2021). Therefore, the following hypothesis is proposed:

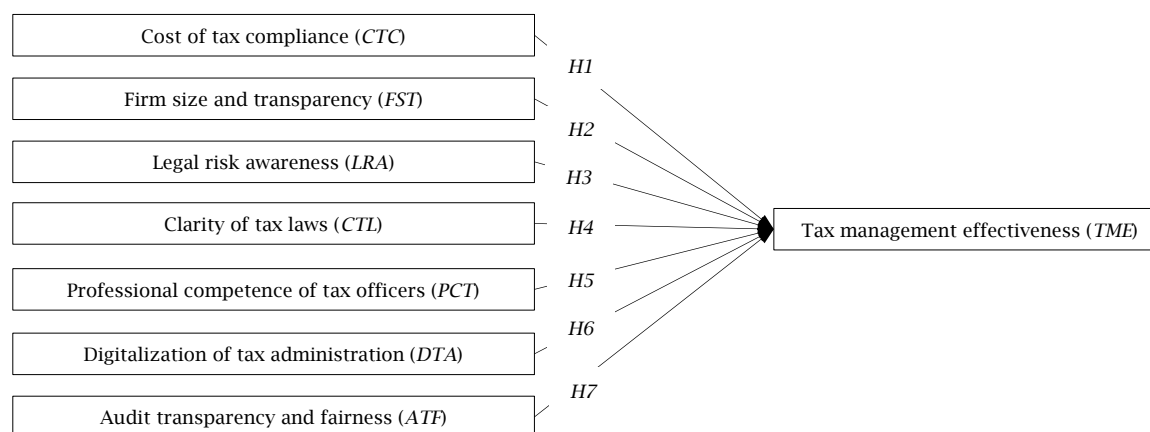
*H5: The professional competence of tax officers has a positive and significant impact on tax management effectiveness.*

The digitalization of tax administration is poised to significantly enhance tax management processes. The implementation of digital platforms for filing, payment, and data exchange, as seen with Vietnam's e-tax system, streamlines compliance, improves data accuracy and accessibility, and reduces processing times. This technological integration provides firms with powerful tools for monitoring obligations, forecasting liabilities, and managing records efficiently, leading to substantial gains in administrative effectiveness (Andres et al., 2022b; OECD, 2023b). Hence, the following hypothesis is proposed:

*H6: The digitalization of tax administration has a positive and significant impact on tax management effectiveness.*

Finally, perceptions of audit transparency and fairness are crucial for building a compliant and effective tax culture. When the audit selection criteria, process, and conclusion mechanisms are perceived as transparent, predictable, and fair, it builds trust in the tax system. This perception encourages voluntary compliance and incentivizes firms to invest in sound, justifiable tax management practices and documentation, rather than resorting to risky evasion tactics, thereby strengthening long-term effectiveness (OECD, 2022; EuroCham, 2021). Based on this, the following hypothesis is proposed:

*H7: Audit transparency and fairness have a positive and significant impact on tax management effectiveness.*

**Figure 1.** Conceptual framework of the study

### 3. RESEARCH METHODOLOGY

#### 3.1. Research design

This study employs a quantitative research approach utilizing a cross-sectional survey design to investigate the determinants of tax management effectiveness in Vietnam's IT enterprises. The research design is structured to collect primary data from a single point in time, allowing for the examination of relationships between the predefined constructs within the proposed conceptual model. This approach is deemed appropriate for theory testing and for identifying key factors influencing the outcome variable (Hair et al., 2010).

A hybrid analytical methodology integrating SEM and ANN was adopted to analyze the collected data. This dual-stage analytical framework leverages the complementary strengths of both techniques. In the first stage, SEM — specifically, the partial least squares (PLS-SEM) variant — is utilized to test the hypothesized relationships and validate the measurement model, assessing the reliability, validity, and significance of the paths as postulated in the research hypotheses (Hair et al., 2019). PLS-SEM is particularly suitable for this study due to its ability to handle complex models and its less restrictive assumptions regarding data distribution (Hair et al., 2019).

Subsequently, in the second stage, an ANN model is employed. While SEM is powerful for confirming hypothesized linear relationships and theory, ANN is a machine learning technique capable of modeling complex non-linear and non-compensatory interactions among variables without pre-imposing a functional form (Leong et al., 2015). The application of ANN serves to validate the robustness of the SEM findings and to ascertain the relative importance of each predictor variable in forecasting tax management effectiveness, thus mitigating potential limitations of a purely variance-based approach. This sequential SEM-ANN design has been successfully applied in recent social science and business research to achieve higher predictive accuracy and deeper insight (Rahman & Hossain, 2025; Sun et al., 2024).

The research design was operationalized through a structured questionnaire, which served as the primary instrument for data collection. The questionnaire was developed based on an extensive review of the literature, and all

measurement items for the constructs were adapted from established scales to ensure content validity. The survey instrument was pre-tested with a small group of academic experts and industry professionals to refine the wording, clarity, and relevance of the questions before full-scale deployment.

#### 3.2. Sampling and data collection

The target population for this study comprises finance and tax professionals working in IT enterprises operating in Vietnam. To ensure the sample was representative of the industry, a multi-stage sampling approach was adopted. Initially, a purposive sampling technique was used to identify IT firms registered with the Vietnam Software and IT Services Association (VINASA) and those listed in major industrial parks in Hanoi, a key hub for the country's IT sector. Following this, a combination of stratified and convenience sampling was employed within these organizations to reach qualified respondents holding positions such as accountants, tax specialists, finance managers, and directors, who possess direct knowledge of their firm's tax management practices.

The survey was administered from July 2025 to September 2025, spanning a three-month period to ensure adequate response collection and representation. The survey instrument, developed based on an extensive literature review, was pre-tested with a group of five academic experts and 10 industry practitioners to assess content validity, clarity, and contextual relevance. Minor adjustments were made to the wording based on their feedback. The final questionnaire was distributed via professional networks on platforms such as LinkedIn and Zalo, as well as through direct email invitations to human resources departments of target firms, requesting them to forward the survey to relevant staff. To encourage participation, no monetary incentives were offered, but a summary of the aggregate findings was promised to interested participants upon the study's completion.

### 4. RESEARCH RESULTS

#### 4.1. Respondent demographics

A total of 450 responses were initially collected. The data screening process led to the exclusion of 48 responses due to incomplete answers, straight-

lining patterns, or failure to pass attention-check questions, resulting in 402 valid responses for the final analysis, yielding a usable response rate of approximately 89.3%. This sample size of 402 is considered robust for SEM analysis, as it exceeds the minimum requirement of 10 times the largest number of structural paths directed at a particular

construct in the inner model (Hair et al., 2019). The demographic and organizational profile of the respondents, detailed in Table 2, indicates a diverse sample across gender, age, education, professional experience, and firm characteristics, enhancing the generalizability of the findings within the study's context.

**Table 2.** Summary of respondent demographics

<i>Demographic characteristic</i>	<i>Category</i>	<i>Frequency (n)</i>	<i>Percentage (%)</i>
Gender	Male	222	55.2
	Female	180	44.8
Age group (years)	Under 25 years old	38	9.5
	25-34 years old	178	44.3
	35-44 years old	123	30.6
	45 years old and above	63	15.7
Education level	College/Diploma	24	6.0
	Bachelor's degree	251	62.4
	Master's degree	103	25.6
	Doctoral degree	24	6.0
Job position	Accountant/Tax staff	136	33.8
	Finance/Tax supervisor	89	22.1
	Department/Division manager	112	27.9
	Director/Executive	65	16.2
Years of experience in taxation or finance	< 3 years	42	10.4
	3-5 years	109	27.1
	6-10 years	161	40.0
	> 10 years	90	22.4
Type of enterprise	Domestic private IT enterprise	223	55.5
	State-owned or partially state-owned	63	15.7
	Foreign-invested IT firm	54	13.4
	IT outsourcing/service provider	62	15.4
Firm size (number of employees)	< 50 (small)	121	30.1
	50-199 (medium)	176	43.8
	≥ 200 (large)	105	26.1
Business area	Software development	134	33.3
	IT services/outsourcing	116	28.9
	Fintech/digital platform	84	20.9
	Hardware/infrastructure	68	16.9
Region (headquarters)	Hanoi (urban districts)	332	82.6
	Hanoi suburban & neighboring provinces	70	17.4

Note:  $n = 402$ .

The sample includes professionals from both listed and non-listed IT enterprises. Among the participating firms, a subset represents publicly listed companies on the Ho Chi Minh City Stock Exchange (HOSE) and Hanoi Stock Exchange (HNX), enhancing the diversity and relevance of the sample to broader corporate governance contexts.

#### 4.2. Reliability and validity analysis

Prior to testing the structural model, the measurement model was rigorously assessed for reliability and validity. The evaluation of internal consistency reliability, as detailed in Table 3, demonstrated strong results. The Cronbach's alpha values for all constructs exceeded the recommended threshold of 0.7, ranging from 0.914 to 0.934, indicating

excellent internal consistency. Furthermore, the composite reliability scores for all constructs were above 0.9, surpassing the more stringent benchmark of 0.7, thereby confirming the high reliability of the measurement scales.

Convergent validity was established by examining the outer loadings and the average variance extracted (AVE). As shown in Table 3, all indicator loadings were significantly high, exceeding the value of 0.7. Moreover, the AVE for each construct was well above the required minimum of 0.5, with values ranging from 0.745 to 0.883. This confirms that each latent construct explains a substantial portion of the variance in its indicators, thereby establishing strong convergent validity (Fornell & Larcker, 1981).

**Table 3.** Indicator and construct reliability and convergent validity

<i>Variable</i>	<i>Cronbach's alpha</i>	<i>Composite reliability</i>	<i>AVE</i>	<i>Outer loading</i>
<i>ATF</i>	0.934	0.958	0.883	0.940; 0.945; 0.934
<i>CTC</i>	0.925	0.952	0.869	0.921; 0.938; 0.937
<i>CTL</i>	0.925	0.952	0.869	0.939; 0.932; 0.926
<i>DTA</i>	0.926	0.952	0.868	0.912; 0.940; 0.943
<i>FST</i>	0.919	0.949	0.861	0.928; 0.935; 0.920
<i>LRA</i>	0.920	0.949	0.861	0.926; 0.931; 0.928
<i>PCT</i>	0.922	0.951	0.865	0.926; 0.938; 0.926
<i>TME</i>	0.914	0.936	0.745	0.865; 0.848; 0.872; 0.868; 0.863

To ensure discriminant validity, two established criteria were employed: the Fornell-Larcker criterion and the heterotrait-monotrait (HTMT) ratio. As presented in Table 4 (Panel A), the square root of the AVE for each construct (diagonal values) was greater than its highest correlation with any other construct, satisfying the Fornell-Larcker criterion. Additionally, Table 4 (Panel B) displays the HTMT ratios, all of which were notably below the conservative

threshold of 0.85, as recommended by Henseler et al. (2016). This provides robust evidence that the constructs in the model are distinct from one another, confirming adequate discriminant validity. The collective results from these tests affirm that the measurement model is both reliable and valid, providing a solid foundation for proceeding with the evaluation of the structural model.

**Table 4.** Discriminant validity: Fornell-Larcker criterion and HTMT ratio

Variable	ATF	CTC	CTL	DTA	FST	LRA	PCT	TME
<b>Panel A: Fornell-Larcker criterion</b>								
ATF	0.940							
CTC	-0.018	0.932						
CTL	0.025	0.037	0.932					
DTA	0.018	0.032	0.043	0.932				
FST	0.026	-0.072	0.099	0.011	0.928			
LRA	0.059	-0.058	0.053	-0.059	0.088	0.928		
PCT	-0.054	0.042	-0.039	-0.027	-0.017	0.094	0.930	
TME	0.360	0.252	0.399	0.114	0.143	0.199	0.252	0.863
<b>Panel B: HTMT ratio</b>								
	ATF	CTC	CTL	DTA	FST	LRA	PCT	TME
ATF								
CTC	0.022							
CTL	0.035	0.048						
DTA	0.042	0.031	0.045					
FST	0.030	0.079	0.107	0.026				
LRA	0.062	0.063	0.062	0.068	0.094			
PCT	0.060	0.049	0.043	0.044	0.026	0.101		
TME	0.389	0.273	0.432	0.118	0.155	0.215	0.273	

### 4.3. Structural equation modeling analysis

Following the validation of the measurement model, the structural model was evaluated to test the hypothesized relationships. The path coefficients, their significance levels, and the model's explanatory power are presented in Table 5. The bootstrapping procedure with 5,000 subsamples was employed to assess the statistical significance of the path coefficients (Hair et al., 2019). The results indicate that all seven hypothesized paths are positive and statistically significant, providing support for *H1* through *H7*. Specifically, clarity of tax laws (*CTL*) ( $\beta = 0.369$ ,  $p < 0.001$ ) and audit transparency and fairness (*ATF*) ( $\beta = 0.357$ ,  $p < 0.001$ ) exhibit the strongest positive influences on tax management effectiveness (*TME*). These are followed by professional competence of tax officers (*PCT*) ( $\beta = 0.266$ ,  $p < 0.001$ ), cost of tax compliance (*CTC*) ( $\beta = 0.246$ ,  $p < 0.001$ ), legal risk awareness (*LRA*) ( $\beta = 0.143$ ,  $p < 0.001$ ), firm size and transparency (*FST*) ( $\beta = 0.105$ ,  $p = 0.006$ ), and digitalization of tax administration (*DTA*) ( $\beta = 0.098$ ,  $p = 0.012$ ).

The model's predictive accuracy was assessed by examining the coefficient of determination ( $R^2$ ). The  $R^2$  value for the endogenous construct, *TME*, is 0.460. This indicates that the seven exogenous constructs collectively explain 46.0% of the variance in tax management effectiveness. According to the guidelines proposed by Hair et al. (2019), this  $R^2$  value can be considered moderate, suggesting a substantial explanatory power for a behavioral study of this nature. Furthermore, the model's predictive relevance was confirmed through the blindfolding procedure, which yielded a Stone-Geisser's  $Q^2$  value of 0.337 for *TME*. Since this value is greater than zero, it provides evidence that the model has satisfactory predictive relevance for the endogenous construct (Henseler et al., 2016). The findings from the PLS-SEM analysis thus confirm the significant roles of legal, institutional, technological, and firm-specific factors in shaping effective tax management practices within Vietnam's IT sector.

**Table 5.** Path coefficients

Hypothesis	Original sample (O)	T statistics (O/STDEV)	p-values	Conclusion
CTC → TME	0.246	6.824	0.000	Supported
FST → TME	0.105	2.783	0.006	Supported
LRA → TME	0.143	4.034	0.000	Supported
CTL → TME	0.369	10.164	0.000	Supported
PCT → TME	0.266	7.424	0.000	Supported
DTA → TME	0.098	2.527	0.012	Supported
ATF → TME	0.357	11.172	0.000	Supported

#### 4.4. Artificial neural network analysis

To complement the SEM results and account for potential non-linear and complex relationships among variables, an ANN model was developed. The ANN analysis serves to validate the robustness of the SEM findings and to rank the relative importance of the predictor variables in a non-parametric manner (Leong et al., 2015). A multilayer perceptron architecture with a single hidden layer was employed, which is a widely used and effective design for predictive modeling in social science research. The dataset was partitioned randomly, with 70% of the cases ( $n = 281$ ) used for training the model and the remaining 30% ( $n = 121$ ) reserved for testing, ensuring the model's generalizability. The network's architecture, depicted in Figure 2, consisted of seven neurons in the input layer (corresponding to the seven independent variables), a configurable number of neurons in the hidden layer, and one neuron in the output layer representing tax management effectiveness.

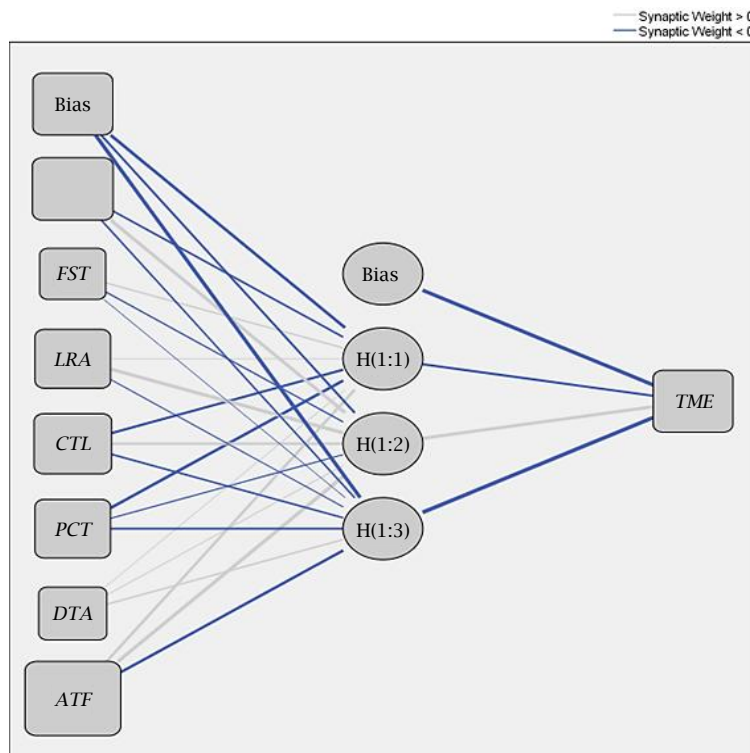
The model's performance was evaluated using the root mean square error (RMSE) for both the training and testing samples. A lower RMSE value indicates superior predictive accuracy. As shown in the results, the RMSE values for both the training and testing phases were low and very close to each other, demonstrating that the model has a good fit and does not suffer from overfitting, thus

confirming its high predictive power for the dependent variable. The most critical output from the ANN analysis is the normalized importance of the independent variables, which is calculated based on the sensitivity analysis and presented in Table 6 and Figure 3. The ranking reveals that audit transparency and fairness (ATF) is the most significant predictor (normalized importance = 100%), followed by cost of tax compliance (CTC), 52.4%, and clarity of tax laws (CTL), 42.9%. This order differs from the path coefficient rankings in the SEM analysis, highlighting the ANN's ability to capture non-compensatory and non-linear relationships that linear models might obscure. The strong performance of the ANN model and the consistency of key predictors like audit transparency and fairness and clarity of tax laws across both SEM and ANN methodologies significantly strengthen the validity and reliability of the study's findings.

**Table 6.** Independent variable importance

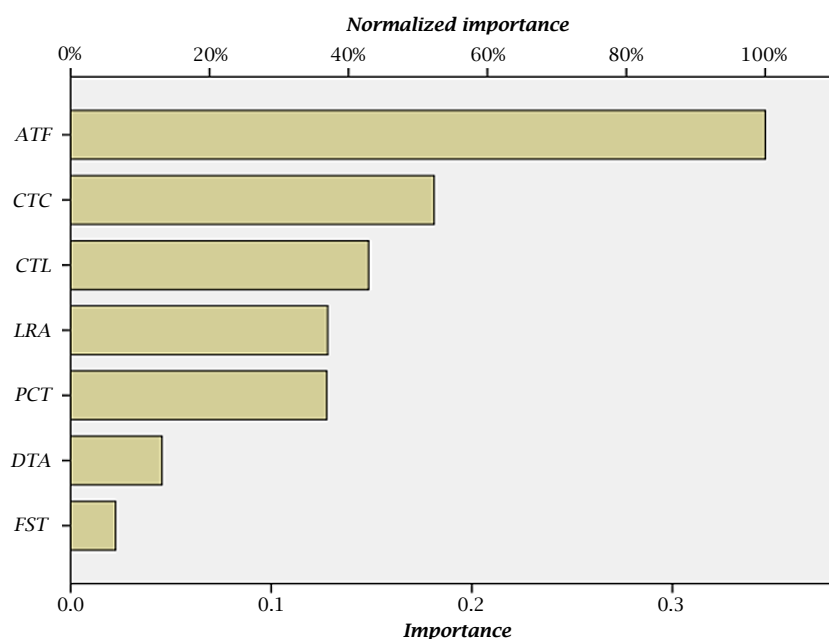
Variable	Importance	Normalized importance
CTC	0.181	52.4%
FST	0.022	6.5%
LRA	0.128	37.0%
CTL	0.149	42.9%
PCT	0.128	36.9%
DTA	0.046	13.2%
ATF	0.346	100.0%

**Figure 2.** Artificial neural network model



Note: H(1:1), H(1:2), and H(1:3) denote the first, second, and third neurons in the first hidden layer of the multilayer perceptron (MLP) model generated by SPSS.

Source: Authors' elaboration.

**Figure 3.** Average normalized importance chart

Source: Authors' elaboration.

## 5. DISCUSSION OF THE RESULTS

The results of this study offer several points of divergence from prior research. While earlier studies in emerging economies often highlighted firm size (Tran-Nam et al., 2016) or digitalization (OECD, 2023b) as primary drivers of tax compliance, our hybrid analysis reveals that those institutional factors — namely, audit transparency and fairness and clarity of tax laws — are the strongest predictors. This shift in emphasis suggests that in the context of Vietnam's evolving digital economy, perceived fairness and regulatory clarity may outweigh traditional firm-level factors in fostering sustainable tax management.

This study set out to identify and analyze the key determinants of tax management effectiveness within Vietnam's dynamic IT sector, employing a robust hybrid SEM-ANN approach on a sample of 402 professionals. The findings from the SEM analysis provide strong support for all seven proposed hypotheses (H1-H7), confirming that the cost of tax compliance, firm size and transparency, legal risk awareness, clarity of tax laws, professional competence of tax officers, digitalization of tax administration, and audit transparency and fairness are all significant positive contributors. The model explains a substantial 46.0% of the variance in tax management effectiveness, underscoring the collective importance of these legal, institutional, technological, and firm-specific factors.

The SEM results revealed that clarity of tax laws and audit transparency and fairness were the two most influential factors based on their path coefficients ( $\beta = 0.369$  and  $\beta = 0.357$ , respectively). This finding aligns with institutional theory, which posits that a stable and predictable regulatory environment (the regulatory pillar) and fair, transparent enforcement mechanisms (the normative pillar) are fundamental to shaping organizational behavior (Scott, 2005). For IT enterprises in Vietnam, which often grapple with complex and evolving

regulations such as those outlined in Decree No. 13/2019/ND-CP, unambiguous tax laws reduce interpretative risks and administrative burdens, thereby facilitating more confident and effective tax planning and compliance. Similarly, the strong effect of audit transparency and fairness underscores the critical role of trust in the tax system. When audit processes are perceived as fair and transparent, it fosters a cooperative rather than adversarial relationship between taxpayers and the authority, encouraging voluntary compliance and long-term strategic tax management over short-term evasion tactics.

The subsequent ANN analysis, which excels at capturing non-linear and complex relationships, provided a nuanced validation and a different ranking of variable importance. Audit transparency and fairness emerged as the most critical predictor (100% normalized importance), reinforcing its paramountcy. Interestingly, the cost of tax compliance ranked second in importance (52.4%) according to the ANN, a position more prominent than its third-place ranking in the SEM analysis. This suggests that the relationship between compliance costs and effectiveness may not be purely linear. While high costs are often viewed as a burden, the ANN results imply that beyond a certain threshold, these investments in specialized software, expert manpower, and consulting services may compel firms to develop more sophisticated, systematic, and ultimately more effective tax management systems, corroborating the arguments of Eichfelder and Vaillancourt (2014). Clarity of tax laws maintained its status as a top-three predictor (42.9%), confirming its foundational role.

The positive and significant impact of professional competence of tax officers and digitalization of tax administration, as confirmed by both SEM and ANN, highlights the importance of the human and technological interfaces in the tax ecosystem. A tax administration whose officers understand the nuances of IT business models can

provide accurate guidance, reduce disputes, and create a more predictable environment (Supriyatin et al., 2019). Meanwhile, digital platforms like Vietnam's e-tax system streamline compliance, enhance data accuracy, and reduce processing times, directly contributing to operational effectiveness (General Department of Taxation, 2024; OECD, 2023b). The significant, though relatively lesser, influence of firm size and transparency and legal risk awareness is also noteworthy. Larger firms likely possess the resources for dedicated tax teams and face greater pressure for transparency, aligning with corporate governance literature (OECD, 2022). In contrast, a firm's awareness of legal risks acts as an internal motivator for adopting defensible tax positions and proactive compliance measures (Kirchler, 2007).

The synergistic application of SEM and ANN in this study has proven highly beneficial. While SEM was effective in confirming the hypothesized linear relationships and validating the measurement model, the ANN uncovered a more complex, non-compensatory interplay among the predictors. The divergence in the ranking of variable importance between the two methods, particularly for the cost of tax compliance, underscores the value of this hybrid approach. It mitigates the limitations of relying solely on a linear, variance-based method and provides a more robust, holistic understanding of the factors driving tax management effectiveness (Rahman & Hossain, 2025). This methodological rigor strengthens the validity and reliability of our conclusions, offering deeper insights for both theory and practice.

## 6. CONCLUSION

This study successfully achieved its objective of identifying and analyzing the determinants of tax management effectiveness in Vietnam's IT sector. By employing a hybrid SEM-ANN approach on a robust sample of 402 professionals, the research provides a nuanced and empirically grounded understanding of the factors at play. The findings confirm that tax management effectiveness is not a function of a single element but is rather a multifaceted outcome driven by a confluence of legal, institutional, technological, and firm-specific factors. The seven constructs — cost of tax compliance, firm size and transparency, legal risk awareness, clarity of tax laws, professional competence of tax officers, digitalization of tax administration, and audit transparency and fairness — were all validated as significant positive influencers. The superior predictive power of audit transparency and fairness and the non-linear importance of the cost of tax compliance, as revealed by the ANN analysis, offer particularly sophisticated insights that extend beyond traditional linear modeling.

The theoretical implications of this study are threefold. First, it strengthens the application of institutional theory in a tax context by empirically validating that both the regulatory pillar, represented by clarity of tax laws, and the normative pillar, embodied by audit transparency and fairness and professional competence of tax officers, are critical in shaping corporate tax behavior in a transitioning economy like Vietnam (Scott, 2005; Dacin et al., 2002). Second, it refines the economic

theory of compliance by demonstrating that the cost of tax compliance can have a dual nature: while a burden, it can also be a catalyst for building more effective tax management systems, a relationship that appears to be non-linear (Eichfelder & Vaillancourt, 2014). Third, and most significantly, the study champions the methodological value of a hybrid SEM-ANN approach in tax and business research. By combining theory-testing (SEM) with powerful, non-parametric prediction (ANN), this methodology offers a more comprehensive analytical framework, capable of uncovering complex variable interactions that might be missed by standalone techniques (Hayat et al., 2022).

From a practical standpoint, the findings offer clear guidance for policymakers, tax authorities, and IT business leaders in Vietnam. For policymakers and tax authorities, the paramount importance of clarity of tax laws and audit transparency and fairness suggests that continued efforts to simplify regulations, particularly those related to incentives under Decree No. 13/2019/ND-CP, and to standardize and communicate audit procedures openly, will yield significant dividends in voluntary compliance and effective tax governance. Investing in the continuous training of tax officers to enhance their professional competence, especially regarding IT-specific business models, is equally crucial. Furthermore, the positive role of digitalization underscores the need to continue developing and promoting the integration capabilities and user-friendliness of the e-tax system.

For IT enterprises, the results highlight strategic levers for improving their tax function. The strong influence of legal risk awareness suggests that fostering a corporate culture of compliance and risk management is essential. The findings on firm size and transparency indicate that investments in specialized tax teams and transparent reporting, even for growing firms, underpin long-term effectiveness. Perhaps most intriguingly, the high importance of cost of tax compliance in the ANN model implies that firms should view expenditures on sophisticated tax software, expert consultants, and skilled personnel not merely as costs, but as strategic investments that can generate returns through optimized tax positions, reduced risks, and more efficient processes (Eichfelder & Vaillancourt, 2014).

Despite its contributions, this study is not without limitations. The cross-sectional design precludes the establishment of causal relationships. The data, while robust, were collected primarily from IT firms in Hanoi, which may limit the generalizability of the findings to other regions or sectors in Vietnam. Future research could address these limitations by employing longitudinal designs and expanding the geographical and industrial scope. Further investigation could also explore the mediating or moderating roles of other variables, such as corporate governance structures or the role of tax consultants, and apply this hybrid SEM-ANN approach to other complex phenomena in public finance and business administration. In conclusion, this research provides a validated framework and actionable insights for enhancing tax management effectiveness, ultimately contributing to a more stable, transparent, and sustainable fiscal environment for Vietnam's pivotal IT industry.

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