

## Updating Tax Administration Systems Using Big Data Analytics and Artificial Intelligence to Prevent Tax Avoidance for a Sustainable Nation

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### ABSTRACT

*This research explores how modernizing tax administration systems through Big Data analytics and Artificial Intelligence (AI) can help prevent tax avoidance and foster sustainable national development. The study employs a sequential exploratory mixed-method approach. The qualitative phase involves in-depth interviews with five senior tax consultants and academic experts to identify key mechanisms, challenges, and policy priorities in implementing AI-based tax administration. Insights from this phase inform the quantitative stage, which surveys 98 companies listed on the Jakarta Stock Exchange using structured questionnaires. Data were analyzed using both descriptive and inferential statistical methods. The findings reveal that integrating Big Data and AI substantially improves tax administration by enhancing taxpayer profiling, risk detection, and real-time monitoring, which in turn reduces tax avoidance and promotes higher compliance. However, the study acknowledges certain limitations, including sample size and institutional context, which may affect the generalizability of the results. This research contributes to the fields of tax compliance and public finance by integrating concepts of digital governance and AI-driven analytics. The results provide practical insights for tax authorities in designing intelligent, data-driven systems that improve transparency, fairness, and fiscal sustainability. Overall, this study offers empirical evidence that AI-supported tax administration serves as a strategic tool for minimizing tax avoidance and advancing sustainable national development.*

**Keywords:** *Artificial Intelligence; Big Data Analytics; Tax Administration System; Tax Avoidance; Sustainable Development*

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## 1. INTRODUCTION

The rapid evolution of digital technologies has profoundly reshaped public sector governance, and tax administration is no exception. Modern tax systems now face increasing complexity driven by globalization, the digitalization of economic activities, and the emergence of sophisticated tax avoidance strategies that undermine government revenues and threaten fiscal sustainability (Zucman, 2015; Belahouaoui & Attak, 2024). Traditional tax administration frameworks largely dependent on manual processes and limited risk profiling are no longer sufficient to detect complex avoidance schemes embedded within large, diverse datasets.

Consequently, tax authorities around the world are increasingly adopting Big Data analytics and Artificial Intelligence (AI) to modernize operations, strengthen risk detection, and enhance

compliance mechanisms. Big Data provides unprecedented capacity to analyze vast amounts of structured and unstructured information sourced from financial transactions, third-party data, and digital footprints (Judijanto & Al-Amin, 2025). When integrated with machine learning and predictive modeling, these technologies enable automation in anomaly detection, improve risk assessment accuracy, and optimize audit selection, ultimately reducing tax evasion and avoidance (Rahman et al., 2024; Fabeke Mbea, 2025).

AI systems further improve compliance monitoring through advanced pattern recognition and analytics, allowing tax authorities to uncover actionable insights previously beyond reach (Corly et al., 2025; Pires, 2024). Beyond the technical benefits, adopting these digital tools also supports broader governance goals by enhancing transparency, operational efficiency, and public trust (OECD, 2025).

However, several challenges remain, particularly regarding data governance, ethical considerations, and digital infrastructure limitations in developing economies. Resource constraints often hinder the full-scale implementation of advanced analytical platforms (UIN et al., 2024). Additionally, the balance between AI-driven enforcement and taxpayer rights requires careful regulatory oversight to prevent unintended legal and ethical consequences (Belahouaoui & Attak, 2024).

Within the framework of sustainable development, a modern digital tax administration system is essential to maintaining stable revenue streams that fund public services and social programs. By utilizing Big Data and AI, tax systems can transition from reactive enforcement to proactive risk management, thereby minimizing avoidance behavior and strengthening fiscal sustainability (Zheng & O'Penetrante, 2025; Aggarwal, 2024).

In summary, updating tax administration systems through Big Data and AI is a strategic step toward preventing tax avoidance and achieving national sustainability. Big Data enables the collection and analysis of large volumes of taxpayer information, while AI identifies irregular patterns more efficiently than traditional methods. This combination enhances compliance, reduces administrative costs, promotes fairness in law enforcement, stabilizes government revenue, and strengthens public trust all critical factors in supporting sustainable economic and

social development. The reality of tax revenue in 2020- 2024, can be seen in the following table:

Tabel-01  
State Tax Revenue( 2020-2024)

| Year         | Target (Idr.)                | Realization (Idr.)           | MNC & BUT company (Idr.) | %     |
|--------------|------------------------------|------------------------------|--------------------------|-------|
| 2020         | 1,865,700,000,000,000        | 1,791,072,000,000,000        | 16,324,587,890,706       | 0.91% |
| 2021         | 1,269,969,072,164,950        | 1,231,870,000,000,000        | 11,725,119,706,065       | 0.95% |
| 2022         | 2,097,422,680,412,370        | 2,034,500,000,000,000        | 18,899,514,593,252       | 0.93% |
| 2023         | 1,927,010,309,278,350        | 1,869,200,000,000,000        | 16,939,583,523,080       | 0.91% |
| 2024         | 1,992,164,948,453,610        | 1,932,400,000,000,000        | 18,236,000,000,000       | 0.94% |
| <b>Total</b> | <b>9,152,267,010,309,280</b> | <b>8,859,042,000,000,000</b> |                          |       |
| Percentage   |                              | 96.8%                        |                          |       |

Data Sources: Researcher 2024

## 1.1.Theoretical Concept

Modern tax administrations face significant challenges in detecting and preventing tax avoidance due to growing data volumes, increasingly complex transactions, and the expansion of the global digital economy. The theoretical foundation for modernizing tax systems is rooted in integrating Big Data analytics and Artificial Intelligence (AI) to strengthen compliance monitoring, risk assessment, and enforcement mechanisms.

Big Data technologies allow tax authorities to collect, integrate, and analyze massive datasets from multiple financial and administrative sources, uncovering anomalies and behavioral patterns that traditional audits often overlook (Mehta & Mathews, Big Data Analytics for Tax Administration, Semantic Scholar).

The AI-driven compliance model builds upon machine learning, deep learning, and predictive analytics to automate risk scoring, predict non-compliance, and prioritize audits effectively. Zheng & O’Penetrante (2025) introduced a hybrid AI framework that merges rule-based logic with LSTM neural networks to detect complex avoidance strategies in extensive datasets, demonstrating how AI can augment human judgment in tax administration (RSIS International).

Systematic reviews of tax fraud and compliance research further reveal that AI tools such as neural networks, anomaly detection, and adaptive oversight frameworks significantly enhance detection accuracy and operational efficiency, while also raising governance and ethical considerations for sustainable implementation (MDPI).

From a theoretical standpoint, this integration aligns with institutional and digital governance theories, which argue that technological innovation enhances the state's ability to manage complex regulatory environments and minimize information asymmetry between taxpayers and authorities. Empirical evidence supports that digital advancement, including Big Data systems, reduce corporate tax avoidance by increasing transparency and oversight (ScienceDirect).

In terms of sustainability, strengthening tax compliance through Big Data and AI fosters stable public revenue streams crucial for financing the Sustainable Development Goals (SDGs). Efficient tax administration promotes equitable resource distribution, expands fiscal capacity, and narrows the tax gap—key components of long-term social, economic, and environmental progress. This perspective aligns with governance frameworks that position digital transformation as a driver of fiscal sustainability and fair public finance (Springer).

#### Key Theoretical Concepts:

1. Risk-Based Compliance Modeling – Utilizing AI scoring and anomaly detection to prioritize enforcement (MDPI).
2. Predictive Analytics and Machine Learning – Forecasting patterns of non-compliance and tax avoidance (RSIS International).
3. Big Data Integration and Transparency – Consolidating diverse datasets for comprehensive oversight (Semantic Scholar).
4. Digital Governance and Institutional Capacity – Viewing technology adoption as a foundation for sustainable, accountable tax systems (Springer).

Overall, these theoretical perspectives illustrate how Big Data and AI can transform conventional tax administration into an intelligent, data-driven system that not only reduces

tax avoidance but also reinforces public confidence and contributes to sustainable national development.

## **1.2 Updating Tax Administration Systems and Tax Avoidance**

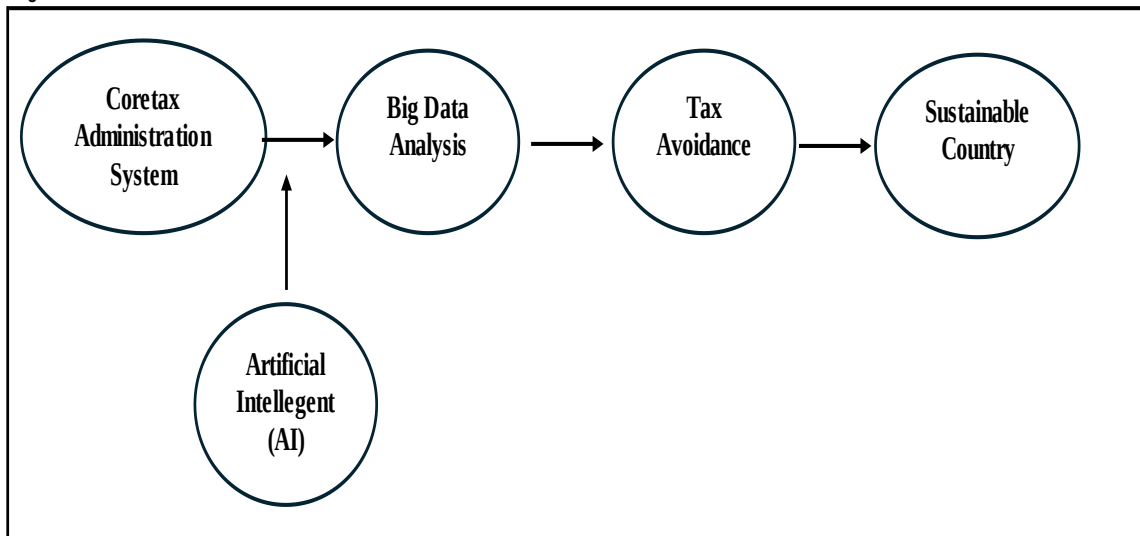
Modernizing tax administration through Big Data analytics and Artificial Intelligence (AI) has become a vital approach to preventing tax avoidance and promoting sustainable national progress. Traditional systems often rely on manual operations and fragmented data integration, creating information gaps between taxpayers and tax authorities. These gaps are frequently exploited through complex schemes such as profit shifting, transfer pricing manipulation, and income underreporting. Consequently, modernization is essential for enhancing tax compliance and enforcement effectiveness.

Big Data technologies enable tax authorities to gather, integrate, and process enormous volumes of structured and unstructured information from multiple sources, including tax returns, banking records, customs data, digital platforms, and third-party disclosures. When combined with AI techniques such as machine learning and predictive analytics, this information can be analyzed to detect irregular patterns, identify high-risk taxpayers, and anticipate potential avoidance behavior with greater precision.

AI-based risk profiling allows authorities to prioritize audits on cases with the highest likelihood of non-compliance, improving enforcement efficiency and reducing administrative costs. Moreover, AI-supported tax systems enhance fairness and transparency in taxation. Automated analytics reduce human error and subjective decision-making, while real-time data monitoring enables preventive control measures rather than relying solely on retrospective audits.

In the long run, improved compliance increases government revenues and supports funding for sustainable development initiatives such as social welfare, infrastructure, and environmental programs. Thus, upgrading tax administration systems with Big Data and AI not only deters tax avoidance but also contributes to fiscal stability, economic resilience, and the realization of sustainable national development.

Figure 1: Research Model



## 2. RESEARCH METHOD

This study employs a sequential exploratory mixed-method research design to investigate how the modernization of tax administration systems—through Big Data analytics and Artificial Intelligence (AI) can mitigate tax avoidance and support sustainable national development.

The research begins with a qualitative phase, involving in-depth interviews with five senior tax consultants and university professors. This stage aims to explore key mechanisms, institutional challenges, and policy priorities associated with implementing AI-based tax administration. The insights gained from these interviews inform the development of the research framework and serve as the foundation for constructing measurement indicators in the subsequent quantitative phase.

The quantitative phase consists of a survey administered to 98 companies listed on the Jakarta Stock Exchange. Using structured questionnaires, this phase assesses organizational perceptions, readiness levels, and the impact of adopting Big Data and AI technologies in tax administration. The collected quantitative data are analyzed using descriptive and inferential statistical techniques to identify key patterns, correlations, and empirical evidence supporting the qualitative findings.

By integrating both qualitative insights and quantitative validation, this study provides a comprehensive understanding of how AI-supported tax administration systems contribute to

reducing tax avoidance and advancing sustainable fiscal governance. The overall research process for this sequential exploratory mixed-method design is illustrated as follows:

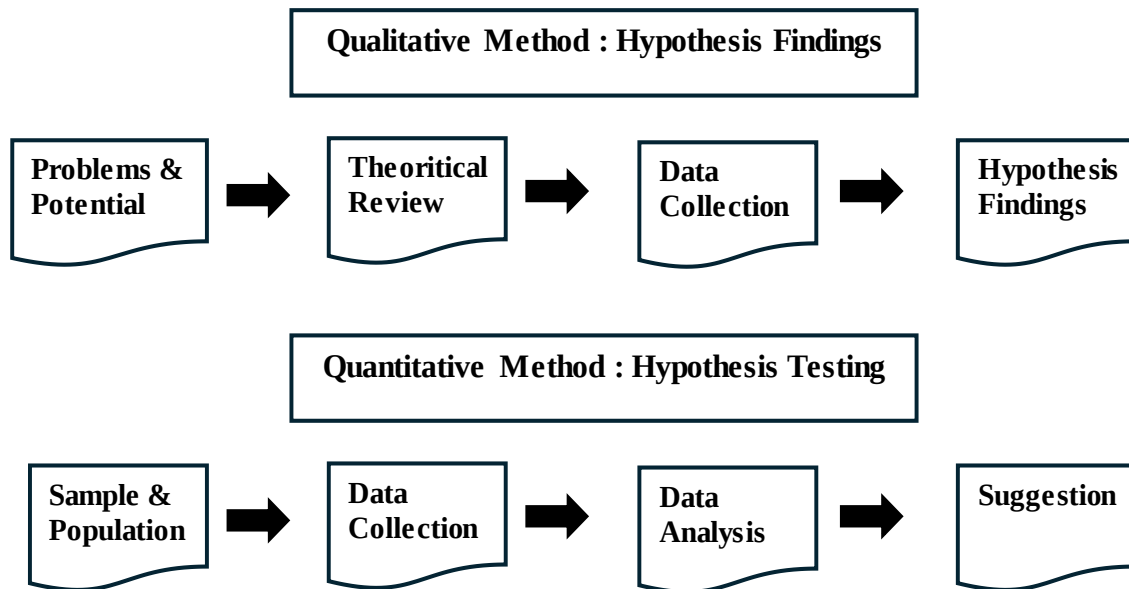


Figure 2: Sequential exploratory process combination methods

## 2.1 Sample Characteristics

The survey sample represents the demographic and organizational characteristics of respondents participating in the quantitative phase of this study on AI-enhanced tax administration. The gender distribution is relatively balanced, with 45% male and 55% female respondents. The majority of participants fall within the 17–24-year age group (85%), followed by 10% aged 27–42 years and 5% aged 43–58 years.

Regarding educational background, 30% of respondents hold a high school qualification, 55% possess a bachelor's degree, and 15% have completed postgraduate studies. From an industrial perspective, 70% of the surveyed companies operate in the manufacturing sector, while 25% are engaged in trading, and 5% in services.

These sample characteristics reflect a diverse and representative respondent profile, supporting the reliability of the analysis on perceptions of Big Data and AI in strengthening tax administration, reducing tax avoidance, and fostering sustainable national development.

Table 2: Respdnent Characteristic

| Category         | Classification    | Percentage (%) |
|------------------|-------------------|----------------|
| Gender           | Male              | 45             |
|                  | Female            | 55             |
| Age (years)      | 17–24             | 85             |
|                  | 27–42             | 10             |
|                  | 43–58             | 5              |
| Education Level  | High School       | 30             |
|                  | Bachelor's Degree | 55             |
|                  | Postgraduate      | 15             |
| Type of Business | Manufacturing     | 70             |
|                  | Trading           | 25             |
|                  | Service           | 5              |

## 2.2 Qualitative Data Analysis Techniques

The qualitative data collected from in-depth interviews were analyzed using thematic analysis, consistent with the sequential exploratory mixed-method approach. Interview transcripts from the five senior tax consultants and academic experts were systematically coded using open, axial, and selective coding techniques to identify recurring themes related to AI-driven tax administration such as operational mechanisms, implementation challenges, governance risks, and policy priorities.

Data reduction and categorization were conducted iteratively to ensure conceptual coherence and consistency across participants. To strengthen the credibility and validity of findings, the results were cross-validated through expert comparison and alignment with existing literature.

The key qualitative themes derived from this process served as the basis for developing constructs and survey indicators for the quantitative phase, which involved 98 companies listed on the Jakarta Stock Exchange. This methodological integration ensured that the study maintained both theoretical rigor and empirical relevance across research stages.

The qualitative data analysis process is summarized in the following table (as presented by the researcher). The analysis process can be explained by the researcher through the table as follows:

Table 3: Schematic Data Processing Research

| Technical analysis of data       | Test the validity of the data     |
|----------------------------------|-----------------------------------|
| Data reduction                   | Data triangulation                |
| Data display                     | Triangulation between researchers |
| Decision making and verification | Triangulate data sources          |

## 2.3 Questionnaire and Interview Guidelines

### 2.3.1 Research Overview.

This study employs a sequential exploratory mixed-method design to examine the role of Artificial Intelligence (AI) in strengthening tax administration systems. The qualitative phase consists of in-depth, semi-structured interviews with five leading tax consultants and university professors who possess extensive expertise in taxation policy and digital governance. These interviews aim to identify the key mechanisms, implementation challenges, and policy priorities associated with AI-based tax administration.

Insights derived from the qualitative phase are then used to refine the conceptual framework and develop constructs, indicators, and questionnaire items for the quantitative phase, ensuring that the survey instrument is both theoretically grounded and contextually relevant.

### 2.3.2 Respondent Profile.

The quantitative phase targets 98 companies listed on the Jakarta Stock Exchange as organizational respondents. These firms were chosen because they are directly affected by tax administration systems and government compliance policies. Respondents are drawn from senior-level positions in finance, accounting, or tax management to ensure knowledgeable perspectives on corporate taxation and the adoption of digital tax technologies.

Data collection is conducted using structured questionnaires, allowing for standardized measurement and statistical analysis of respondents' perceptions, readiness, and the impacts of AI-based tax administration on compliance and sustainability across listed companies.

## 2.4 Face-to-Face Interviews

This research applies a sequential exploratory mixed-method approach, beginning with qualitative data collection through face-to-face, in-depth interviews with five senior tax consultants and university professors. These sessions aim to uncover detailed insights into key mechanisms, practical challenges, and policy priorities related to implementing AI-driven tax administration systems. The direct, interactive nature of these interviews facilitates the collection of nuanced and context-rich data.

The qualitative findings are subsequently used to design the quantitative survey instrument, which was distributed to 98 companies listed on the Jakarta Stock Exchange through structured questionnaires. The quantitative data are analyzed using descriptive and inferential statistical techniques, providing empirical validation and extension of the qualitative insights.

A total of 98 potential participants were initially approached for interviews, of which 90 agreed to participate. However, due to scheduling constraints, only five interviews were successfully conducted, as one participant cancelled at the last moment and no replacement was made. Interviews were conducted in English, depending on the participant's preference.

The interview questions were designed after the completion of the survey phase to further explore and clarify issues identified in the quantitative findings. This approach reflects the intentional selection of participants as central to the study's aim of exploring the phenomenon of AI-supported tax administration within real-world contexts. This describes the intentional selection of participants as a central phenomenon to be explored in the study

Table 4: Comparison Respondent from Total Response with Kind of Business

| Category      | Classification                 | Number of Companies | Percentage (%) |
|---------------|--------------------------------|---------------------|----------------|
| Industry Type | Manufacturing                  | 64                  | 65             |
|               | Trading                        | 25                  | 25             |
|               | Service                        | 9                   | 10             |
|               | <b>Total</b>                   | <b>98</b>           | <b>100</b>     |
| Survey Method | Face-to-face (Drop-off survey) | 64                  | 65             |
|               | Online survey                  | 34                  | 35             |
|               | <b>Total</b>                   | <b>98</b>           | <b>100</b>     |

## 2.5 Quantitative Data Analysis Techniques

The quantitative phase of this study, developed based on insights from the qualitative findings, involves a survey conducted among 98 companies listed on the Jakarta Stock Exchange using structured questionnaires. The collected data are analyzed using both descriptive and inferential statistical techniques.

Descriptive statistics such as frequencies, percentages, means, and standard deviations are used to summarize respondent demographics and the distribution of key variables related to AI-based tax administration. Inferential analyses, including correlation and regression tests, are employed to examine the relationships and effects of AI and Big Data-supported tax administration systems on tax avoidance prevention and sustainable governance outcomes.

These analyses ensure the reliability and validity of the research results and provide empirical evidence on how AI integration enhances the efficiency, transparency, and accountability of tax administration. The stages of the quantitative data analysis process are summarized in the following table (as presented by the researcher). The stages in quantitative data analysis can be seen in the table as follows:

Table 5: Research Scheme and Data Processing

| Instrument quality test             |
|-------------------------------------|
| Validity Test                       |
| Reliability Test                    |
| Descriptive statistics              |
| Classic assumption test             |
| Normality test                      |
| Multicollinearity test              |
| Heteroscedasticity Test             |
| Hypothesis testing.                 |
| Correlation Coefficient test        |
| Determination Coefficient Test (R2) |
| Statistical Test F                  |
| T test                              |

## **2.6 Survey**

This study applies a sequential exploratory mixed-method design to comprehensively examine the role of Artificial Intelligence (AI) in enhancing tax administration systems. The research begins with a qualitative phase, consisting of in-depth, semi-structured interviews with five leading tax consultants and university professors who possess extensive expertise in taxation policy, digital governance, and AI applications. This phase aims to explore the mechanisms through which AI is integrated into tax administration, as well as to identify the primary challenges, risks, and policy priorities associated with its implementation—particularly in the context of preventing tax avoidance and improving administrative efficiency.

Insights generated from the qualitative analysis are subsequently used to guide the development of the quantitative research instrument, ensuring that the survey items accurately capture both practical realities and theoretical dimensions of AI-based tax governance.

The quantitative phase involves the administration of a structured questionnaire to 98 companies listed on the Jakarta Stock Exchange. The survey is designed to empirically evaluate corporate perceptions, experiences, and responses regarding the implementation of AI-supported tax administration practices. Data collected through this process facilitate statistical analyses that validate and extend the qualitative findings, enhancing the study's methodological rigor and explanatory strength through triangulation.

## **3. RESULTS AND DISCUSSION**

### **3.1 Survey Results**

Based on data collected from 98 companies listed on the Jakarta Stock Exchange, this study identifies clear sectoral patterns of tax avoidance prior to the implementation of Big Data analytics and AI within Indonesia's tax administration system.

Before these technologies were adopted, tax avoidance behavior was most prevalent in the manufacturing sector, with 20 companies identified as engaging in such practices. This was followed by the trading sector with 10 companies and the service sector with 6 companies. These results suggest that sectors with more complex supply chains, cost structures, and

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transaction volumes—particularly manufacturing—tend to offer greater opportunities for tax avoidance under traditional, manually operated tax systems.

Following the introduction of Big Data analytics and AI-supported tax administration, a substantial decline in tax avoidance behavior was observed across all sectors. The number of manufacturing companies engaging in avoidance fell from 20 to 15, while trading firms declined from 10 to 6, and service firms from 6 to 3.

This decline indicates that enhanced data integration, automated risk profiling, and AI-driven monitoring significantly improve the ability of tax authorities to identify anomalies and discourage aggressive tax planning. The results provide empirical evidence of the effectiveness of AI and Big Data technologies in improving tax compliance, reducing sector-specific tax avoidance, and promoting sustainable national development through more transparent and data-driven tax governance.

The detailed breakdown of tax avoidance patterns before and after AI adoption is presented in the following table (as provided by the researcher). The details of the ethnic groups and their religious adherence are shown in Table.

Table 6: Tax Avoidance Findings Before and After Big Data and AI Implementation (n = 98)

| Business Sector | Before Big Data & AI (Companies) | Before (%) | After Big Data & AI (Companies) | After (%) | Change (Percentage Points) |
|-----------------|----------------------------------|------------|---------------------------------|-----------|----------------------------|
| Manufacturing   | 20                               | 20.41%     | 15                              | 15.31%    | -5.10 pp                   |
| Trading         | 10                               | 10.20%     | 6                               | 6.12%     | -4.08 pp                   |
| Service         | 6                                | 6.12%      | 3                               | 3.06%     | -3.06 pp                   |
| Total           | 36                               | 36.73%     | 24                              | 24.49%    | -12.24 pp                  |

## 3.2 Face-to-Face Interview Results

The in-depth, face-to-face interviews conducted with five senior tax consultants and university professors reveal a strong consensus among experts that the adoption of modern technologies particularly Big Data analytics and Artificial Intelligence (AI) is essential for the modernization of tax administration in the digital era.

Interviewees emphasized that AI enhances the government's capacity to process vast amounts of taxpayer data in real time, enabling more accurate risk profiling and early detection of irregular patterns associated with tax avoidance. According to the experts, technology-driven tax systems help reduce information asymmetry between taxpayers and tax authorities, enhance transparency, and minimize opportunities for aggressive tax planning, especially among large corporations.

Furthermore, participants highlighted the broader normative and institutional dimensions of AI integration in taxation, including the importance of citizens' civic responsibility, social contribution, trust in government, and law enforcement integrity. The experts argued that effective AI-based tax administration does more than enhance efficiency it can also strengthen public confidence in the fairness and reliability of the taxation system.

Such systems, they explained, foster a culture of compliance by ensuring equal treatment, reinforcing ethical standards, and aligning fiscal governance with sustainable development objectives. In this sense, technological innovation in tax administration is viewed not merely as a supporting tool, but as a structural necessity for achieving effective, equitable, and sustainable tax governance in the digital economy.

Experts further noted that the integration of AI and Big Data into tax administration enhances perceptions of fairness and accountability, thereby encouraging voluntary compliance. When taxpayers perceive that tax revenues are managed transparently and tax laws are enforced consistently, compliance becomes viewed not merely as a legal obligation but as a civic responsibility and a form of social contribution to national development.

However, all informants emphasized that technology alone is insufficient. Effective implementation requires strong legal frameworks, clear regulatory guidelines, and consistent enforcement mechanisms to ensure that the use of AI is legitimate, ethical, and aligned with principles of good governance. Only through such institutional support can digital tax systems effectively prevent tax avoidance while promoting sustainable and accountable governance.

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**Table 7: Summary of Face-to-Face Interview Findings (5 Consultants and Professors)**

| Key Theme                | Reason Identified                                                                  | Representative Statement from Informants                                                                                                           |
|--------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| New Technology           | AI and Big Data improve data integration, real-time monitoring, and risk detection | “AI enables tax authorities to analyze massive datasets efficiently and identify potential tax avoidance patterns that were previously invisible.” |
| Prevent Tax Avoidance    | Advanced analytics reduce loopholes and aggressive tax planning                    | “With AI-based risk profiling, companies find it more difficult to manipulate financial data or exploit regulatory gaps.”                          |
| Duty of Citizen          | Fair and transparent systems strengthen moral obligation to pay taxes              | “When the tax system is fair and technology-driven, taxpayers increasingly see compliance as a civic duty.”                                        |
| Social Contribution      | Taxes are viewed as a collective contribution to sustainable development           | “Paying taxes is not just a legal obligation, but a contribution to social welfare and national sustainability.”                                   |
| Perception of Government | Digital systems improve trust, transparency, and accountability                    | “Technology enhances public confidence because decisions are data-based, not discretionary.”                                                       |
| Law & Enforcement        | Strong legal frameworks are required to support AI implementation                  | “AI will only be effective if supported by clear regulations and consistent enforcement mechanisms.”                                               |

### 3.3 Discussion of Findings

The results of this study provide both empirical and theoretical confirmation of the transformative potential of Artificial Intelligence (AI) and Big Data in modernizing tax administration and reducing tax avoidance.

First, the survey findings offer strong empirical support for information asymmetry and deterrence theories in tax compliance. Prior to the adoption of Big Data analytics and AI, tax avoidance was most prevalent in the manufacturing sector, followed by trading and service industries. This pattern aligns with theoretical expectations that sectors characterized by complex supply chains, high transaction volumes, and flexible cost structures present greater opportunities for aggressive tax planning under conventional administrative systems. The concentration of avoidance behavior in manufacturing firms thus reinforces the institutional and economic complexity theories, which suggest that weak monitoring systems enable corporations to exploit regulatory gaps.

Second, the observed reduction in tax avoidance across all sectors following the adoption of AI and Big Data strengthens the argument that technology-enhanced governance improves compliance behavior. Automated risk profiling, integrated databases, and real-time anomaly detection increase the perceived likelihood of detection, thereby reshaping firms' cost-benefit assessments of noncompliance. These findings extend existing compliance frameworks by showing that AI not only increases enforcement capacity but also modifies behavioral incentives, supporting both deterrence and responsive regulation theories in the context of digital tax administration.

Third, insights from the qualitative interviews complement the quantitative data by emphasizing the institutional and normative dimensions of AI-based tax administration. Experts highlighted that AI reduces information asymmetry, enhances transparency, and reinforces procedural fairness key drivers of trust-based compliance. When taxpayers perceive tax systems as fair, consistent, and technologically capable, compliance becomes a voluntary civic duty rather than a coerced response. Thus, technological modernization simultaneously strengthens enforced compliance (through detection and deterrence) and voluntary compliance (through trust and legitimacy). Collectively, these dynamics indicate that minimizing tax avoidance contributes directly to a more sustainable and equitable fiscal system.

### 3.4 Theoretical Implications

The findings of this study contribute significantly to the theoretical discourse on tax compliance and public finance by reinforcing and extending deterrence theory, information asymmetry theory, and institutional theory within the context of digital tax administration.

The observed decline in tax avoidance following the introduction of AI and Big Data validates the notion that enhanced detection capabilities and real-time data integration increase the perceived probability of enforcement, thereby discouraging opportunistic tax behavior. At the same time, qualitative evidence demonstrates that AI-driven transparency, consistency, and fairness strengthen institutional legitimacy and taxpayer trust.

This aligns with behavioral and institutional compliance theories, which emphasize governance quality and fairness as determinants of voluntary compliance. Taken together, the results suggest that AI operates not only as a technological enforcement mechanism but also as an

institutional catalyst reshaping compliance behavior by reducing information asymmetry and reinforcing normative expectations within modern tax systems.

### **3.5 Policy Implications**

The demonstrated effectiveness of AI and Big Data supports policy strategies that prioritize digital tax infrastructure development, inter-agency data integration, and the deployment of advanced analytics in tax administration. However, the study's qualitative findings underscore that technology must be complemented by robust legal frameworks, clear data governance standards, and consistent law enforcement.

Policymakers should therefore treat AI not as an isolated solution but as a core component of comprehensive institutional reform aimed at enhancing transparency, fairness, and accountability in public finance. Integrating technological innovation with sound governance structures will ensure that AI-supported tax systems contribute to sustainable national development, equitable resource allocation, and stronger public trust in fiscal institutions.

### **3.6 Limitations**

Despite its contributions, this study acknowledges several limitations. The survey sample is confined to 98 publicly listed companies, which may not fully represent small and medium-sized enterprises (SMEs) or informal economic actors whose tax behaviors could differ substantially. Additionally, tax avoidance reduction is measured primarily through reported and detected cases, which may underestimate unobserved or undisclosed practices.

The qualitative phase, while rich in expert insights, involved a relatively small number of informants, potentially limiting the generalizability of findings across broader contexts. Future research could expand sectoral coverage, adopt longitudinal designs, and incorporate taxpayer perception studies to evaluate long-term behavioral and institutional impacts of AI-driven tax administration.

Such extensions would deepen understanding of how digital technologies influence compliance behavior, governance quality, and fiscal sustainability over time.

## 4. CONCLUSION

This study concludes that the integration of Big Data analytics and Artificial Intelligence (AI) into tax administration plays a pivotal role in reducing corporate tax avoidance and enhancing tax compliance across economic sectors. Empirical evidence from the survey indicates that, prior to digital transformation, tax avoidance was most prevalent in sectors with greater economic and institutional complexity—particularly manufacturing—thereby supporting theories of information asymmetry and deterrence.

Following the adoption of AI-based tax administration systems, a consistent decline in tax avoidance was observed across manufacturing, trading, and service industries. These findings confirm that technology-enhanced governance improves the effectiveness of tax monitoring by increasing detection capabilities, reshaping corporate cost–benefit calculations, and reinforcing both enforced and voluntary compliance.

Qualitative insights complement these results by showing that AI-driven systems also promote transparency, procedural fairness, and public trust in tax institutions. This transformation reframes tax compliance as a civic duty and social contribution to national development rather than a response to coercive enforcement.

At the theoretical level, the study positions AI not merely as a technical enforcement tool but as an institutional catalyst that bridges economic, behavioral, and governance dimensions of tax compliance. By reducing information gaps and strengthening institutional legitimacy, AI contributes to more equitable, efficient, and accountable tax systems.

At the policy level, the findings underscore the importance of embedding AI implementation within a comprehensive reform framework—one that ensures legal certainty, robust data governance, and consistent enforcement. Such integration is essential to achieving sustainable outcomes that balance technological innovation with good governance principles.

Nonetheless, the study acknowledges its limitations, particularly the focus on publicly listed firms and a small sample of expert informants, which may limit generalizability. Future research should expand the scope to include small and medium-sized enterprises, conduct longitudinal analyses, and incorporate taxpayer perception studies to better capture the long-term behavioral and institutional impacts of AI-driven tax administration.

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Ultimately, as tax avoidance is minimized and compliance is strengthened, fiscal stability and sustainable national development can be more effectively achieved.

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