

An Analytical Study of the Role of Artificial Intelligence in Income Tax Assessment in India

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Abstract—The income tax assessment system in India has undergone major transformation through the adoption of digital technologies and Artificial Intelligence (AI). Traditional manual assessment procedures gradually became inadequate due to increasing taxpayer participation and expanding financial transactions. To improve efficiency and transparency, the Income Tax Department introduced reforms such as e-filing, faceless assessment, centralized processing, and AI-based compliance systems. The present study examines the role of Artificial Intelligence in income tax assessment in India with reference to transparency, taxpayer compliance, and administrative efficiency. Based on secondary data from official government reports and CBDT publications, the study finds that AI-enabled systems have improved risk assessment, fraud detection, compliance monitoring, and assessment efficiency while reducing procedural delays and human intervention. The study also identifies challenges relating to data privacy, cybersecurity, and digital accessibility in AI-driven tax governance.

Index Terms—Artificial Intelligence, Income Tax Assessment, Digital Tax Administration, Taxpayer Compliance, Faceless Assessment, Transparency, Administrative Efficiency, CBDT.

I. INTRODUCTION

Artificial Intelligence (AI) has significantly transformed modern governance and financial administration systems. In taxation, AI is increasingly used for risk assessment, fraud detection, automated scrutiny, data analytics, and compliance monitoring. India's income tax administration has also undergone major transformation during the last two decades. Earlier assessment procedures were mainly dependent on manual scrutiny, physical records, and jurisdiction-based administration. However, increasing taxpayer

participation and growth in digital transactions created the need for technology-driven tax governance.

To modernize the system, the Government of India introduced reforms such as e-filing, PAN integration, centralized processing, Annual Information Statements (AIS), faceless assessment, and AI-based analytics platforms. These reforms strengthened transparency, improved assessment efficiency, reduced human intervention, and enhanced compliance monitoring.

The present study examines the role of Artificial Intelligence in the assessment procedure of income tax assesses in India using official statistical data and policy trends.

II. REVIEW OF LITERATURE

Recent studies in the Indian context indicate that Artificial Intelligence (AI) and digital technologies have significantly transformed income tax administration and assessment procedures in India. Researchers have emphasized that technology-driven reforms such as e-filing, faceless assessment, centralized processing, PAN–Aadhaar integration, and AI-based compliance monitoring have improved transparency, taxpayer compliance, and administrative efficiency.

Gupta and Sharma (2019) observed that digital taxation reforms in India strengthened transparency and accountability by reducing manual intervention and improving electronic verification systems. The study highlighted that e-filing and automated processing mechanisms enhanced taxpayer convenience and operational efficiency.

Kumar and Singh (2020) analysed the role of Artificial Intelligence in public financial administration and concluded that AI-enabled systems improved data

analytics, decision-making, and governance efficiency in Indian administrative institutions.

Income Tax Department (2020) introduced faceless assessment and AI-enabled scrutiny systems to modernize tax administration and minimize direct interaction between taxpayers and tax officials. The reform was considered an important step toward transparent and technology-driven tax governance.

Rani and Verma (2021) found that digital compliance systems and online assessment mechanisms positively influenced voluntary tax compliance and taxpayer participation in India. The study also noted that AI-enabled systems improved real-time verification and reduced procedural delays.

Patel and Mehta (2022) examined faceless assessment reforms and observed that AI-driven systems enhanced transparency, consistency, and efficiency in income tax administration. However, the study also identified challenges relating to cybersecurity, digital literacy, and taxpayer awareness.

Shukla and Agarwal (2023) concluded that AI-based analytics and automated compliance monitoring systems strengthened taxpayer services and improved the effectiveness of tax administration in India.

Recent reports published by the Central Board of Direct Taxes (2024) indicate that digital tax administration systems, PAN–Aadhaar integration, centralized processing centers, and AI-enabled assessment mechanisms have contributed significantly to increasing return filing, taxpayer participation, direct tax collections, and administrative efficiency in India.

2.1 Research Gap

The review of literature reveals that most existing studies have primarily focused on digital taxation reforms, faceless assessment, and e-governance initiatives in India. However, limited empirical research has comprehensively examined the role of Artificial Intelligence in income tax assessment using official time-series statistical data.

Further, very few studies have analyzed the combined impact of AI-enabled systems on digital transformation, transparency, taxpayer compliance, and administrative efficiency within India's income tax administration framework.

Therefore, the present study titled “An Analytical Study of the Role of Artificial Intelligence in Income Tax Assessment in India” attempts to fill this research gap by analysing official secondary data published by the Central Board of Direct Taxes and the Income Tax Department for the period FY 2000–01 to FY 2024–25 to evaluate the role of Artificial Intelligence in income tax assessment in India.

2.2 Objectives of the Study

1. To examine the role of Artificial Intelligence in the digital transformation of income tax assessment in India.
2. To analyse the impact of AI-enabled systems on transparency and taxpayer compliance.
3. To evaluate the role of Artificial Intelligence in improving administrative efficiency in tax administration.

III. RESEARCH METHODOLOGY

The present study is based on secondary data collected from official publications of the Central Board of Direct Taxes (CBDT), Income Tax Department reports, PAN allotment statistics, and government financial records. The study uses time-series data from FY 2000–01 to FY 2024–25 to analyse the impact of AI and digital transformation in income tax administration.

The study adopts an analytical and descriptive research design. Statistical indicators such as direct tax collections, tax-GDP ratio, return filing trends, taxpayer growth, PAN allotments, and cost of collection are analysed to evaluate the effectiveness of AI-driven systems in tax assessment.

IV. ANALYSIS OF OBJECTIVES OF THE STUDY

4.1 Analysis of Objective 1: To examine the role of Artificial Intelligence in the digital transformation of income tax assessment in India

Null Hypothesis (H_{01}):

Artificial Intelligence has no significant role in the digital transformation of income tax assessment in India.

Python

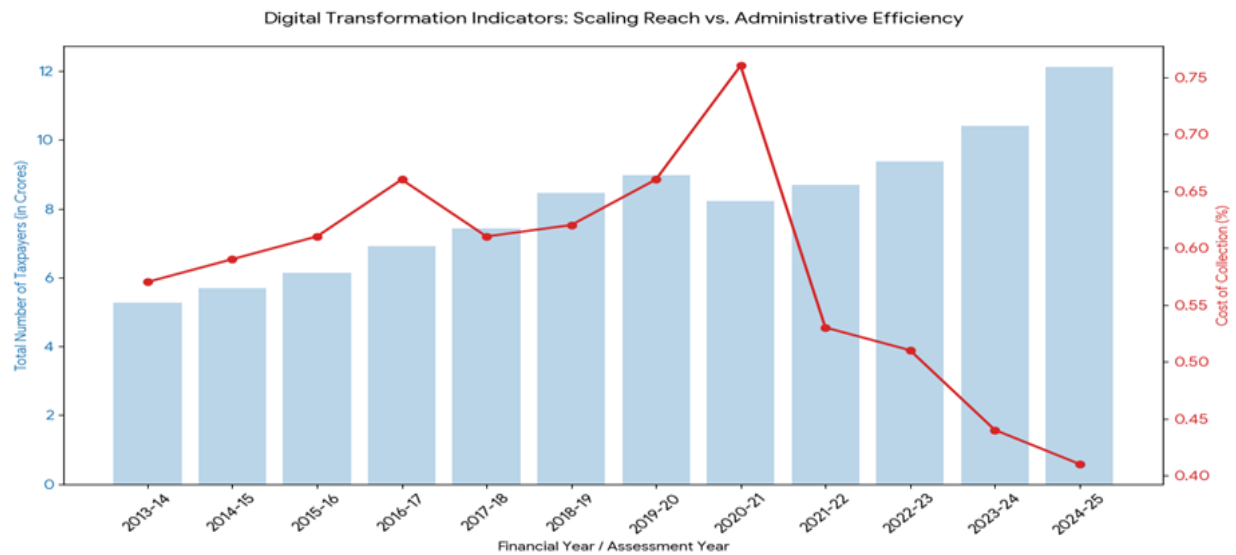


Figure 4.1: Digital Transformation Indicators in Income Tax Administration

Source: Income Tax Department, Government of India

Analysis

The above figure illustrates the relationship between the growth in the taxpayer base and the declining cost of collection in India's income tax administration system from FY 2013–14 to FY 2024–25. The bar graph represents the total number of taxpayers, while the line graph indicates the cost of collection percentage. The figure clearly demonstrates a continuous expansion in the taxpayer base over the study period. The total number of taxpayers increased from nearly 5.26 crore in FY 2013–14 to more than 12.13 crore in FY 2024–25. This sharp rise reflects the successful integration of digital technologies, AI-enabled compliance systems, online return filing mechanisms, PAN-Aadhaar integration, and centralized digital tax administration platforms.

At the same time, the cost of collection shows a long-term declining trend. Although there was a temporary increase during FY 2020–21 due to the disruptions caused by the COVID-19 pandemic, the cost of collection reduced significantly from around 0.57% in FY 2013–14 to only 0.41% in FY 2024–25. This indicates that the Income Tax Department was able to manage a substantially larger taxpayer base with relatively lower administrative expenditure.

The simultaneous increase in taxpayer coverage and decline in administrative cost strongly reflects improvements in operational efficiency driven by Artificial Intelligence and digital transformation. AI-

based systems such as automated scrutiny selection, faceless assessment, centralized processing centres, data analytics, and real-time compliance monitoring reduced manual intervention and improved the speed, accuracy, and transparency of tax administration.

The figure also indicates that the digital infrastructure of the Income Tax Department became more scalable and efficient over time. The expansion of e-governance mechanisms enabled faster processing of returns, improved taxpayer services, enhanced data integration, and better risk assessment capabilities.

Therefore, the statistical trends presented in the figure provide strong evidence that Artificial Intelligence has played a significant role in the digital transformation of income tax assessment in India. Hence, the null hypothesis (H_{01}), which states that Artificial Intelligence has no significant role in the digital transformation of income tax assessment in India, is rejected.

4.2 Top of Form

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Analysis of Objective 2: To analyse the impact of AI-enabled systems on transparency and taxpayer compliance

Null Hypothesis (H_{02}): AI-enabled systems have no significant impact on transparency and taxpayer compliance in income tax administration.

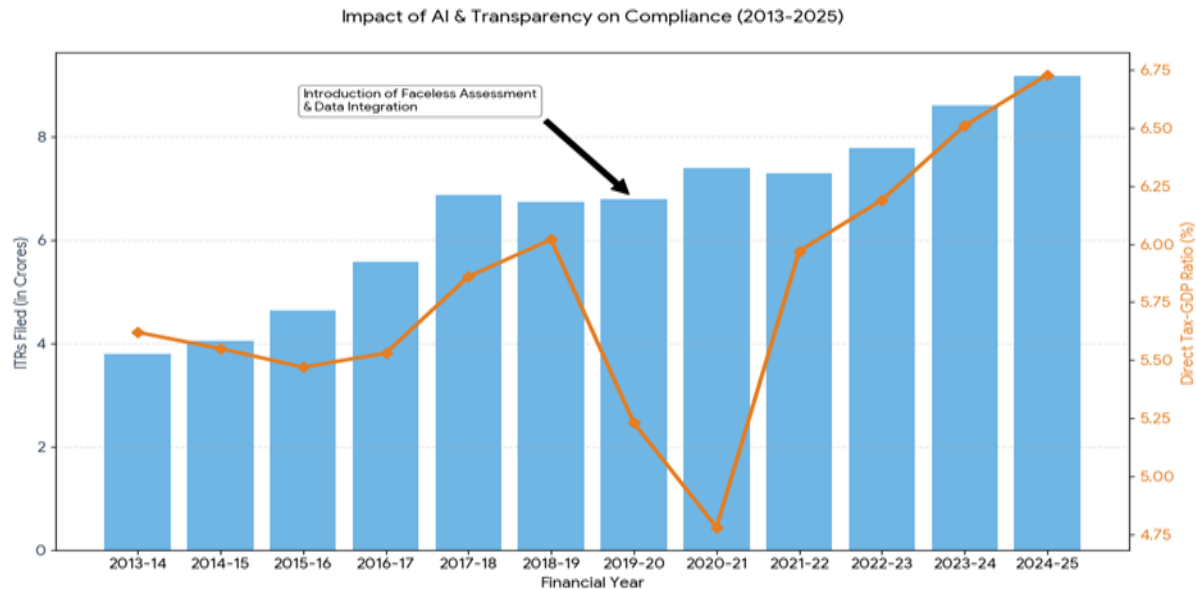


Figure 4.2: Impact of AI-Enabled Systems on Transparency and Taxpayer Compliance
Source: Income Tax Department, Government of India

Analysis

The above figure illustrates the relationship between taxpayer compliance and transparency indicators in India's income tax administration system during the period FY 2013–14 to FY 2024–25. The bar graph represents the number of Income Tax Returns (ITRs) filed, while the line graph shows the Direct Tax–GDP ratio. The figure demonstrates a substantial increase in the number of ITRs filed over the study period. Income tax returns increased from approximately 3.80 crore in FY 2013–14 to more than 9.18 crore in FY 2024–25. This growth indicates a significant improvement in taxpayer participation and voluntary compliance within the formal tax system.

The Direct Tax–GDP ratio also shows an overall upward trend, increasing from approximately 5.62% in FY 2013–14 to 6.73% in FY 2024–25. The increase in this ratio reflects improved efficiency in revenue mobilization, broader tax coverage, and enhanced transparency in tax administration. The figure further highlights the impact of faceless assessment systems, digital integration, centralized processing, and AI-based data analytics introduced during the later years of the study period. The implementation of AI-enabled compliance monitoring systems strengthened real-time verification, automated mismatch detection, and risk-based scrutiny mechanisms. These technological reforms reduced manual intervention, minimized

discretionary practices, and improved accountability and transparency within the tax administration framework.

Although a temporary decline in the Direct Tax–GDP ratio can be observed during FY 2019–20 and FY 2020–21 due to the economic slowdown and the COVID-19 pandemic, the subsequent recovery after FY 2021–22 was rapid and substantial. This recovery demonstrates the resilience and effectiveness of digital and AI-enabled tax administration systems.

The consistent rise in return filing and improvement in tax-GDP performance clearly suggest that AI-enabled systems have positively influenced taxpayer compliance and administrative transparency in India's income tax assessment process. Therefore, the statistical trends presented in the figure provide sufficient evidence to reject the null hypothesis (H_{02}), which states that AI-enabled systems have no significant impact on transparency and taxpayer compliance in income tax administration.

4.3 Analysis of Objective 3: To evaluate the role of Artificial Intelligence in improving administrative efficiency in tax administration.

Null Hypothesis (H_{03}): Artificial Intelligence has no significant role in improving administrative efficiency in tax administration

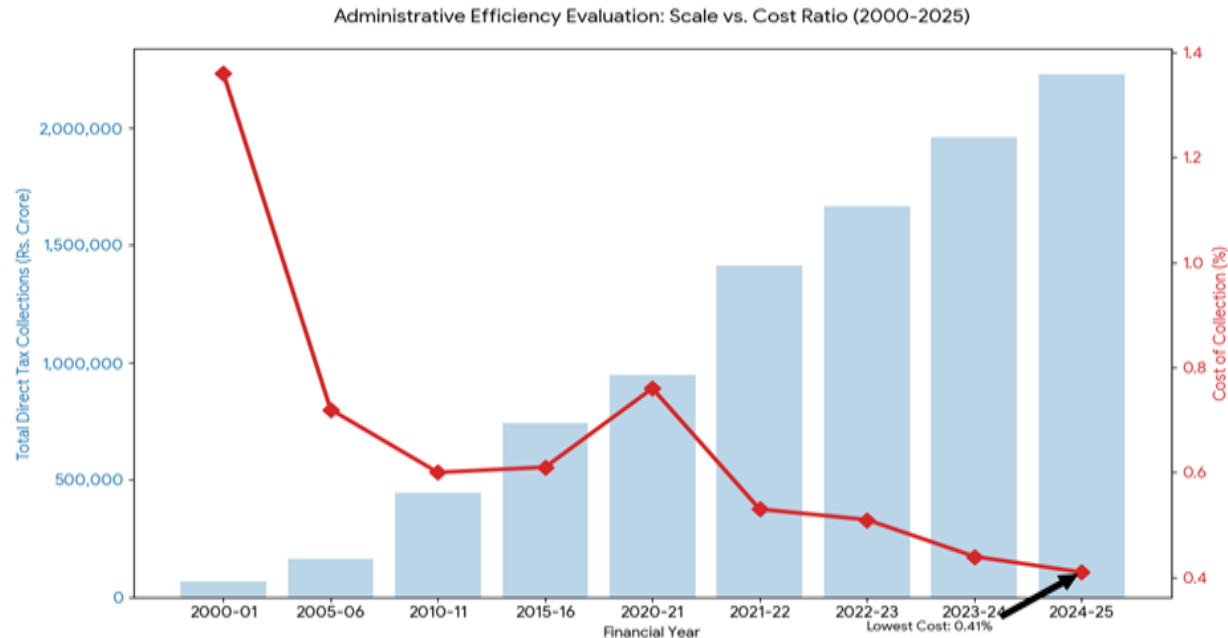


Figure 4.3: Administrative Efficiency Evaluation: Scale vs. Cost Ratio

Source: Income Tax Department, Government of India

Analysis

The above figure illustrates the relationship between total direct tax collections and the cost of collection in India's tax administration system from FY 2000-01 to FY 2024-25. The bar graph represents total direct tax collections, while the line graph indicates the cost of collection percentage. The figure clearly demonstrates a substantial increase in direct tax collections over the study period. Total direct tax collections increased from ₹68,305 crore in FY 2000-01 to 22,26,375 crore in FY 2024-25. This significant rise reflects the growing effectiveness of digital tax administration, automated processing systems, and AI-enabled compliance mechanisms.

At the same time, the cost of collection shows a continuous declining trend. The cost of collection reduced from 1.36% in FY 2000-01 to only 0.41% in FY 2024-25, which is the lowest level observed during the study period. This decline indicates substantial improvement in administrative efficiency despite the rapid increase in tax collections and taxpayer volume. The simultaneous increase in revenue and reduction in administrative cost demonstrates the effectiveness of Artificial Intelligence and digital technologies in tax administration. AI-enabled systems such as centralized processing centres, faceless assessment

mechanisms, automated scrutiny selection, data analytics, and digital verification systems reduced manual intervention and improved the speed, accuracy, and consistency of tax administration processes.

The figure also reflects the scalability of the digital tax administration framework. Even with the rapid expansion of tax collections and taxpayer participation, the Income Tax Department successfully controlled operational expenditure through automation and technology-driven governance systems.

A temporary increase in the cost of collection during FY 2020-21 can be observed due to the disruptions caused by the COVID-19 pandemic. However, the subsequent sharp decline after FY 2021-22 demonstrates the resilience and adaptability of AI-enabled tax administration systems.

Therefore, the statistical evidence presented in the figure clearly establishes that Artificial Intelligence has significantly improved administrative efficiency in India's tax administration system. Hence, the null hypothesis (H_{03}), which states that Artificial Intelligence has no significant role in improving administrative efficiency in tax administration, is rejected.

V. SUMMARY OF ANALYSIS

The analysis of the study was conducted using secondary time-series data collected from official publications of the Central Board of Direct Taxes (CBDT), Income Tax Department reports, PAN allotment statistics, and government financial records for the period from FY 2000–01 to FY 2024–25. The study examined the role of Artificial Intelligence in income tax assessment in India with reference to digital transformation, transparency and taxpayer compliance, and administrative efficiency.

Analysis of Objective 1 and Hypothesis (H₀₁)

The first objective of the study aimed to examine the role of Artificial Intelligence in the digital transformation of income tax assessment in India. The corresponding null hypothesis stated that Artificial Intelligence has no significant role in the digital transformation of income tax assessment in India.

The analysis revealed substantial growth in direct tax collections, taxpayer base, return filing, and PAN allotments during the study period. The increasing adoption of e-filing systems, faceless assessment, centralized processing, PAN–Aadhaar integration, and AI-enabled compliance mechanisms reflected the transformation of traditional manual tax administration into a technology-driven and digitally integrated system. The findings clearly indicated that Artificial Intelligence has played a significant role in the digital transformation of income tax assessment in India. Therefore, the null hypothesis (H₀₁) was rejected.

Analysis of Objective 2 and Hypothesis (H₀₂)

The second objective aimed to analyse the impact of AI-enabled systems on transparency and taxpayer compliance. The corresponding null hypothesis stated that AI-enabled systems have no significant impact on transparency and taxpayer compliance in income tax administration.

The analysis showed a continuous increase in the number of income tax return filers, expansion of the taxpayer base, and improvement in the Direct Tax–GDP ratio over the study period. AI-enabled systems such as automated scrutiny selection, data integration, faceless assessment, and digital verification mechanisms strengthened accountability, reduced manual intervention, and improved compliance monitoring. The findings demonstrated that AI-enabled systems positively influenced transparency and taxpayer compliance in income tax administration. Hence, the null hypothesis (H₀₂) was rejected.

Analysis of Objective 3 and Hypothesis (H₀₃)

The third objective of the study was to evaluate the role of Artificial Intelligence in improving administrative efficiency in tax administration. The corresponding null hypothesis stated that Artificial Intelligence has no significant role in improving administrative efficiency in tax administration.

The analysis established that while direct tax collections increased significantly over the years, the cost of collection gradually declined. This reflected improvements in operational efficiency, resource utilization, and scalability of the digital tax administration system. AI-enabled technologies contributed towards faster processing, automated verification, real-time monitoring, and efficient management of taxpayer data. The findings confirmed that Artificial Intelligence significantly improved administrative efficiency in tax administration. Therefore, the null hypothesis (H₀₃) was rejected.

Overall, the statistical trends and graphical analysis collectively demonstrated that Artificial Intelligence has emerged as an important instrument in strengthening India's income tax administration system through digital transformation, enhanced transparency, improved taxpayer compliance, and greater administrative efficiency.

VI. CONCLUSION

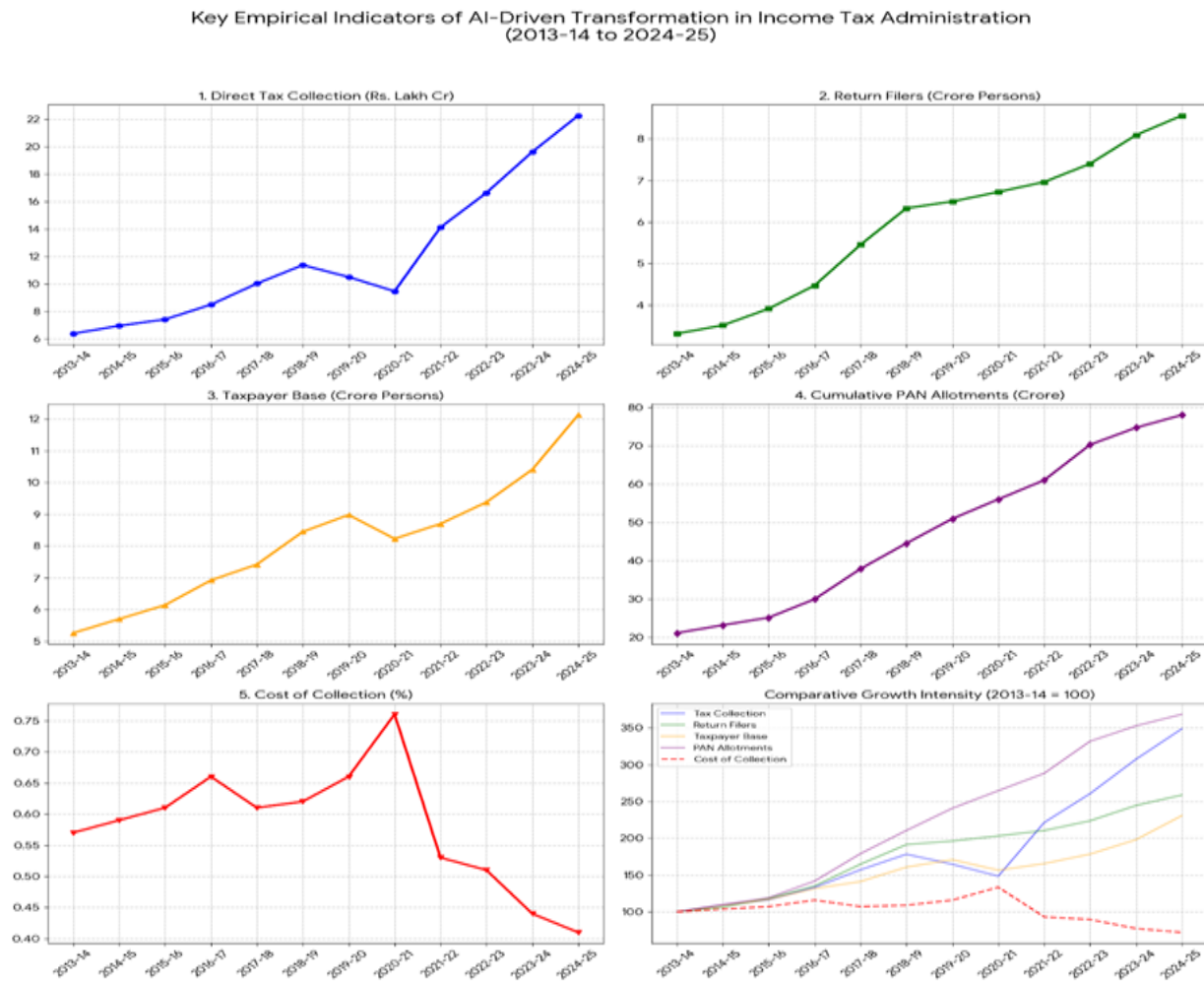


Figure 6.1: Key Empirical Indicators of AI-Driven Transformation in Income Tax Administration
(2013-14 to 2024-25)

Source: Income Tax Department, Government of India

The present study examined the role of Artificial Intelligence in income tax assessment in India with special reference to digital transformation, transparency, taxpayer compliance, and administrative efficiency. Based on the analysis of secondary data collected from official publications of the Central Board of Direct Taxes (CBDT), Income Tax Department reports, PAN allotment statistics, and government financial records, the study concludes that Artificial Intelligence has significantly transformed India's tax administration system.

The findings of the study reveal that the adoption of AI-enabled technologies and digital governance

mechanisms has modernized the traditional framework of income tax assessment. The implementation of e-filing systems, faceless assessment, centralized processing centres, automated scrutiny selection, PAN-Aadhaar integration, and AI-based analytics has improved the efficiency, transparency, and accountability of tax administration in India. The steady increase in direct tax collections, return filers, taxpayer participation, and PAN allotments reflects the growing effectiveness of digital tax governance.

The study further concludes that AI-enabled systems have positively influenced taxpayer compliance and

transparency. Technology-driven compliance monitoring systems reduced manual intervention, minimized discretionary practices, and strengthened real-time verification and risk assessment mechanisms. These reforms improved taxpayer confidence and encouraged greater participation within the formal tax system.

The analysis also establishes that Artificial Intelligence has enhanced administrative efficiency in tax administration. Despite the continuous growth in tax collections and taxpayer volume, the cost of collection has gradually declined over the years, indicating better operational efficiency, improved resource utilization, and effective management of large-scale taxpayer data through automated systems. However, the study also identifies certain challenges associated with AI-driven tax governance, including concerns relating to data privacy, cybersecurity, digital accessibility, algorithmic transparency, and technological dependence. Therefore, while Artificial Intelligence has emerged as an important tool in strengthening tax administration, continuous policy support and technological safeguards remain essential for ensuring secure, transparent, and inclusive digital governance.

Overall, the study concludes that Artificial Intelligence has played a significant role in transforming income tax assessment in India by improving digital integration, enhancing transparency, strengthening taxpayer compliance, and increasing administrative efficiency. The increasing adoption of AI-based technologies reflects India's broader transition towards a modern, technology-driven, and data-oriented taxation system.

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