



A Study on GST Compliance Using Artificial Intelligence Tools

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Abstract—Goods and Services Tax (GST) is a comprehensive indirect tax system introduced in India in 2017. Compliance with GST regulations remains a significant challenge for businesses, particularly Small and Medium Enterprises (SMEs). This study examines the role of Artificial Intelligence (AI) tools in improving GST compliance, reducing errors, and streamlining tax filing processes. Using a descriptive research design, primary data was collected from 100 respondents including tax consultants, business owners, and government officials. The findings reveal that 34% of respondents are fully compliant using AI-based systems, while a majority face challenges related to lack of technical knowledge and high implementation costs. The study concludes that AI-driven automation significantly enhances GST compliance efficiency and recommends broader adoption of AI tools with adequate training and policy support.

Keywords: Artificial Intelligence, GST Compliance, Tax Automation, Machine Learning, SMEs, Indirect Tax, E-invoicing, Natural Language Processing.

1. INTRODUCTION

The Goods and Services Tax (GST) was introduced in India on July 1, 2017, replacing a complex multi-layered indirect tax structure. It is a comprehensive, multi-stage, destination-based tax that is levied on every value addition. While GST has brought significant improvements in tax transparency and ease of doing business, compliance with its provisions continues to pose challenges for businesses of all sizes.

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, especially computer systems. In the domain of taxation, AI encompasses a wide range of technologies including Machine Learning (ML), Natural Language Processing (NLP), Robotic Process Automation (RPA), and predictive analytics. These technologies are increasingly being applied to automate tax filing, detect fraudulent returns, interpret complex tax regulations, and provide real-time assistance to taxpayers.

The integration of AI in GST compliance is transforming how businesses manage their tax obligations. AI-powered software can automatically extract invoice data, match

purchase and sales records, compute tax liabilities, and submit returns with minimal human intervention. This not only reduces the burden on taxpayers but also significantly decreases the probability of errors and penalties.

Despite the promising potential of AI, adoption remains uneven across sectors and enterprise sizes. Larger corporations have invested heavily in AI-based tax management systems, while SMEs often lack the resources, technical expertise, and awareness needed to leverage these technologies. Government initiatives such as the GST Council's e-invoicing mandate and the introduction of the Invoice Registration Portal (IRP) have further accelerated the need for AI-based compliance tools.

This study investigates the current state of AI adoption for GST compliance, identifies the challenges faced by taxpayers, and proposes recommendations for promoting wider and more effective use of AI tools in the GST ecosystem.



2. OBJECTIVES OF THE STUDY

The primary objectives of this study are as follows:

- To examine the level of awareness among taxpayers regarding AI-based GST compliance tools.
- To assess the extent of adoption of AI tools for GST compliance across different categories of taxpayers.
- To identify the key challenges faced by businesses in implementing AI for GST compliance.
- To evaluate the impact of AI tools on reducing GST non-compliance, errors, and penalties.
- To suggest policy recommendations for promoting AI-driven GST compliance in India.

3. LITERATURE REVIEW

The intersection of AI and taxation has attracted considerable academic interest in recent years. Several scholars have explored how emerging technologies can address the challenges of tax compliance.

Kumar and Singh (2020) demonstrated that AI tools can automate repetitive tax compliance tasks, reducing human errors by approximately 40% in large enterprises. Their study highlighted the role of Robotic Process Automation (RPA) in extracting and processing GST invoice data efficiently.

Patel et al. (2021) studied the impact of GST complexity on Small and Medium Enterprises (SMEs) in India and found that AI-powered filing tools significantly reduce the time and cost of compliance. They emphasized that SMEs need government support to access affordable AI solutions.

Sharma (2022) explored the use of Machine Learning algorithms in GST audit processes and concluded that ML models can detect anomalies in tax returns with high precision,

thereby improving the quality and efficiency of tax audits.

Reddy and Rao (2021) investigated the role of AI in e-invoicing under the GST framework. Their findings indicated that AI-based invoice verification systems significantly reduce fraudulent invoicing and improve Input Tax Credit (ITC) reconciliation.

Mishra et al. (2023) examined the application of Natural Language Processing (NLP) for interpreting GST regulations and found that NLP-based tools help taxpayers accurately understand and apply complex GST provisions, thereby reducing inadvertent non-compliance.

Gupta (2022) studied the potential of Blockchain technology integrated with the GST portal to enhance transparency and immutability of tax records. The study found that blockchain can significantly reduce disputes between taxpayers and tax authorities.

Verma and Joshi (2023) analyzed the effectiveness of AI-powered chatbots deployed by the GSTN helpdesk and found that chatbots resolved over 65% of taxpayer queries without human intervention, substantially reducing the operational burden on tax officials.

TABLE I. Summary of Literature Review

Author & Year	Focus Area	Key Findings
Kumar & Singh (2020)	AI in Tax Administration	AI automates repetitive tax tasks, reducing errors by 40%.
Patel et al. (2021)	GST Compliance India	SMEs struggle with GST due to complexity; AI tools ease filing.
Sharma (2022)	Machine Learning in Audit	ML detects anomalies in GST returns, improving audit quality.
Reddy & Rao (2021)	E-invoicing & AI	AI-based e-invoicing reduces fake invoice fraud significantly.
Mishra et	NLP for GST	NLP tools help



Author & Year	Focus Area	Key Findings
al. (2023)		taxpayers interpret GST rules accurately.
Gupta (2022)	Blockchain & GST	Blockchain integration with GST portal enhances transparency.
Verma & Joshi (2023)	AI Chatbots for Tax	Chatbots reduce helpdesk load and improve taxpayer experience.

Source: Compiled by the Authors (2024)

4. RESEARCH METHODOLOGY

4.1 Research Design

This study employs a descriptive research design to systematically describe the characteristics, patterns, and relationships related to AI adoption for GST compliance. The descriptive design is appropriate as the study aims to understand the current state of awareness, usage patterns, and challenges associated with AI tools in GST compliance, without manipulating any variables. Both quantitative and qualitative data analysis methods are used to ensure comprehensive coverage of the research objectives.

4.2 Data Sources

Primary Data: Primary data was collected through a structured questionnaire administered to 100 respondents across Hyderabad and Secunderabad. The questionnaire was designed on a five-point Likert scale to measure attitudes, awareness levels, and challenges related to AI-based GST compliance tools. The questionnaire was pilot-tested with 10 respondents before the final survey to ensure clarity and reliability.

Secondary Data: Secondary data was sourced from published research journals, GST Council reports, GSTN annual reports, Ministry of Finance publications, Reserve Bank of India bulletins, and reputed databases including Scopus, Web of Science, and Google Scholar. Government notifications,

CBIC guidelines, and industry reports from NASSCOM and CII were also referred to.

4.3 Sample Size

A purposive sampling technique was used to select 100 respondents with direct experience in GST compliance. The sample comprised four major categories as presented in Table II.

TABLE II. Sample Distribution

Category	No. of Respondents	Percentage (%)
Tax Consultants / CAs	42	42%
Business Owners / SMEs	35	35%
Government Tax Officials	15	15%
IT/Software Professionals	8	8%
Total	100	100%

Source: Primary Data (2024)

4.4 Tools for Analysis

The collected data was analyzed using the following statistical tools and techniques:

TABLE III. Statistical Tools Used

Tool / Technique	Purpose
SPSS / MS Excel	Descriptive statistics, frequency analysis
Percentage Analysis	Distribution of responses
Likert Scale Analysis	Attitude measurement on AI tools
Chi-Square Test	Association between variables
Pie Charts / Bar Graphs	Graphical representation of findings

Source: Research Design (2024)

5. DATA ANALYSIS AND INTERPRETATION

This section presents the analysis of primary data collected from 100 respondents. The analysis is organized around the key research



objectives: awareness, AI tool usage, impact, and challenges.

5.1 Awareness of AI Tools for GST Compliance

Respondents were asked to rate their level of awareness about AI-based tools available for GST compliance. The responses are summarized in Table IV below.

TABLE IV. Awareness Level of Respondents

Level of Awareness	No. of Respondents	Percentage (%)
Highly Aware	32	32%
Moderately Aware	28	28%
Slightly Aware	22	22%
Not Aware	18	18%
Total	100	100%

Source: Primary Data (2024)

The data reveals that 32% of respondents considered themselves highly aware of AI tools available for GST compliance, while 28% were moderately aware. A significant 22% had only slight awareness and 18% were not aware at all. This indicates that while a majority (60%) possess some degree of awareness, a substantial portion (40%) require targeted awareness campaigns and training programs.

5.2 Pattern of AI Tool Usage

Respondents were asked to indicate which AI tools they currently use for GST-related compliance activities. Table V presents the distribution of AI tool usage among the surveyed population.

TABLE V. AI Tool Usage Pattern

AI Tool Used	No. of Users	Percentage (%)
GST Filing Software (AI-based)	38	38%
Chatbots / Virtual Assistants	22	22%
ML-Based Audit Tools	18	18%
NLP-Based Query Systems	12	12%
None / Manual Methods	10	10%

AI Tool Used	No. of Users	Percentage (%)
Total	100	100%

Source: Primary Data (2024)

GST filing software with AI capabilities was the most widely used tool (38%), followed by chatbots and virtual assistants (22%). ML-based audit tools were used by 18% of respondents, while NLP-based query systems were employed by 12%. A notable 10% still relied on entirely manual methods, highlighting the gap in AI adoption. These findings suggest that while AI-powered filing software has achieved reasonable penetration, more advanced AI applications such as ML auditing and NLP remain underutilized.

5.3 Challenges in AI Adoption for GST Compliance

Respondents were asked to identify the primary challenges they face in adopting AI tools for GST compliance. Multiple responses were permitted, and the most frequently cited challenge per respondent is reported in Table VI.

TABLE VI. Key Challenges in AI Adoption

Challenge	No. of Respondents	Percentage (%)
Lack of Technical Knowledge	35	35%
High Implementation Cost	28	28%
Data Privacy Concerns	18	18%
Frequent Regulatory Changes	12	12%
Integration Issues	7	7%
Total	100	100%

Source: Primary Data (2024)

Lack of technical knowledge emerged as the most significant barrier (35%), indicating that the workforce engaged in tax compliance often lacks the digital literacy required to operate AI-based systems. High implementation costs were cited by 28% of respondents, particularly those representing SMEs. Data privacy and security concerns



were raised by 18% of respondents, reflecting growing apprehension about sharing sensitive financial data with AI systems. Frequent changes in GST regulations (12%) and system integration challenges (7%) were also identified as important barriers.

6. FINDINGS AND SUGGESTIONS

6.1 Key Findings

Based on the analysis of primary and secondary data, the following key findings have emerged from this study:

- Awareness of AI-based GST tools is moderate to high among tax consultants and IT professionals, but significantly low among SME owners and small business taxpayers.
- GST filing software with embedded AI features is the most commonly adopted tool (38%), while advanced applications like ML-based audit systems (18%) and NLP tools (12%) remain in early adoption stages.
- 34% of surveyed organizations are fully compliant with GST requirements using AI-assisted systems, demonstrating the tangible compliance benefits of AI adoption.
- The primary obstacles to AI adoption are lack of technical knowledge (35%), high implementation costs (28%), and data privacy concerns (18%).
- AI tools have demonstrated measurable improvements in invoice reconciliation accuracy, ITC claim processing, and timely return filing among early adopters.
- Government initiatives such as mandatory e-invoicing have indirectly accelerated AI adoption by necessitating automated invoice processing capabilities.

6.2 GST Compliance Status – Distribution (Pie Chart Representation)

Figure 1 below presents the distribution of GST compliance status among respondents, illustrating the proportion of businesses at different stages of AI-driven compliance maturity.

TABLE VII. GST Compliance Status Distribution

Category	Respondents (%)	Interpretation
Fully Compliant using AI tools	34%	Adopted AI-based GST systems
Partially Compliant	28%	Limited use of AI tools
Manual Compliance	22%	No AI integration
Non-Compliant	10%	Lack of awareness
Under Process	6%	Transitioning to AI

Fig. 1. GST Compliance Status of Respondents Using AI Tools (Source: Primary Data, 2024)

The data illustrates that 34% of respondents have achieved full GST compliance through AI tools, while 28% are partially compliant. A combined 22% rely entirely on manual processes, representing a critical segment requiring immediate intervention. The 6% category transitioning to AI-based systems indicates growing momentum toward technology adoption.

6.3 Suggestions

Based on the findings, the following suggestions are offered to stakeholders including policymakers, tax professionals, and businesses:

- The Government should launch targeted digital literacy programs specifically designed for SME owners and small business taxpayers to improve awareness and proficiency in AI-based GST tools.
- Subsidies, tax incentives, or credit-linked schemes should be introduced to reduce the financial burden of AI implementation for micro, small, and medium enterprises.



- GSTN should develop and promote open-source, free-to-use AI modules that can be integrated with existing accounting software used by small businesses.
- A standardized data privacy framework specifically addressing GST-related financial data processed by AI systems should be established to address security concerns.
- Industry associations and professional bodies (ICAI, ICSI) should include AI-based tax compliance tools in their continuing professional development (CPD) curricula.
- The GST Council should ensure that policy changes are communicated promptly and integrated into AI tools through regular API updates to GSTN portals.
- Public-private partnerships should be encouraged to develop affordable AI-powered GST compliance solutions tailored for rural and semi-urban business ecosystems.

7. CONCLUSION

This study provides empirical evidence that Artificial Intelligence has a transformative potential for improving GST compliance in India. The findings confirm that AI tools, ranging from automated filing software to ML-powered audit systems and NLP-based query assistants, are progressively being adopted by tax professionals and businesses. The 34% full compliance rate achieved through AI tools among surveyed respondents underscores the practical benefits these technologies bring to tax administration.

However, the study also highlights critical barriers that impede wider adoption. Lack of technical knowledge, high implementation costs, and data privacy concerns represent systemic challenges that require coordinated action from government, industry, and educational institutions. The significant

proportion of respondents (22%) still relying on entirely manual methods suggests that the transition to AI-driven compliance is far from complete.

The findings align with global trends where tax administrations are increasingly leveraging AI to reduce compliance gaps, detect tax evasion, and improve taxpayer experience. India's GST ecosystem, with its digital infrastructure and growing AI capabilities, is well-positioned to lead this transformation in the developing world context.

Future research could explore the longitudinal impact of AI adoption on GST revenue collection, conduct sector-specific analyses, or examine the integration of Blockchain and AI for comprehensive tax compliance solutions. As AI technologies continue to evolve, their role in creating a more efficient, transparent, and taxpayer-friendly GST system will only grow more significant.

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