

Discussion on the Application of Internet of Things and Artificial Intelligence in Tax Administration

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Abstract: This study explores the application and synergistic effects of the Internet of Things (IoT) and Artificial Intelligence (AI) in tax management. The research addresses the challenges faced by traditional tax management systems, such as data lag, high costs of manual auditing, and limited accuracy, which are exacerbated by human intervention. The integration of IoT and AI is proposed as a core driver for the digital transformation of tax management. IoT enables real-time data collection through smart sensors, enhancing data accuracy and monitoring capabilities, while AI leverages machine learning and natural language processing to analyze tax data, identify patterns and anomalies, and support intelligent risk assessment and decision-making. The study employs a combination of theoretical analysis and case studies to examine how IoT and AI can optimize tax data collection, improve tax risk prediction, and address the challenges faced by enterprises in adopting these technologies. The findings suggest that the integration of IoT and AI significantly enhances the efficiency, accuracy, and transparency of tax management, reducing compliance risks and operational costs. However, challenges such as high implementation costs, data privacy concerns, and technical adaptability remain. The results of this study provide new insights for the digital transformation of tax management.

1 INTRODUCTION

Against the backdrop of an increasingly complex global economy, traditional tax administration is beset by problems such as lagging data, high costs and low efficiency of manual review, and limited accuracy. Manual intervention further escalates the risk of errors, making improvement an urgent need (Song, 2023). The Internet of Things (IoT) and artificial intelligence (AI) have emerged as the core drivers for the digital transformation of tax administration. IoT enables real-time data collection through smart sensors, enhancing data accuracy and the ability to monitor corporate behavior, and improving decision-making efficiency. AI, on the other hand, leverages machine learning and natural language processing to deeply analyze tax data, identify patterns and anomalies, support intelligent risk assessment and decision-making, reduce human errors, and significantly enhance efficiency (Wu, 2024). However, challenges such as information silos and poor technological adaptability still impede the

transformation process. Therefore, effectively integrating IoT and AI to collaboratively optimize tax administration is the key to achieving intelligent and digital transformation.

This research mainly focuses on the application and synergy of IoT and AI in enterprise tax management. With the above research background, this paper raises the following three specific questions: First, how can IoT optimize tax data collection and enhance the real-time and accuracy of tax management? Second, how can the application of AI in tax data analysis and decision-making improve tax risk prediction and management? Third, what are the main challenges that enterprises face when adopting these technologies?

This research will explore the possibility of IoT technology, AI technology and tax management from both theoretical and data perspectives, and will also discuss specific cases. The significance of this research lies in promoting the intelligence of tax management. Through IoT and AI technologies, it aims to enhance the real-time and accuracy of tax data

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and reduce tax compliance risks. This research will combine the latest application cases of AI and IoT to provide new perspectives and solutions for enterprises and academia, and contribute to the modernization of tax management.

2 THEORETICAL BASIS

2.1 IoT and Tax Administration

This section focuses on the crucial role of IoT in tax administration, and it is mainly divided into three aspects. First, real-time data collection. IoT achieves monitoring of the entire logistics process through GPS and wireless sensors, providing real-time data support to ensure accurate collection of value-added tax, consumption tax, etc. (Yan, 2021). Second, intelligent invoice management. By integrating IoT with blockchain technology, an intelligent invoice system is created. Through RFID tags, the entire invoice process can be monitored, ensuring authenticity and compliance, and enhancing management transparency and review efficiency (Shi et al, 2024). Thirdly, tax management for fixed assets. The IoT utilizes RFID technology to achieve precise tracking and status monitoring of enterprise fixed assets, ensuring accurate depreciation calculation, optimizing asset management, and reducing tax compliance risks (Chen,2024).

2.2 AI and Tax Administration

The application of AI in enterprise taxation mainly includes the following types. The first is tax risk prediction, where machine learning identifies potential tax compliance risks for enterprises; the second is intelligent tax declaration, which automatically fills in and optimizes tax strategies; the third is the identification of false transactions, where AI combined with IoT data detects abnormal transaction patterns. At the same time, the development and introduction of AI robot customer service facilitate more convenient communication between tax authorities and enterprises, saving human and material resources (Zheng et al., 2022).

It employs three core technologies in tax administration. The first is natural language processing (NLP), which is used to automatically identify tax compliance issues; the second is machine learning, which is used for tax data analysis and prediction of tax risks; the third is computer vision, which is used for automatic invoice review and identification of forged documents (Merola, 2022).

2.3 Analysis of the Possibility of Combining IoT Technology, AI Technology and Tax Administration

2.3.1 Theoretical Support

Technology Acceptance Model (TAM model) is a theoretical model used to explain how users accept and utilize new technologies. It mainly focuses on the influence of perceived usefulness and perceived ease of use on users' behavioral intentions. According to the TAM model, the acceptance of new technologies by users is determined by the perceived usefulness and perceived ease of use of the technology (Almahri et al., 2025). In tax administration, IoT and AI have enhanced tax efficiency and accuracy by providing real-time data and intelligent analysis, meeting the demands of tax officials and enterprises for technology.

Structure-Conduct-Performance (SCP framework) is an industrial organization analysis model that is used to study the interrelationships among market structure, enterprise behavior and market performance (Panhans, 2023). According to the SCP framework, the structure, behavior and performance of the market determine the competitive situation of the market. The combination of the IoT and AI technology optimizes the tax management structure, enabling the tax department to conduct tax monitoring and risk management more precisely and enhancing the performance of tax management.

2.3.2 Data Analysis

The combination of IoT and AI in tax management demonstrates remarkable advantages. Through real-time and precise data collection by IoT and deep analysis and intelligent decision-making by AI, it not only enhances the timeliness, efficiency and transparency of tax management, but also reduces data errors and tax risks, promoting the transformation of the tax system towards intelligence and automation. This technological integration provides important opportunities for improving tax compliance, enhancing public trust, and promoting cross-departmental data cooperation. However, its application also faces high technical implementation costs, insufficient technical adaptability, and disadvantages such as data privacy and security. Moreover, immature technology, system compatibility issues, legal and policy restrictions, and potential stability threats due to over-reliance on

technology may all limit its comprehensive promotion and application effectiveness.

3 APPLICATION SCENARIOS AND CASE ANALYSIS OF IOT AND AI IN TAX ADMINISTRATION

3.1 Specific Applications and Analysis of the IoT

3.1.1 The Brasil ID System

The Brasil ID system ("Brasil ID") is an innovative project jointly initiated by the Ministry of Finance of Brazil, the National Tax Bureau, and the state finance departments in 2007. Its aim is to optimize tax management in interstate trade through Radio Frequency Identification (RFID) technology. This system addresses issues such as low regulatory efficiency and severe tax fraud in the ICMS (Interstate Sales Tax) for interstate goods and services circulation in Brazil. By using RFID tags to store information about goods and automatically collecting data through state interstate highways antennas and comparing it with tax records in real time, it enables compliance verification. As of 2023, the system has been implemented in 13 states, significantly enhancing transportation efficiency (reducing approximately 15% of transportation time), saving millions of dollars in compliance costs, and effectively curbing tax evasion, laying the foundation for the modernization of tax management in Brazil.

3.1.2 California Road Tolling Pilot Program

National Grid of the United Kingdom is a multinational power and gas company headquartered in London. It is responsible for the power transmission network in England and Wales and has approximately 20,000 employees in the UK and the United States. Its revenue in 2023 was approximately 21 billion pounds. Under the impetus of the EU's "Third Energy Package" in 2009, the company cooperated with the government and installed millions of smart meters in the UK by 2023 to track electricity consumption data and assist tax authorities in calculating energy taxes. Pacific Gas and Electric Company (PG&E) is the largest utility company in California, headquartered in San Francisco, serving approximately 16 million customers. Its revenue in 2023 was approximately 24 billion US dollars, and it had about 26,000 employees. As part of the US federal funding program in 2009, PG&E deployed over 5 million smart meters in

California, using IoT technology to record energy consumption and support precise calculation of electricity bills and related taxes. The background for these companies to adopt smart meters is the inefficiency of traditional manual meter reading and the need for a more flexible billing system in the context of the rise of renewable energy. As of 2023, the total number of smart meters worldwide exceeded 1.06 billion, and utility companies ensured efficient operation of the equipment through cooperation with technology suppliers such as Siemens and Lansi, promoting the modernization of tax management.

The California Road Fee Pilot Program is an innovative measure implemented by the California Department of Transportation (Caltrans) to address the issue of insufficient fuel tax revenue. This program utilizes telemetry technology to collect real-time vehicle data. The Department collaborates with technology enterprises to install OBD-II sensors or deploy smartphone applications on pilot vehicles to continuously record mileage and transmit the data wirelessly to the cloud for calculation of corresponding road fees. To ensure broad applicability, the system also provides an option for manual input of mileage. The pilot project, which began in August 2024, covers the entire state of California. Participants pay fees at the rate of 1.8 cents per mile and receive a fuel tax credit (Chandra et al, 2020). The assessment results indicate that this technical solution provides a feasible alternative for Caltrans under the background of the reduction in fuel taxes due to the popularization of electric vehicles. Preliminary data show that the accuracy of automatic tracking exceeds 95%, and approximately 90% of the participants pay their fees on time, confirming that this technology can effectively support the mileage-based charging model. The system also collected data on the differences in road usage between urban and rural areas, providing a basis for future policy adjustments. Although the pilot program will continue until January 2025, early feedback indicates that this measure is expected to increase road maintenance funds for Caltrans by several hundred million dollars annually. Caltrans has pioneered a new way of road taxation through telemetry technology, verified the feasibility of the concept, and provided new possibilities for tax management innovation.

3.2 Specific Applications and Analysis of AI

3.2.1 Thomson Reuters

Thomson Reuters Corporation was established in 2008 and is a multinational information service giant

formed by the merger of The Thomson Corporation and Reuters Group. Its headquarters is located in Toronto, Canada. The Thomson Corporation originated from the newspaper group founded by Roy Thomson in 1934 and later expanded into the multimedia field; Reuters was established by Paul Julius Reuter in 1851 and has held a leading position in the global news and financial information services sector. The strategic integration of the two institutions combined Thomson's advantages in the North American market with Reuters' extensive influence in Europe and emerging markets, forming an important force in the global information service industry. The company's business initially focused on news release and financial data analysis, and then expanded to professional service areas such as law, taxation, accounting, risk management, and compliance. Its tax and accounting business have developed into the company's core pillar, building a complete product ecosystem, and serving various accounting firms, tax departments of multinational enterprises, and tax regulatory agencies of various countries around the world. As a knowledge-based enterprise, Thomson Reuters has accumulated rich technical reserves, especially the research in the field of AI, which can be traced back to 1991 when Howard Turtle, the chief scientist, initiated the AI research project, laying the foundation for the company's technological innovation in the following decades.

The global tax environment is becoming increasingly complex, with frequent changes in tax laws across different countries, causing tax professionals to face the dual pressures of information overload and knowledge update. At the same time, the compliance requirements for multinational enterprises' taxes are constantly rising, and accurately understanding and applying the tax policies in multiple jurisdictions has become a key challenge. In the era of digital economy, new business models and transaction forms have exceeded the applicable scope of traditional tax frameworks, requiring more intelligent solutions. Moreover, enterprises generally hope to improve tax efficiency and reduce compliance costs. Based on these backgrounds, Thomson Reuters has developed the Checkpoint Edge with CoCounsel system, which is a tax research and compliance tool integrated with generative AI. This system can understand complex tax inquiries, extract relevant information from massive tax laws, regulations, precedents, and professional literature, and generate structured answers, shortening the traditional query process from several hours to several minutes and improving the accuracy of tax decisions through intelligent analysis. This

technology application reflects Thomson Reuters' strategy of maintaining its leadership position in the professional information services sector through digital transformation, as well as the company's proactive response to the changing needs of its customers. By applying AI to automate the processing of cumbersome tasks and in-depth analysis of regulatory provisions, Thomson Reuters has successfully transformed technological innovation into service value and strengthened its authoritative position in the global tax information market.

3.2.2 Intuit TurboTax

Intuit was founded in 1983 and its headquarters is located in Mountain View, California. It is a pioneer in the field of financial management software. Its flagship product, TurboTax, holds approximately 65% of the market share in the personal tax filing market in the United States, serving over 40 million users annually. To cope with complex tax laws and market competition, Intuit has introduced AI technology into TurboTax since 2018, launching an intelligent tax-filing assistant system. This system enables intelligent document recognition and data extraction (reducing the manual input time from 30-45 minutes to several minutes), personalized deduction item recognition (increasing tax refunds by an average of about \$3,900 for users), natural language interaction interface (lowering the professional threshold), and anomaly detection (reducing audit risk by about 40%). These innovations have reduced the error rate of tax filings by approximately 65%, shortened the average filing time from 3.2 hours to 1.5 hours, increased user satisfaction by 28 percentage points, and reduced customer acquisition costs by about 22%, thereby significantly enhancing user experience and market performance, consolidating Intuit's leadership position in the tax filing market, and demonstrating the perfect combination of technology and demand.

4 FUTURE TECHNOLOGICAL TRENDS AND IMPROVEMENT SUGGESTIONS

4.1 Future Technological Trends

The combination of IoT and AI shows great potential in the field of tax management, especially in

intelligent taxation and the application of blockchain technology. This combination has promoted the intelligent upgrade of tax management systems, enhanced compliance, reduced fraud, and improved efficiency. In the future, blockchain technology will enhance the transparency and security of tax data, further optimizing management. With the support of big data and internet technology, AI has been widely applied in tax services, and will continue to drive the scientific, refined, and diversified tax management in the future. However, current tax services still face challenges such as technological backwardness, information asymmetry, talent shortage, and insufficient data management. Solving these problems requires government support, encouraging service institutions to upgrade, strengthening data sharing and cross-departmental collaboration, and building an intelligent tax service ecosystem. The development of automated tax declaration systems will simplify processes. The combination of AI and IoT will make declarations more accurate and efficient, reduce errors, and enhance compliance and management efficiency.

4.2 Policy Suggestion

4.2.1 The Government Formulates Reasonable AI + IoT Tax Supervision Policies

When formulating AI+IoT tax supervision policies, the government should attach importance to the promoting role of technological innovation and enhance the intelligence level of tax source monitoring and tax enforcement. In terms of tax source monitoring, strong AI can enhance anti-fraud capabilities through big data analysis and effectively combat tax evasion. For instance, the United States uses individual tax identification numbers to cross-analyze taxpayer data and precisely identify high-risk individuals; France summarizes fraud patterns through "tax document models" and accurately detects potential risks, demonstrating the effectiveness of AI in tax risk prevention and control. In terms of tax enforcement, Brazil has developed an AI system that automates the processing of repetitive tasks such as asset search, improving efficiency. Data from 2022 shows that 35% of judicial cases in Brazil are tax enforcement cases, and due to insufficient resources, there are often delays. The introduction of AI is expected to alleviate this problem and enhance judicial efficiency.

4.2.2 Balancing the Application of Enterprise Technologies and Data Compliance Requirements

With the increasing popularity of AI and IoT technologies in tax management, enterprises must pay attention to data compliance requirements while promoting the application of these technologies. Enterprises should further improve their own industry and finance data standard systems and build and upgrade relevant systems to meet the needs of internal control and auditing. Specifically, enterprises need to coordinate the upgrade of systems, implement digital and intelligent transformation, and achieve integrated construction of industry and finance to cope with increasingly complex internal control and external auditing requirements. Through the introduction of intelligent technologies, enterprises can enhance the efficiency of tax management while ensuring data compliance and avoiding legal and policy risks.

5 CONCLUSIONS

This study explores the application and synergy of IoT and AI technologies in tax management. With the rapid development of the global economy and technology, tax management is confronted with many challenges, such as data lag, high costs of manual review, and information silos. The combination of IoT and AI has brought intelligent changes to tax management, especially in real-time data collection, intelligent analysis, and tax risk management, demonstrating great potential. IoT provides real-time and precise data collection, significantly enhancing the timeliness and accuracy of tax management. AI, through in-depth analysis and intelligent decision-making of these data, further optimizes tax risk prediction and management, reducing manual intervention and human errors. The synergy with AI not only improves the accuracy of tax monitoring and VAT management but also promotes the realization of intelligent tax decision-making.

This study still has some shortcomings in research perspective, research methods, and research scope. In the future, this research will improve the research methods and incorporate more cases to conduct more in-depth discussions. Although the introduction of technology has greatly promoted the intelligence and digital transformation of tax management, there are still certain challenges in practical application. Issues such as technology costs, data privacy protection, and the technical adaptability of tax personnel need to be gradually resolved on the basis of government policy

support and the continuous maturation of technology. In the future, with the continuous development of IoT and AI technologies, tax management will further move towards intelligence and automation. To achieve this goal, tax departments need to strengthen technology application while paying attention to data compliance and security issues, and promote cross-departmental collaboration and information sharing to create a more efficient and transparent tax management ecosystem.

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