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Application Analysis and Prospect Exploration of Intelligent Tax System Driven by Big Data and Artificial Intelligence

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Abstract: In today's era of continuous acceleration of intelligent development, the low efficiency and high error rate of traditional tax system due to the high dependence on manual operation are becoming more and more prominent, and the importance of the intelligent tax system has been significantly increased. This paper adopts the literature research method and case study method, systematically outlines the enabling role of big data and artificial intelligence technology in the field of taxation, analyzes the path of technological realization and typical application scenarios, and illustrates the practical path of the development of the tax system to intelligent modernization through examples. The study finds that the intelligent tax system shows a significant development trend driven by technology, and its future potential in cross-border tax collaboration, macroeconomic regulation and control is worth paying attention to.

Keywords: Artificial intelligence; Big data; Intelligent tax system; Tax administration.

1. Research Background and Practical Significance of Intelligent Tax System Driven by Big Data and Artificial Intelligence

With the deepening development of the digital economy, the modernization of the tax governance system is facing pressure for change and opportunities for innovation from various aspects and angles. The scale of the global digital economy has exceeded 38 trillion dollars, and the borderless and virtual nature of digital transactions has strongly impacted the traditional tax collection and management rules. The traditional tax collection and management mode of relying on manual verification is characterized by low efficiency and high error rate, which makes it difficult to adapt to the exponentially growing demand for tax data processing. In this process, the introduction of big data technology has enabled tax management to begin to have a wide range of high-efficiency data processing capabilities, providing strong data support for tax decision-making. Subsequently, the integration of artificial intelligence further boosted the intelligent development of tax management. The application of machine deep learning, machine vision and other technologies makes tax management not only data analysis, but also a kind of intelligent decision-making [1]. Emerging technologies centered on big data mining and artificial intelligence algorithms have provided key technological breakthroughs for the construction of an intelligent tax system, promoting the acceleration of global tax governance to the data-enabled intelligent stage.

In modern tax management, through comprehensive collection, intelligent processing and in-depth analysis of tax data, the intelligent tax system helps enterprises and government departments to have a more in-depth understanding of tax policies and market directions through predictive analysis, so as to be more targeted and forward-looking in tax decision-making, and to substantially improve the automation level and accuracy of tax processing. The leap in the effectiveness of tax collection and management, the compression of costs for both the levy and payment sides, and the optimization of public resource allocation are all achieved through intelligent tax systems. At the same time, the use of artificial intelligence technology to carry out automated audits and intelligent risk assessment, shorten the audit cycle and reduce the cost of collection and payment have all improved the efficiency of tax collection and administration. In addition, the personalized service of the system enables the tax experience to be further optimized, and taxpayers can be promoted in improving tax compliance, so that taxpayers can enjoy more intimate and efficient tax services [2]. The application of intelligent tax system makes tax management present new possibilities in optimizing resource allocation, forms a modern tax governance structure that deeply fits with the development law of the digital economy, and eventually forms a technology-enabled tax governance theory, which makes up for the blankness of the traditional tax theory in the digitalization scenario.

2. Overview of the Core Technology Base of The Intelligent Tax System

As the key technology of the digital era, big data and artificial intelligence together constitute the core area of modern information infrastructure, and the intelligent transformation of tax management system reflects the synergistic effect of the two [3]. Through the integration of technology to reconfigure the tax governance model, to realize the leap from "experience-driven" to "data intelligence-driven", which significantly improves the efficiency of tax collection and management, the precision of risk identification and the level of taxpayer service.

Specifically, big data technology takes the collection, storage and analysis of massive heterogeneous data as its core ability, aiming to extract key decision-making basis from complicated information. Using the characteristics of scale, diversity, high speed and low value density, data-driven mechanism optimization is used to improve decision-making accuracy and business process efficiency [4]. Big data technology collects and integrates tax-related data from a

variety of channels, such as corporate financial reports, market transactions, social media content, and public records, so that tax authorities can build a comprehensive national tax data framework. On this basis, data cleansing technology is further applied to effectively identify and remove duplicates, errors and invalid entries in the data set to ensure the quality of the data and provide an accurate data base for in-depth audit analysis. In the field of tax collection and management, big data technology can provide tax management with a more accurate prediction of the direction of tax collection and detection of potential risks therein, formulate the best program for tax planning, improve the office efficiency and quality of tax work, and further promote the development of intelligent tax systems. The artificial intelligence system, with which the technology is complementary, simulates and extends human cognitive functions through algorithmic models in order to enhance the degree of automation of tax work, such as automated auditing, intelligent consulting and assessment and personalized services, etc. With the help of machine learning and adaptive mechanisms, it can perform identification, semantic parsing, and strategy generation and other complex tasks, which greatly improves the efficiency of the work [1]. This technology can replace financial personnel to deal with highly repetitive calculations, realize cross-business and cross-position technical operations, save labor costs, and reduce the probability of manual operation errors. The technical combination of big data and artificial intelligence has not only revolutionized the way tax authorities work, but also provided strong technical support for the formulation and implementation of tax policy [5]. In the future, with the continuous progress and application of these technologies, the level of intelligence of tax management will be enhanced even more.

3. Anatomy of the Application of Big Data and Artificial Intelligence Technology in Intelligent Tax Systems

3.1. Big Data Technology Realization Path

The collection of data is the main grip of an intelligent tax system. Its main sources are mainly e-declarations, enterprise statements, third-party e-invoice platforms and several other areas. These data provide information about enterprise finance, transactions, tax declarations, etc., which provides the basis for subsequent tax analysis and decision-making. Utilizing big data distributed computing and storage, it is possible to collect compensation and performance, cost and expenses, etc., both in the enterprise's human resources and financial systems, as well as external data, such as national and local tax policies, market salaries, and industry tax incentives.

The key to improving data quality lies in data integration and cleansing. In order to ensure the consistency and reliability of the data, machine learning algorithms are used to standardize and integrate multi-source information to form a standardized tax data warehouse [6]. Tax prediction and policy simulation after data integration is also a key part. The intelligent analysis architecture based on data collection deep mining and machine learning can provide insight into the potential correlation of multi-dimensional tax-related information, reveal the trend of tax source changes and risk tendency, and provide decision support for policy optimization. Enterprises use the integrated historical data, market trends and policy changes and other information to predict future tax pressures and adjust corporate financial strategies based on big data analysis and artificial intelligence technology.

Data analysis is the core of an intelligent tax system. Through the establishment of the "integrated" tax data platform, it not only realizes the sharing of internal information resources, but also supports the construction of various data application systems, such as the quality analysis and monitoring of the collection and management, and the macroeconomic analysis system of taxation, etc., through the rich tax data, especially structured data [7]. The application of these systems not only strengthens the monitoring of tax sources and the quality of collection and management, but also improves the efficiency and service quality of tax authorities.

3.2. Core Application Scenarios of Artificial Intelligence Technology

The in-depth application of artificial intelligence technologies is leading to changes in the collection and management model in the contemporary tax governance system.

Artificial intelligence technology is increasingly used in tax auditing. It has greatly improved the efficiency and accuracy of auditing through intelligent audit robots and automated auditing processes. Intelligent audit robots are able to realize automatic identification and comparison of invoices and contracts through language and image processing, and conduct in-depth analysis of a large amount of historical tax information, so as to efficiently identify potentially high-risk companies and automatically generate warning instructions [8]. The application of artificial intelligence technology in intelligent tax risk assessment is also very extensive, and this application realizes a fundamental change in the risk identification paradigm. Relying on real-time data flow analysis technology, the behavioral trajectory of taxpaying subjects is continuously tracked in order to construct a risk quantification model and a dynamic early warning system to accurately locate the probability of potential violations. It enables the regulator to shift from passive response to active intervention, easing the compliance burden of enterprises while significantly compressing the disposal cycle of tax-related disputes, thus realizing the synergy of risk identification in terms of corporate compliance. In addition, the self-adaptive learning module set up by the assessment mechanism can dynamically adjust the assessment parameters according to changes in policies and regulations, thus ensuring that the risk identification criteria are kept in synchronized iteration with the regulatory environment.

While artificial intelligence technology has improved the efficiency and accuracy of auditing, it has also improved the efficiency of tax administration. The intelligent assessment of risks by the relevant departments reduces, to a certain extent, the risk losses caused by policymaking errors, thus further improving the tax management capacity. It can be seen that, with the continuous development of modern technology, the future tax work will need the support of artificial intelligence technology in tax management.

3.3. Convergence and Development of Big Data and Artificial Intelligence Technologies

Utilizing the advantages of big data technology and

artificial intelligence, an efficient and intelligent audit system can be constructed. This system can utilize a large amount of data and information resources to accurately predict and identify abnormal situations in the tax field, and then realize the deep learning of artificial intelligence. Through the analysis of multifaceted data, the potential risks are intelligently classified and processed, and the behavioral patterns of enterprises are more clearly understood [8]. Combining the dynamic update of big data and the rapid analysis function of artificial intelligence, the tax authorities can track abnormalities and provide feedback in a timely manner, and build a new model of tax collection and management driven by "data + algorithm". The fusion of the two developments has also led to the collaborative governance of cross-border taxation, more convenient access to transaction data on cross-border e-commerce platforms, automatic matching of tax rates of various countries using artificial intelligence models, and blockchain records of cross-border payment flows, which will gradually promote the "one-network handling of global tax sources".

Based on big data technology to record the taxpayer's historical tax behavior, questioning preferences and other information, artificial intelligence recommendation algorithms can provide taxpayers with personalized tax services. Shenzhen tax department's AI digital human live room, through the analysis of taxpayers' previous viewing records and question content, the use of artificial intelligence algorithms to accurately push taxpayers interested in explaining the live broadcast, the digital human lecturer can also answer personalized questions in real time. This integration has transformed tax services from "uniformity" to personalized customization, greatly enhancing taxpayers' satisfaction and tax efficiency.

4. Case Study of Intelligent Tax System Driven by Big Data and Artificial Intelligence

At present, in response to the problems of inefficiency in the degree of traditional tax supervision and the difficulty of detecting tax evasion, the intelligent tax platform based on big data and artificial intelligence technology plays an indispensable role.

In recent years, localities have introduced a series of policies and measures to promote the development of market players, but most of these enterprise-friendly policies suffer from the problems of asymmetric information and non-interoperability of resources. In order to improve the efficiency and effectiveness of tax policy implementation, Dalian tax authorities, together with relevant departments, have made full use of data sharing, big data analysis, artificial intelligence and other modern technologies to innovatively launch the "Smart Tax Union" government service mechanism. Enterprises are accurately matched with various types of enterprise-friendly policies in a quantitative manner, and label management is implemented to summarize the enterprise-friendly policies in an indexed manner. For example, "Smart Tax Union" accurately "portraits" enterprises in multiple dimensions, creating a comprehensive "data warehouse" for enterprises. With the help of multi-dimensional data, multiple labels are constructed to distinguish different types of enterprises. This initiative makes the policy push more accurate, and provides strong support for enterprises to obtain and enjoy the relevant policy dividends in a timely manner [9].

While working for the development of enterprises, the government is also concerned about individuals and enterprises that do not pay taxes in accordance with the law, such as tax evasion, and utilizes the intelligent tax system to monitor and control. Since the tax evasion behavior of several public figures, government tax inspectors have been training intelligent systems that use big data to detect tax evasion. With the development of e-commerce platforms, the governance of the intelligent tax system has been gradually extended to live broadcast income data, using big data and artificial intelligence technology to detect the live broadcast sales data of the anchor, to project the income and tax payable for a single session based on the sales commission of the goods in a single session, and then combining with the intelligent tax system to query the real tax payment records, so as to monitor whether the person has committed tax evasion and avoidance behaviors. For example, a head anchor registers and establishes several sole proprietorships and partnerships to diversify his income, and the enterprises do not have any substantial business activities, but only use private-to-private transfers to avoid supervision. The intelligent system, by back-measuring the logical relationship between promotion expenses and sales revenue, found that it evaded 643 million yuan of tax by hiding personal income, fictitious business conversion of the nature of income, and false declarations, and other underpayment of tax of 0.06 billion yuan. Tax authorities use big data and other modern information technology to account for and make tax administrative treatment and punishment decisions in accordance with the law, recovering taxes, adding late fees and imposing fines to recover taxes and penalties totaling 1.341 billion yuan, highlighting the efficacy of data modeling in the regulation of the virtual economy [10]. According to incomplete statistics, since 2021, at least seven head anchors have been penalized for tax evasion and have been subjected to a cumulative tax recovery, late fees and fines of more than 1.6 billion yuan.

In the context of Golden Tax IV, intelligent tax systems are also of great help in auditing corporate taxes. The "Golden Tax Project" is a national key project, where AI robots can flag a wide range of offenses, and then connect to government databases using AI technology, which in turn can automatically detect whether companies and individuals have violated the law by falsely reporting data when filing tax returns. Using big data analysis and artificial intelligence technology to address the group's high degree of complexity in the economic field and mismanagement of production and operation, the intelligent tax system also provides effective countermeasures to fill in the loopholes in its risks in all aspects. The Hechi Inspection Bureau of Guangxi Local Taxation Bureau randomly selected a total of 12 households for tax inspection work, with the main issues covering unsound financial systems, non-accounting and under-accounting of income, false reporting of data, and failure to obtain invoices in accordance with regulations. The tax authorities utilized artificial intelligence technology to target and strengthen tax management, and promoted investigation for management under the synergy of big data technology. Through this tax inspection work, a total of 2006.21 million yuan of taxes were investigated and remedied, and 3.682 million yuan of fines were imposed, with a penalty rate of 18.35%, of which the largest amount of taxes investigated and remedied by a single household amounted to 7.793 million

yuan [11]. This spot check also reflects the key role of big data comparison in the audit of real enterprises, which improves the effectiveness of tax collection and management through the application of big data and artificial intelligence technology, and provides strong support for local economic development and tax governance.

As can be seen from the typical case analysis, the intelligent tax system is reconfiguring the tax governance ecology in depth. By building a standardized process of "data collection-cleaning-integration", the system breaks the traditional information silos with the help of big data technology, and realizes real-time collection and dynamic governance of tax information dispersed in different business systems. This technological change has a double effect: on the one hand, the real-time monitoring system of tax indicators constructed on the basis of artificial intelligence algorithms can accurately capture abnormal tax behaviors, and while sounding legal alarms for taxpayers with lucky breaks, it also enhances tax compliance through the intelligent legal module; on the other hand, the built-in policy adaptation model of the system automatically matches the business data of enterprises, and transforms the preferential policies of taxation into implementable solutions, providing taxpayers and taxpayers with the most suitable tax policies for the implementation of the tax policy and the most suitable tax policies for the implementation of the tax policy. On the other hand, the system's built-in policy adaptation model can automatically match enterprise operation data, transform tax preferential policies into implementable solutions, and provide intelligent governance tools for both parties. This two-way empowerment mechanism is promoting the transformation of tax management from "experience-driven" to "data-driven".

5. Development Trend and Application Prospect of Intelligent Tax System Driven by Big Data and Artificial Intelligence Technology

The synergistic development of big data and artificial intelligence makes the management method more intelligent and efficient. With the enhancement of data processing capacity and the continuous progress of artificial intelligence technology, the tax management system will provide a more secure and efficient tax work processing mode in the future with the application of blockchain, edge computing, 5G technology and other emerging technologies. The application of blockchain technology provides security for the data and ensures the non-tampering of audit data, which further enhances the credibility of tax information. The combination of edge computing and 5G technology enables the speed of data transmission and processing to gradually increase while guaranteeing real-time tax management.

As the digitization level of the national tax system continues to increase, the Golden Tax IV system is beginning to be used, which also puts forward higher requirements for tax management. Under the comprehensive analysis of data from multiple sources, the tax collection and management department should gradually realize the transformation from passive to active governance, join the application of building a full range of intelligent models covering filing, statistics, and auditing, minimize errors due to human intervention, and further improve the automation efficiency of the tax process. The use of AI algorithm technology promotes the innovation of the service industry model and allows for the interpretation and analysis of complex tax demands based on deep learning, further allowing AI technology to generate personalized policies. For invoices, vouchers and other tax information, OCR recognition technology and machine learning algorithms are used for recognition and intelligent classification to improve the efficiency and accuracy of data processing. At the same time, combined with big data technology, the intelligent audit and risk warning functions of the intelligent tax program are utilized to timely detect and correct problems of information errors in the return, and once potential risks are found, the system will immediately issue an early warning and avoid the risks in advance. The synergistic governance of big data and artificial intelligence technology in many aspects of the system, technology, and subject matter can not only provide more efficient and accurate tax services and achieve personalized and accurate tax management in the whole process, but also promote the development of tax management to a higher level of intelligence [12]. With the deep integration of intelligent system and economic and social operation, the intelligent tax system will gradually broaden to the fields of macroeconomic early warning, industry chain assessment, etc., and make greater contributions to the country's economic development and social progress.

6. Conclusion

After analyzing the application of big data and artificial intelligence technology in tax-related aspects, we found that the integration and application of the two technologies not only provide efficient and effective technical support for tax collection and management, but also bring significant improvement to the quality and transparency of tax services. The comprehensive use of big data has made the tax authorities more efficient in data management and analyzing ability, making tax decision-making more data-driven and decision-making process more justifiable [13]. At the same time, the integration and optimization of artificial intelligence in the tax process, so that the human cost is reduced, greatly reducing the tax risk, the accuracy of the work has been improved, especially in the automated processing, and decision-making supporting the performance of a great deal of developability.

The development prospect of intelligent tax system driven by big data and artificial intelligence technology is even broader. With the continuous progress of information technology and strong policy support, intelligent taxation gradually forms a more perfect service system, thus better meeting the accuracy needs of taxpayers as well as enhancing personalized services. With the deepening of tax policies, intelligent taxation will play an increasingly important role in further promoting the accurate formulation of tax policies and economic decision-making. Shifting from "experience-driven" to "data-driven" and from "passive management" to "active service" are the main features of the intelligent tax system. The intelligent tax system characterized by "experience-driven" to "data-driven" and from "passive management" to "active service" will play a more important role in optimizing the business environment, serving macro decision-making and promoting social fairness in the continuous progress of big data and AI technology and the continuous improvement of the system, so as to provide a solid support for the modernization of taxation in the era of digital economy.

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