World Journal of Management Science
ISSN: 2959-9636
DOI: https://doi.org/10.61784/wms3065

INNOVATION IN TAX ADMINISTRATION MODELS IN THE CONTEXT OF THE DIGITAL ECONOMY

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Abstract: Against the backdrop of the rapid development of the digital economy, traditional tax administration models face multiple challenges, including base erosion, information asymmetry, and outdated management technologies. This paper systematically analyzes the impact of characteristics inherent to the digital economy—such as virtuality, data-driven nature, and network externalities—on tax administration, highlighting the limitations of traditional models in areas like data integration, risk identification, and cross-border coordination. Based on theories from information economics, behavioral economics, big data, and artificial intelligence, practical pathways for innovating tax administration models are proposed: building a smart taxation system to enhance administrative efficiency through big data analytics and AI technologies; strengthening international cooperation to promote the coordination of international tax rules and information sharing; and improving legal frameworks to clarify the legal status of digitalized administration. The driving role of technological innovation and institutional optimization in modernizing tax administration is validated through domestic and international case studies (e.g., Shenzhen's smart tax system, U.S. big data risk control, Singapore's blockchain invoice management). The research concludes that innovating tax administration models is imperative for adapting to the digital economy, requiring synergistic advancement across technological empowerment, institutional safeguards, and international cooperation to achieve comprehensive improvements in tax fairness, administrative efficiency, and the business environment.
Keywords: Digital economy; Innovation in tax administration models; Smart taxation; Information economics

1 INTRODUCTION

Since the beginning of the 21st century, the digital economy has surged like an irresistible tide, developing at an astonishing pace and permeating every sphere of the socio-economic landscape. This new economic form, supported by information technologies such as the Internet, big data, and artificial intelligence, has not only profoundly transformed people's modes of production and lifestyles but also posed severe challenges to traditional tax administration models. Traditional tax administration, built upon a relatively stable real economy foundation, finds its methods and approaches inadequate in the face of the digital economy, revealing numerous mismatches and shortcomings. Therefore, innovating tax administration models to adapt to the development of the digital economy has become an issue that urgently needs to be addressed. Against this backdrop, the purpose of this paper is to explore innovative pathways for tax administration models in the context of the digital economy. Through an in-depth analysis of the characteristics of the digital economy, it becomes apparent that its virtuality, cross-border nature, and immediacy render traditional tax administration methods difficult to apply effectively. Consequently, it is necessary to innovate at the theoretical level by reexamining the basic principles of taxation and the construction of tax systems so as to make them more consistent with the practical realities of the digital economy. At the practical level, this paper will investigate how to leverage modern information technologies, such as big data analytics, cloud computing, and blockchain, to enhance the efficiency and equity of tax administration. Big data analytics can assist tax authorities in grasping taxpayers' true circumstances more accurately and improving the precision of tax administration; cloud computing can achieve real-time sharing and efficient processing of tax data, thereby enhancing the operational efficiency of tax administration; meanwhile, blockchain technology can strengthen the transparency and security of tax administration, reducing the risk of tax fraud and evasion. Through the exploration of these innovative pathways, this paper aims to provide theoretical support and practical guidance for improving the efficiency and fairness of tax administration. This not only contributes to the modernization of the tax administration system, making it better suited to the demands of the digital economy's development, but also promotes the healthy growth of the digital economy, optimizes the tax environment, strengthens the stability of national fiscal revenues, and provides solid support for sustainable socio-economic development. In summary, faced with the challenges and opportunities brought by the digital economy, innovation in tax administration models is an inevitable choice. This paper will systematically analyze the innovation of tax administration models in the context of the digital economy from both theoretical and practical dimensions, with the hope of offering valuable references for the reform and development of China's tax administration system.

2 DIGITAL ECONOMY CHARACTERISTICS, TAX CHALLENGES, AND RESEARCH ON THE LIMITATIONS OF TRADITIONAL ADMINISTRATION MODELS

2.1 Digital Economy and Traditional Tax Administration Models

The digital economy, as an entirely new economic form, has gradually emerged alongside the rapid development of information technology. Many scholars have defined it from different perspectives. Some, from a technology-driven standpoint, believe that the digital economy is a series of economic activities that take digitized knowledge and information as key production factors, use modern information networks as important carriers, and regard the effective use of information and communication technology as a significant driving force for efficiency improvement and economic structure optimization. Others focus on the digital transformation of economic activities to define the digital economy. The digital economy encompasses all economic activities that employ digital technology for production, exchange, distribution, and consumption, including emerging fields such as e-commerce, digital finance, and digital entertainment, as well as the transformation and upgrading of traditional industries through digitalization. From this perspective, the digital economy is not merely a collection of emerging digital industries but a brand-new economic model that permeates every sector of the economy. International organizations have also standardized and elaborated on the concept of the digital economy. The Organisation for Economic Co-operation and Development (OECD) defines the digital economy as a broad term that covers all economic activities based on digital technologies, including the production and application of digital technologies and the economic and social impacts that result. The United Nations Conference on Trade and Development (UNCTAD) emphasizes that the digital economy comprises economic activities conducted using digital technologies and the extensive influence of digital technologies on economic and social development. Data is the core production element of the digital economy, characterized by high mobility, replicability, and non-exclusivity. In the digital economy, enterprises collect, analyze, and utilize vast amounts of data to understand market demand, optimize production processes, and innovate products and services. For instance, e-commerce platforms analyze users' browsing history and purchasing behavior to achieve precise marketing and personalized recommendations, thereby improving user shopping experiences and corporate sales efficiency. Data-driven decision-making enables firms to formulate strategies and operational plans more scientifically, enhancing resource allocation efficiency and thus gaining a competitive advantage in the market[1]. The transactional activities within the digital economy mostly occur in virtual cyberspace, unrestricted by time and location. Enterprises and consumers can conduct transactions of goods and services via the Internet anytime and anywhere, greatly reducing transaction costs. For example, online education platforms break through the geographic limitations of traditional education, allowing students to access quality educational resources at any time and place; remote office software enables employees to work from home or other locations, increasing work flexibility and efficiency. However, virtualization also brings problems, such as difficulty in verifying the identity of transaction parties and challenges in ensuring the authenticity and security of transaction information. The digital economy is built on information technology, characterized by rapid innovation and a continuous emergence of innovative outcomes. New business models, technological applications, and products and services spring up endlessly, driving rapid economic development and social progress. For instance, the emergence of blockchain technology has brought decentralization, immutability, security, and transparency to the financial sector, potentially resolving trust issues in traditional finance; artificial intelligence technology applied in healthcare, transportation, and security has improved the intelligence level and service quality in these fields. Innovation is the driving force of digital economic development; enterprises must continuously innovate in order to survive and develop in fierce market competition. The digital economy exhibits significant network externalities, meaning that the value of a product or service for one user increases as the number of users of that product or service grows. For example, the more users a social networking platform has, the richer the social interactions among users, and the greater the value of the platform; the more merchants and consumers on an e-commerce platform, the more diverse the product selection becomes, and the higher the efficiency and success rate of transactions. Network externalities make it easy for monopolistic patterns to form in the digital economy, allowing a few large enterprises to dominate the market with their vast user bases and network effects.

The traditional tax administration model was gradually formed and developed during the industrial economy era, relying primarily on paper documentation, manual operations, and on-site management. Its basic characteristic is to center around tax authorities by establishing tax administration institutions, staffing professional tax personnel, and conducting management activities such as taxpayer registration, filing, collection, and inspection according to tax laws and regulations. In the registration stage, taxpayers must visit the tax authority's office to complete tax registration procedures, submit relevant paper documents and materials, and have their information reviewed and entered by the tax authority. In the filing stage, taxpayers fill out tax return forms in accordance with prescribed deadlines and formats and submit them to the tax authority in paper or electronic form. In the collection stage, the tax authority issues a tax payment notice based on the taxpayer's filing information, and the taxpayer pays the tax at a designated bank. In the inspection stage, tax personnel conduct field investigations and review accounting books, etc., to examine and verify taxpayers' compliance with tax obligations. After long-term practice and refinement, the traditional tax administration model has formed a relatively stable and mature process flow and institutional system. Tax personnel, having undergone professional training, are familiar with tax laws, regulations, and administration procedures, effectively ensuring the normal conduct of tax administration work. Meanwhile, the preservation of paper materials and archives provides reliable evidence and basis for tax administration, facilitating post facto audits and supervision by tax authorities. Face-to-face communication between tax authorities and taxpayers is an important advantage of the traditional administration model. Tax personnel can directly communicate with taxpayers to understand their production and operation conditions and tax needs, providing personalized tax guidance and services. Such communication helps enhance taxpayers' understanding of and compliance with tax policies, reducing tax errors and disputes. Tax personnel can also conduct on-site inspections of an enterprise's production and operation locations to examine and verify the

company's financial status, production processes, and inventory conditions, identifying potential tax issues. On-site inspections facilitate the acquisition of first-hand information, improving the accuracy and effectiveness of tax administration.

The traditional tax administration model relies heavily on manual operations and paper-based information exchange, resulting in low administration efficiency. Taxpayers must spend considerable time and effort visiting tax authorities to complete various procedures, and tax authorities, in turn, must invest significant human and material resources in document review, data entry, and management. For example, during the tax filing and payment process, taxpayers may need to shuttle multiple times between their enterprise, the tax authority, and the bank, increasing both monetary and time costs. Under the traditional administration model, tax authorities have relatively limited channels for obtaining taxpayer information, relying mainly on taxpayer filings and on-site inspections. Due to inadequate information collection and processing capabilities, tax authorities find it difficult to comprehensively and promptly grasp taxpayers' production, operation, and financial information, leading to information asymmetry. Such information asymmetry may allow taxpayers to conceal income or overstate costs, thereby evading tax obligations. The traditional tax administration model requires building a large administration apparatus and staffing a significant number of tax personnel, as well as investing heavily in office equipment, premises, and funding. These factors contribute to the high cost of tax administration. Moreover, because of low administration efficiency, tax authorities need to spend more time and effort completing administration tasks, further increasing administration costs[2].

2.2 Impact of the Digital Economy on Tax Administration

Under the digital economy model, the virtualization and mobility of transactional activities render traditional tax jurisdiction rules difficult to apply. Traditional tax jurisdiction is primarily based on principles of territoriality and personality, using standards such as an enterprise's place of registration, the location of its permanent establishment, or the source of its income. However, digital economy enterprises can conduct business globally via the Internet, with business activities potentially involving multiple countries and regions; the identities and locations of transaction parties are difficult to determine, and the source of income cannot be accurately identified. For example, an online gaming company may have users in multiple countries and regions, but its servers and operation centers may be located elsewhere, creating difficulties for each country in determining tax jurisdiction. The development of the digital economy challenges traditional tax jurisdiction rules and requires the international community to jointly explore and formulate new rules to resolve conflicts in tax jurisdiction.

Digital economy enterprises can exploit their virtualization and mobility to engage in base erosion and profit shifting through transfer pricing and the use of tax havens, thereby reducing their tax obligations in high-tax countries and regions. For instance, some multinational digital enterprises transfer intangible assets such as intellectual property to subsidiaries in low-tax jurisdictions, then shift profits to those low-tax regions by charging royalties, thereby lowering their overall tax burden. In addition, the business models in the digital economy are complex and varied; some emerging business models and transaction methods are difficult to regulate and supervise under traditional tax regulations, providing opportunities for enterprises to engage in base erosion and profit shifting. Transactional activities in the digital economy mostly occur in virtual cyberspace, with transaction information existing in digital form, exhibiting concealment and dispersion. Tax authorities find it difficult to obtain comprehensive and accurate transaction information, exacerbating information asymmetry in tax administration. For example, a large number of small-value transactions on e-commerce platforms may not have detailed transaction records, making it hard for tax authorities to grasp their true status; some digital economy enterprises use encryption technology to protect transaction information, further increasing the difficulty for tax authorities to access information. Tax administration information asymmetry makes it difficult for tax authorities to accurately assess enterprises' tax obligations, leading to potential tax revenue loss. Strengthening information sharing and communication between tax authorities and enterprises and improving the informatization level of tax administration are necessary[3].

"Smart taxation" and tax administration model reform have a complementary and mutually reinforcing relationship. On the one hand, "smart taxation" provides the modern information foundation and development direction for tax administration model reform. As a tax ecosystem that integrates collection, management, and service, "smart taxation" serves as the goal and blueprint for the reform of tax administration models in the new era. It offers a modern information technology foundation and important guidance for applying digital information technology in the tax field, and represents the ultimate objective for the modernization of tax administration models. Figure 1 illustrates the relationship between "smart taxation" and the tax administration model. On the other hand, tax administration model reform is the pathway to realizing "smart taxation." The tax administration model encompasses the normative forms and combinations that tax authorities adopt in terms of tax collection, administration, and inspection, as well as the organizational structure of tax administration. Reforming the traditional tax administration model must be based on "smart taxation," fully utilizing digital governance thinking and promoting the reengineering of administration model processes through information technologies such as the Internet.

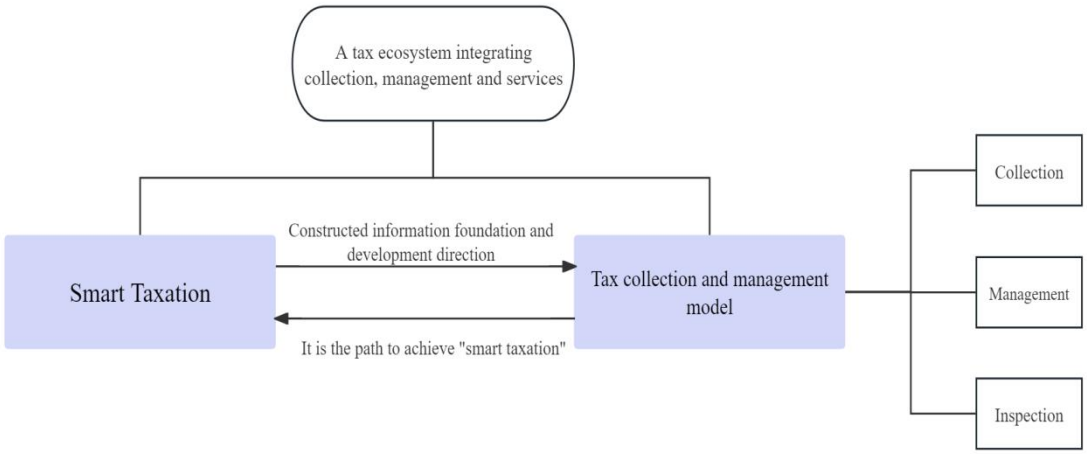

Figure 1 The Relationship between "Smart Taxation" and Tax Collection and Management Models

The development of the digital economy imposes higher demands on tax administration technology. Tax authorities need to leverage advanced information technologies such as big data, artificial intelligence, and blockchain to enhance the efficiency and accuracy of tax collection and administration. For example, through big data analytics, tax authorities can conduct comprehensive and in-depth analysis of corporate transaction data to identify potential tax risks; the application of artificial intelligence enables the automation and intelligence of tax administration, thereby improving efficiency and service quality. However, the current level of information technology and talent pool within tax authorities remains insufficient to fully meet the demands of digital economy tax administration. Increased investment in information technology and talent development is essential. Elevating the technical capabilities of tax administration is crucial for addressing the challenges posed by the digital economy. Tax authorities must continuously innovate administrative approaches and methods to advance the modernization of tax administration.

2.3 Limitations of the Traditional Tax Administration Model in the Context of the Digital Economy

The development of the digital economy has led to an increasing number of transactional activities being conducted via the Internet and electronic platforms, with the transaction process becoming ever more virtualized and digitized. The traditional tax administration model, which is mainly based on tangible transactions and physical business premises, finds it difficult to effectively regulate virtual transactions of digital products and services. For instance, the sale of digital products can be completed instantaneously through online platforms, with the parties involved in the transaction possibly located in different regions or even different countries, making it difficult for tax authorities to determine the place where the transaction occurred, the taxpayer, and the tax liability.

The digital economy generates massive volumes of data characterized by diversity, rapid change, and complex interconnections. The data-processing capability of the traditional tax administration model is limited, making it difficult to effectively collect, analyze, and utilize these vast amounts of data. As a result, tax authorities cannot identify tax risks and anomalies in a timely manner from the huge volume of data, thereby affecting the accuracy and timeliness of tax administration.

The cross-border and mobile nature of the digital economy has made international tax issues increasingly prominent. The traditional tax administration model, which is primarily based on the principles of territoriality and personality, struggles to adapt to the cross-border transaction characteristics of the digital economy. In the context of the digital economy, enterprises can conduct business globally via the Internet, making the allocation of profits and tax jurisdiction difficult to determine. Differences in tax policies and administration standards among countries and regions lead to challenges in international tax coordination and are prone to triggering disputes over international taxation.

The digital economy has given rise to many emerging business models, such as the sharing economy and platform economy[4]. These new business models are characterized by innovation, flexibility, and rapid change, which the traditional tax administration model cannot regulate and supervise in a timely and effective manner. For example, sharing-economy platforms involve a large number of individual operators and frequent transactions, making it difficult for tax authorities to carry out comprehensive tax registration and tax return management. At the same time, the income recognition and cost accounting methods of these emerging business models differ from those of traditional enterprises, posing new challenges to tax administration.

2.4 Current Research Status at Home and Abroad

Foreign scholars paid attention early to the impact of the digital economy on traditional tax administration models. In a series of reports, the OECD (Organisation for Economic Co-operation and Development) pointed out that the mobility, virtuality, and complexity of the digital economy make traditional tax administration rules—based on physical presence—difficult to apply. For instance, transactions in digital products and services can cross borders

instantaneously, leading to difficulties in determining the source of income and consumption location, which in turn triggers conflicts over international tax jurisdiction. Avi-Yonah argued that digital economy enterprises often transfer profits by establishing entities in low-tax jurisdictions or through intellectual property transfer, eroding national tax bases, and that traditional transfer pricing rules are challenging to enforce effectively in the digital economy environment. To address the challenges of the digital economy, many explorations in innovating tax administration models have taken place abroad. The European Union led the way in implementing the Value-Added Tax Digital Services Tax (DST), requiring digital service providers to pay VAT in the place where the service is consumed. Picciotto found that this consumption-based taxation model to some extent resolves the difficulties of taxing cross-border digital services, but it also faces issues such as increased compliance costs for enterprises and difficulties in international coordination. Moreover, some countries have begun exploring the establishment of digital-economy tax information–sharing platforms to strengthen tax-information exchange internationally. Cripe in the United States pointed out that information sharing can enhance tax authorities' ability to supervise multinational digital enterprises and reduce revenue leakage.

Foreign scholars pay great attention to the application of new technologies in tax administration. Because of its decentralization and immutability, blockchain technology is considered capable of constructing a trusted tax administration system. Nakamoto proposed that leveraging blockchain technology can achieve real-time sharing and verification of tax information, improving the efficiency and transparency of tax administration. Artificial intelligence and big data analytics technologies are also widely applied to tax-risk assessment and tax forecasting. For example, the Australian Taxation Office uses big data analytics to monitor taxpayers' transaction data in real time, accurately identifying potential tax risks, and Smith believes that this practice effectively improves the precision of tax administration.

Domestic scholars have also conducted in-depth studies on the impact of the digital economy on tax administration. Li Xuhong pointed out that the development of the digital economy has changed traditional production, transaction, and consumption models, causing profound changes in the objects, scope, and methods of tax administration. The light-asset operation model of digital-economy enterprises and the high proportion of intangible assets present challenges to the traditional tax administration, which is based on tangible assets. Additionally, the rise of platformization and sharing-economy models in the digital economy has increased the difficulty of tax administration; for instance, there are significant loopholes in the tax administration of individuals participating in sharing-economy activities. Regarding directions for innovating tax administration models, domestic scholars have proposed a series of recommendations. Liu Shangxi argued that a modernized tax administration system that adapts to digital-economy development should be built, achieving a shift from invoice-based to data-driven taxation. This requires strengthening the digitalization of tax administration, integrating various internal and external data resources of tax authorities, and establishing a unified tax big-data platform. Other scholars have suggested drawing on international experience and combining it with China's national conditions to explore tax administration models suited to China's digital-economy development, such as establishing a special tax administration regime for the digital economy, clarifying the tax obligations and administration processes for digital-economy enterprises.

Domestically, there is also abundant practice and research on tax administration innovation driven by new technologies. Tax authorities actively promote electronic invoicing and the intelligent upgrading of tax administration information systems, improving the efficiency and convenience of tax administration. Zhang Bin found that the popularization of electronic invoicing effectively reduces invoicing management costs and tax risks, and that using artificial intelligence and big data technologies to analyze invoice data can accurately identify unlawful behaviors such as false invoicing. In addition, the application of blockchain technology in the tax domain has gradually received attention; some local tax authorities have launched blockchain invoicing pilot projects to achieve full-process supervision of invoices through blockchain technology, improving the authenticity and credibility of invoices.

With the globalization of the digital economy, domestic scholars have also recognized the importance of international tax coordination and cooperation. Zhu Qing pointed out that China should actively participate in the formulation of international tax rules, strengthen tax-information exchange and administration cooperation with other countries, and jointly address the international tax challenges brought by the digital economy. In the context of the digital economy, international tax competition is intensifying. Through international tax coordination and cooperation, double taxation and revenue leakage can be avoided, protecting China's tax interests. Overall, domestic and foreign scholars have conducted extensive research and exploration regarding the innovation of tax administration models in the context of the digital economy, achieving certain results. However, as the digital economy develops rapidly and new business forms and models continue to emerge, tax administration model innovation still faces many challenges, requiring further in-depth research and practice[5].

3 IMPACT OF THE DIGITAL ECONOMY ON TAX ADMINISTRATION

3.1 Base Erosion and Profit Shifting

Under the traditional economic model, tax administration is mainly based on an enterprise's physical presence or permanent establishment, allowing tax authorities to relatively clearly define the enterprise's business activities and profit sources. However, the rapid development of the digital economy has disrupted this traditional model. The digital economy relies on digitized knowledge and information as key production factors and conducts economic activities

through information networks; it is characterized by virtuality, mobility, and concealment, posing numerous challenges to traditional tax administration rules and giving rise to base erosion and profit-shifting issues. There are many specific ways in which the digital economy leads to base erosion and profit shifting. In the digital economy, intangible assets such as software, algorithms, and data play a core role; these intangible assets are highly mobile and difficult to value, allowing enterprises to easily transfer intangibles to low-tax jurisdictions or tax havens. For example, a technology company that develops a popular software product may carry out research and development in multiple countries, but the company could transfer ownership of the software via intellectual property rights to a subsidiary in a lower-tax region. In this way, the profits generated by the software are concentrated in the low-tax jurisdiction, eroding the tax base that should have been taxed in the R&D location or the market location. Multinational enterprises can also achieve profit shifting through licensing of intangible assets. For instance, a multinational digital enterprise may license its core algorithms to subsidiaries located in different countries; by adjusting the licensing fees, it shifts profits from high-tax countries to low-tax countries. If the subsidiary in the high-tax country is charged an excessively high licensing fee, its profits decrease, reducing its taxable income, while the subsidiary in the low-tax country can retain more profit, thereby lowering the overall tax burden. The rise of digital platforms has made cross-border transactions more convenient and frequent. These platforms can provide services globally without needing to establish physical entities in every market. For example, some e-commerce platforms enable transactions between sellers and buyers around the world, yet the platform itself may only be registered in a few low-tax jurisdictions. Because the platform does not establish a permanent establishment in the location where transactions occur, under traditional tax rules, the tax authorities in the transaction location may be unable to tax the platform's profits, leading to local tax base loss. Digital platforms can also shift profits through segregating business functions and pricing strategies: the platform may allocate different business segments to different subsidiaries and then adjust internal transfer prices to transfer profits. For example, advertising services, technical support services, and other functions might be assigned to separate subsidiaries; by raising or lowering internal transaction prices, profits become concentrated in the low-tax jurisdiction subsidiary, thereby eroding the tax base of high-tax jurisdictions. Data is a significant asset in the digital economy, yet its value is not fully reflected in tax administration; enterprises, in collecting and using user data, can generate enormous commercial value, but there are no clear rules for the tax treatment of data itself. For example, social media platforms collect personal information and behavioral data from users and conduct targeted advertising, earning substantial profits. However, because data ownership and value are difficult to define, tax authorities find it hard to accurately tax the profits generated by data, resulting in tax base erosion. Multinational enterprises can also transfer profits through cross-border data flows: they can locate data storage and processing centers in low-tax jurisdictions, concentrating the value and profit generated by data in those regions, thereby reducing tax obligations in high-tax countries. For developing countries, due to relatively weak digital economy regulatory capabilities, the issue of tax base erosion brought by the digital economy may be more severe. Reduced tax revenues affect the government's ability to provide public services—such as education, healthcare, and infrastructure construction—potentially limiting such investments and impacting economic development and social stability. Digital economy enterprises reduce their tax burden through base erosion and profit shifting, while traditional enterprises, whose business models are relatively fixed, cannot engage in similar operations, resulting in unfair tax burdens between digital economy enterprises and traditional enterprises. This unfairness affects the fairness of market competition, hinders the development of traditional enterprises, and is not conducive to the healthy and sustainable development of the digital economy[6]. The global nature of the digital economy makes base erosion and profit shifting an international issue. Different countries have differing understandings and implementations of digital economy tax rules, easily leading to international tax disputes. For example, some countries, in order to protect their tax base, may adopt unilateral tax measures—such as imposing a digital services tax—potentially provoking countermeasures by other countries, thus undermining the international tax order and increasing compliance costs for multinational enterprises. The international community needs to strengthen cooperation and jointly formulate unified digital economy tax rules. For example, the OECD has been promoting reform of digital economy tax rules and proposed the "Two-Pillar" solution. The first pillar aims to reallocate taxing rights of multinational enterprises, ensuring that market jurisdictions have greater taxing rights over multinational enterprise profits; the second pillar sets a global minimum tax rate to prevent multinational enterprises from avoiding tax by shifting profits to low-tax jurisdictions. Through international cooperation, countries can reduce tax competition and disputes, preserving the international tax order. Each country needs to adjust domestic tax policies according to the characteristics of the digital economy. For example, it is necessary to refine the definition of permanent establishment to include virtual presence of digital economy enterprises, establish clear rules for the tax treatment of data—defining the value of data and the scope of taxation—and strengthen tax administration capacity for digital economy enterprises, improving tax authorities' informatization level and professional expertise. Multinational enterprises are required to disclose their global business activities and profit distribution more transparently. By establishing a sound information disclosure system, tax authorities can better understand enterprise operations, identify base erosion and profit-shifting behaviors, and thereby strengthen tax administration. For instance, some countries require multinational enterprises to submit country-by-country reports detailing their revenues, profits, assets, personnel, and other information in each jurisdiction.

3.2 Complexity of Data and Information

3.2.1 Challenges posed by massive data volumes

In the digital economy environment, the volume of enterprise transaction data grows explosively. Taking e-commerce platforms as an example, every day thousands of transactions occur, each containing rich information such as product details, transaction time, transaction location, and consumer information. For tax authorities to comprehensively collect this data requires consuming vast amounts of human, material, and time resources. At the same time, the cross-border and cross-regional nature of the digital economy means the sources of data are broad and dispersed; tax authorities must collaborate with relevant agencies in different regions and countries, coordinating data collection efforts, which further increases the difficulty of data collection. Massive data also requires sufficient storage space. Tax authorities' existing data storage systems may be unable to meet the demands of data storage in the digital economy era. As data volumes continue to increase, storage costs also rise, including expenses for purchasing and maintaining hardware equipment and the energy consumption of data storage. Moreover, the security of data is a critical concern: large volumes of stored data increase the risk of data breaches. If a data breach occurs, it not only harms taxpayers' interests but also undermines tax authorities' credibility. Faced with massive data, tax authorities' data-processing capabilities face a severe test. Traditional data-processing methods and technologies are inefficient when handling large-scale data, making it difficult to quickly and accurately extract useful information from massive datasets. For example, in conducting tax risk assessments, a large volume of transaction data must be analyzed and compared; if data-processing speeds cannot keep pace, tax administration will lag, preventing timely detection and prevention of tax risks.

3.2.2 Challenges arising from data complexity

Data in the digital economy originate from diverse sources—enterprise financial systems, e-commerce platforms, social media, etc.—and data from different sources exhibit various formats. For example, financial data may exist as spreadsheets, while social media data may be in the form of text, images, or videos. Tax authorities need to process and analyze these differently formatted data uniformly, requiring diverse data-processing technologies and tools, which increases the difficulty of data processing. Transactions in the digital economy often involve multiple parties and multiple stages, making the interrelationships among data complex. For instance, in the sharing economy model, a sharing platform may connect numerous service providers and consumers; during transactions, the flows of funds, logistics, and information intertwine to form complex network relationships. Tax authorities, to accurately understand these interrelationships among data and determine taxpayers' tax obligations, must possess strong data-analysis and data-mining capabilities. Due to the virtuality and concealment of the digital economy, the authenticity and reliability of data are hard to guarantee. Some enterprises may evade taxes by tampering with data or concealing transactions. For example, enterprises might inflate costs or understate revenue in financial statements or shift profits through related-party transactions. Tax authorities, in judging the authenticity and reliability of these data, need to invest more effort in investigation and verification, increasing the cost and difficulty of tax administration[7].

3.2.3 Suggestions for addressing the challenges of data complexity

Tax authorities should increase investment in infrastructure for data storage, processing, and analysis, build modern data centers, and adopt advanced big-data and cloud-computing technologies to enhance data-storage and processing capabilities. At the same time, they should strengthen data-security management and establish a sound data-security protection system to ensure the security of taxpayer data. Tax authorities should also strengthen data-literacy training for tax personnel and cultivate a group of interdisciplinary talents who understand both tax business and data analysis. Through professional training and practical exercises, tax personnel's capabilities in data collection, processing, analysis, and mining can be improved, enabling them to better address the challenges posed by data complexity in the digital economy era. The cross-border characteristic of the digital economy necessitates international cooperation and communication in tax administration. Tax authorities should actively participate in the formulation of international tax rules, strengthen information sharing and collaboration with tax authorities of other countries, and jointly tackle the tax administration challenges brought by the digital economy. For example, by signing bilateral or multilateral tax administration mutual assistance agreements, they can enhance cross-border data exchange and sharing, improving the efficiency of administering taxes on multinational enterprises. Tax authorities should accelerate the digital transformation of tax administration, using advanced information technology tools to achieve intelligent and automated tax administration. For example, developing intelligent tax administration systems that automatically collect, analyze, and provide risk warnings based on enterprise data can improve the efficiency and accuracy of tax administration. At the same time, tax authorities should strengthen information interfacing with enterprises, achieving real-time data sharing and reducing the time costs of data collection and processing. The massive volume and complexity of data in the digital economy bring many challenges to tax administration, but they also present opportunities for innovation. Tax authorities should proactively respond to these challenges, strengthen data infrastructure construction, cultivate high-quality data talent, enhance international cooperation and communication, and promote the digital transformation of tax administration to meet the development requirements of the digital economy era.

3.3 Lagging Administration Technologies

3.3.1 Challenges in data acquisition and integration

In the context of the digital economy's rapid development, existing tax administration technologies reveal significant shortcomings in many areas and cannot effectively address the new challenges posed by the digital economy. The business models of the digital economy result in transaction data being scattered across various digital platforms, social networks, and e-commerce systems. Tax authorities face many obstacles in acquiring these data; numerous digital platforms, for reasons of commercial interest and data security, are unwilling to proactively provide complete and

accurate transaction data to tax authorities. For example, some cross-border e-commerce platforms possess vast amounts of transaction information, but due to international data privacy regulations and commercial competition factors, tax authorities find it very difficult to obtain comprehensive transaction records, resulting in many potential tax sources being beyond supervision. Even if tax authorities acquire partial data, data from different sources differ greatly in format, standards, and quality, making integration of these data a formidable task. For instance, data from online transaction platforms might be formatted entirely differently from the data in traditional enterprise financial systems, requiring tax authorities to invest extensive human, material, and time resources to clean, transform, and match data to ensure consistency and usability. These data-integration difficulties hinder tax authorities from comprehensively and accurately understanding taxpayers' operational status and tax-paying capacity.

3.3.2 Difficulties in transaction identification and tracking

In the digital economy, there are numerous virtual goods and service transactions—such as digital music, in-game virtual items, and virtual currencies. These virtual transactions often lack traditional physical forms and transaction vouchers, making it challenging for tax authorities to accurately identify their nature and amount. For example, some transactions of in-game items by players may occur solely through in-game virtual currency without clear invoices or contracts, making it very difficult for tax authorities to track these transactions and determine their taxable amounts. With the globalization of the digital economy, cross-border transactions are becoming increasingly frequent. Digital services can be transmitted instantly worldwide via the Internet, and the parties involved in transactions may be located in different countries and regions, making cross-border transaction tracking extraordinarily complex for tax authorities. For example, a foreign software company providing software services to domestic users through an online platform makes it difficult for tax authorities to accurately understand where the transaction took place, the identities of the transacting parties, and the flow of funds, thus complicating the determination of tax jurisdiction and the taxable amount and making international tax leakage likely.

3.3.3 Inadequate risk assessment and early-warning capabilities

Existing tax risk assessment models are mainly built on traditional economic models and cannot adapt to the characteristics of the digital economy. The business models, profit approaches, and financial conditions of digital economy enterprises differ significantly from those of traditional enterprises, and traditional risk-assessment indicators—such as debt-to-asset ratio and profit margin—lose applicability in the digital economy domain. For instance, some emerging sharing-economy platforms have asset structures that are primarily light-asset based, making traditional leverage indicators unable to accurately reflect their operational risks and tax-paying capacity. Tax authorities lack specialized risk-assessment models for the digital economy and cannot accurately identify the tax risks of digital economy enterprises. In the digital economy environment, enterprises' business activities change rapidly, and tax risks exhibit high uncertainty and concealment. Current tax-early-warning mechanisms mainly rely on ex-post data monitoring and analysis, making it difficult to provide timely warnings of potential tax risks. For example, some digital enterprises may hide profits and evade tax obligations through complex related-party transactions and tax-planning strategies, but tax authorities' warning systems often detect anomalies only after enterprises have completed transactions and reported taxes. By that time, tax revenue has already been lost, making it difficult to effectively prevent tax risks.

3.3.4 Challenges in information security and privacy protection

During the tax administration process, tax authorities need to collect and process vast amounts of taxpayer data, which include enterprise trade secrets and personal privacy information. With the development of the digital economy, cyberattacks and data breaches occur frequently, and tax authorities' data security faces severe threats. If a tax authority's information system is attacked and taxpayer data leaked, it not only harms taxpayers' interests but also severely impacts the credibility of the tax authority. For example, hackers might attack a tax authority's database, obtaining sensitive taxpayer information for illegal activities. In the digital economy era, taxpayers are increasingly concerned about personal privacy and data security. While tax authorities need to collect relevant taxpayer information during administration, they must also comply with strict privacy protection regulations. Effectively protecting taxpayers' privacy while meeting administration needs becomes a significant challenge for tax authorities. For instance, when tax authorities obtain taxpayers' digital transaction data, they must ensure that data usage complies with privacy protection rules and avoid excessive collection and misuse of taxpayer information, but achieving this balance in practice is often difficult. In summary, existing administration technologies exhibit clear deficiencies in data acquisition and integration, transaction identification and tracking, risk assessment and early warning, and information security and privacy protection, making it challenging to effectively address the challenges posed by the digital economy. Tax authorities need to accelerate innovation and upgrading of administration technologies to meet the needs of the digital economy's development.

4 THEORETICAL FOUNDATIONS FOR INNOVATION IN TAX ADMINISTRATION MODELS

4.1 Information Economics Theory

In tax administration, information asymmetry is a ubiquitous problem. Taxpayers generally know more about their own operating status, income levels, and taxpaying capacity than tax authorities do, and this information asymmetry can lead to adverse selection and moral hazard behaviors on the part of taxpayers. Adverse selection manifests when taxpayers conceal true tax-related information, choosing to underreport income or overstate costs to reduce their tax liabilities. Moral hazard refers to taxpayers, after paying taxes, engaging in tax evasion or other illegal behaviors due to lack of

effective oversight. Such behaviors not only cause revenue loss but also undermine tax equity principles and disrupt the normal order of tax administration. For example, some small enterprises may conceal income by issuing no invoices or maintaining two sets of books, making it difficult for tax authorities to accurately grasp their real tax situation. Meanwhile, tax authorities face an informational disadvantage because their channels for obtaining information are limited, making it hard to conduct comprehensive and accurate oversight of all taxpayers.

Tax authorities can use modern information technology to broaden their information-gathering channels. On one hand, they can strengthen information sharing with departments such as industry and commerce, banks, and customs by building information-exchange platforms to obtain taxpayers' registration data, transaction records, import-export information, and more. For example, tax authorities could cooperate with banks to regularly obtain taxpayers' bank-account transaction data, thereby more accurately understanding the flow of funds and business activities of taxpayers. On the other hand, authorities can encourage taxpayers to proactively provide accurate tax information and grant certain tax incentives or rewards to those who truthfully report, thus improving taxpayer compliance. At the same time, they should strengthen the collection and use of third-party information—such as data provided by industry associations or accounting firms—to enrich the information resources available to tax authorities[8].

By applying data-mining and machine-learning techniques to the large volume of collected information, authorities can filter and analyze data to identify potential tax-risk points. By building tax-risk assessment models, they can quantitatively evaluate taxpayers' tax behaviors and assign risk levels. For instance, based on taxpayers' financial indicators and operational data, tax authorities can predict their taxpaying capacity and compare it with actual tax payments; any anomalies can trigger timely warnings. High-risk taxpayers can then be subject to targeted supervision and verification, improving the precision and effectiveness of tax administration. At the same time, by analyzing tax data, authorities can summarize weaknesses and problems in the tax-administration process, providing a basis for adjusting tax policies and optimizing administration models.

An effective information-incentive mechanism should be established whereby taxpayers who voluntarily disclose information and cooperate with tax authorities receive rewards—such as simplified filing procedures or access to tax-consultation services—while those who hide information or evade taxes face strict penalties, increasing the cost of noncompliance. Through such a clear system of rewards and punishments, taxpayers can be guided to comply consciously with tax laws and regulations, thereby raising overall compliance rates. It is also important to strengthen the construction of a tax-credit system by including taxpayers' credit information in the broader social-credit framework and linking it with credit information from finance, industry, and commerce. Taxpayers with good credit can receive more policy support and conveniences, while those with poor credit face joint penalties, creating a societal atmosphere in which everyone participates in tax administration.

By effectively obtaining, analyzing, and utilizing information, tax authorities can more accurately understand taxpayers' situations, reduce the frequency of on-site inspections, and lower administration costs. At the same time, authorities can use information technology to automate and make tax-administration processes more intelligent—such as by offering online filing and electronic payment—to increase processing efficiency and convenience for taxpayers. Information economics theory thus helps to address information asymmetry problems, enabling tax authorities to treat different taxpayers more fairly. By accurately assessing each taxpayer's capacity, authorities can ensure that every taxpayer bears tax liabilities commensurate with their actual ability, preventing unfair tax burdens. Based on information economics theory, tax administration can shift from the traditional "audit-based" model to a risk-management–oriented model, where authorities focus more on monitoring high-risk taxpayers to achieve precise administration. Meanwhile, using big data, cloud computing, and other technologies, authorities can develop personalized tax-administration services to meet different taxpayers' needs, thereby improving the quality and level of tax administration.

4.2 Behavioral Economics Theory

Behavioral economics, as a practical branch of economics, integrates behavioral analysis theory with economic operating rules, combining psychology and economic science to identify errors or omissions in contemporary economic models, thus amending mainstream economic assumptions about human rationality, self-interest, complete information, utility maximization, and consistent preferences. Traditional economics assumes that people are fully rational and always make optimal choices in decision-making[9]. However, behavioral economics, through extensive experiments and empirical research, finds that, in reality, people are often influenced by cognitive biases and emotional factors, so their decisions do not always align with the rational assumptions of traditional economics.

In traditional tax administration, it is usually assumed that taxpayers are fully rational and can accurately understand tax policies and conscientiously fulfill their tax obligations. However, behavioral economics research shows that when faced with complex tax regulations, taxpayers often have cognitive limitations. For example, many taxpayers may struggle to understand certain professional terms and complex calculation methods in tax laws, leading them to make errors or omissions when filing returns. Based on this, tax authorities can innovate their taxpayer service models. On one hand, they can simplify tax-filing procedures and forms, and use plain and easy-to-understand language and formats to explain tax policies to taxpayers. For instance, they can transform tax regulations into clear charts or videos and disseminate them widely through official websites and social media, helping taxpayers better understand and comply with tax policies. On the other hand, authorities can offer personalized tax guidance services. Based on each taxpayer's industry characteristics and business scale, they can provide targeted interpretations of tax policies and instructions for filing, reducing the risk of errors due to insufficient understanding.

Prospect theory is a key component of behavioral economics, which posits that people often focus more on avoiding losses than on acquiring gains, and their sensitivity to losses is greater than to gains. In tax administration, this means taxpayers' perception of penalties (losses) is stronger than their perception of benefits from tax incentives (gains). Tax authorities can use prospect theory to guide compliance: when publicizing tax policies, they should not only emphasize the benefits of lawful tax payment—such as good tax credit bringing more business opportunities—but also highlight the severe consequences of noncompliance, like hefty fines, late-payment penalties, and credit damage. Additionally, by intensifying punishment for tax-violation behaviors and raising the cost of illegality, taxpayers will be more cautious when weighing the risks of noncompliance. Furthermore, taxpayers who proactively correct tax violations can receive lighter penalties or partial waivers of late-payment charges, incentivizing positive behavior and compliance.

Behavioral economics research also finds that people's behavior is often affected by social norms. In tax administration, if a favorable social atmosphere of paying taxes is fostered—where taxpayers feel that paying taxes is socially recognized and that nonpayment will be socially condemned—this can promote cooperation among taxpayers and enhance compliance. Tax authorities can reinforce social norms by various means, such as conducting tax-credit rating exercises and publicly listing enterprises and individuals with high tax credit, awarding them honors and rewards as positive examples. Simultaneously, publicly disclosing those with poor credit pressures them to correct noncompliant behavior under societal scrutiny. In addition, authorities can use community outreach and school education to cultivate citizens' tax awareness and sense of responsibility from a young age, making tax payment a deeply ingrained social moral norm.

Mental accounting theory holds that people manage and make decisions by mentally categorizing funds from different sources and for different uses. In tax administration, taxpayers also have different mental perceptions of tax-related funds. Tax authorities can apply mental accounting theory to optimize tax-incentive mechanisms. For example, for corporate R&D expense super-deduction policies, instead of waiting to deduct incentives in the annual tax-reconciliation process, authorities can provide an immediate proportional deduction when enterprises incur R&D expenses, enabling enterprises to feel the benefit of tax incentives more quickly and improving their perception and enthusiasm. For individual income–tax special additional deductions, authorities can optimize filing processes and information systems so that taxpayers can more easily claim deductions and enjoy benefits, thereby increasing taxpayer satisfaction and compliance.

Applying behavioral economics theory to innovate tax administration models requires extensive taxpayer behavior data. However, obtaining comprehensive and accurate behavior data is challenging, and analyzing and mining such data requires specialized technical expertise and talent. Innovating tax policies based on behavioral economics often involves integrating multiple factors, making implementation complex. For example, when formulating personalized tax service policies, authorities must consider different taxpayers' diverse needs, placing higher demands on management and service capabilities. Creating a favorable social atmosphere for tax compliance and changing taxpayers' habits and mindsets cannot happen overnight; it requires long-term publicity and education, facing the challenge of slow shifts in social perceptions. Tax authorities should increase investment in data collection and management, building a comprehensive taxpayer information database. At the same time, they should actively introduce advanced data-analysis technologies and tools—such as big-data analytics and artificial intelligence—to enhance their capability to analyze and mine taxpayer behavior data, providing strong data support for innovating tax administration models. Tax authorities must also strengthen training for personnel, improving their understanding and application of behavioral economics theory. Through professional training courses and academic exchanges, tax staff can master the basic principles and methods of behavioral economics and apply them to actual tax administration work. Additionally, authorities should formulate long-term taxpayer publicity and education plans, continuously conducting outreach through multiple channels—such as public-service advertisements and tax-knowledge contests—to gradually change taxpayers' mindsets and habits, fostering a positive social atmosphere for tax compliance. Behavioral economics provides new perspectives and theoretical foundations for innovating tax administration models. By researching and applying relevant behavioral economics theories, tax authorities can better understand taxpayers' behavioral characteristics and decision-making processes, thereby formulating more scientific and effective tax policies and measures to improve tax administration efficiency and taxpayer compliance.

4.3 Big Data and Artificial Intelligence Theory

In tax administration, tax authorities face massive amounts of taxpayer data, including financial statements, invoice information, and transaction records. Big data technology can mine valuable information from these multi-source, heterogeneous datasets. For example, by mining an enterprise's invoice data, authorities can identify the enterprise's transaction counterparts, transaction frequency, and transaction amounts, thereby understanding the business scope and operating scale. Based on data-mining methods such as association analysis and clustering analysis, authorities can identify taxpayers' abnormal behaviors. For instance, by clustering financial indicators of enterprises in the same industry, authorities can group similarly performing enterprises together; if a particular enterprise's financial indicators differ significantly from its peers, it may indicate tax risk, and that enterprise can be flagged for close monitoring. Using time-series analysis and other data-mining techniques, authorities can predict future tax-revenue trends based on historical tax data. For example, by analyzing corporate income–tax revenue data in a given region over past years and combining it with local economic development plans and industrial policies, authorities can forecast income–tax revenue growth for the coming years, providing a basis for tax-administration decision-making[10].

Within tax authorities, siloed business systems and data barriers often exist between different internal systems and between tax authorities and other government departments (such as industry and commerce or customs). Big-data integration theory can consolidate these disparate datasets, breaking down information silos. For instance, by integrating tax-registration data with industry-and-commerce registration data, authorities can ensure the accuracy and consistency of taxpayer information, avoiding tax-administration loopholes caused by inconsistent data. By merging various types of data, authorities can build more comprehensive taxpayer profiles. For example, integrating enterprise financial data, social-security data, and customs import-export data enables more accurate assessments of an enterprise's operating status and taxpaying capacity, thus achieving more precise tax administration.

Every data point in big data may contain hidden value. In tax administration, analyzing large volumes of taxpayer data can reveal hidden tax-administration issues and potential sources of increased revenue. For instance, by analyzing e-commerce platform transaction data, authorities might discover emerging industries and new business-model blind spots in tax administration and adjust tax policies and measures promptly. Leveraging the value of big data can optimize tax-administration processes and improve efficiency. For example, by analyzing taxpayer filing data in real time, authorities can quickly identify filing errors and anomalies, automatically remind taxpayers to make corrections, reduce manual-review workloads, and improve the efficiency and quality of tax administration.

Machine-learning algorithms can build tax-risk assessment models based on historical tax data and taxpayer characteristics. For example, using algorithms such as logistic regression or decision trees to analyze taxpayers' financial indicators and tax-credit records can assess taxpayers' risk levels. Based on risk classifications, authorities can implement segregated management—focusing on monitoring and inspecting high-risk taxpayers. With machine-learning models continuously monitoring in real time, when a taxpayer's behavior becomes anomalous, the system can automatically issue an alert. For instance, if a company's number of issued invoices suddenly increases dramatically or its tax-burden ratio drops significantly, the system can promptly send out a warning to the tax authorities to investigate and verify, thereby preventing tax risks. Clustering algorithms in machine learning can automatically classify taxpayers. For example, based on characteristics such as industry type, operating scale, and tax credit, taxpayers can be grouped into different categories, enabling authorities to implement differentiated administration strategies and improve the precision and effectiveness of administration.

Tax policies and regulations are often highly specialized and complex, making them difficult for taxpayers to understand. Natural-language processing (NLP) technology can semantically analyze and interpret tax policies and regulations, presenting them to taxpayers in plain and easy-to-understand language. For example, using text-summarization techniques to extract key information from tax policies and push it to taxpayers via SMS or official WeChat accounts can increase taxpayers' awareness and compliance. Building NLP-based intelligent-consultation systems allows taxpayers to input questions by voice or text; the system can automatically recognize the inquiry and provide accurate answers. For instance, if a taxpayer asks about the eligibility and application process for a particular tax incentive, the intelligent-consultation system can quickly retrieve detailed answers from its knowledge base, improving the efficiency and quality of taxpayer services. NLP technology can also automate the recognition and processing of tax documents. For example, using optical-character-recognition (OCR) technology to convert paper tax documents into electronic text, then applying text classification and information-extraction techniques to automatically identify document types and extract key information can achieve automated processing of tax documents, reducing manual workload and error rates.

Knowledge graphs can connect and integrate various pieces of taxpayer information—such as basic information, tax records, and related enterprises—into a complete knowledge network. By analyzing the knowledge graph, tax authorities can discover potential relationships among taxpayers, for instance, equity relationships or business connections between enterprises. This helps authorities detect related-party transactions and transfer-pricing issues in tax administration and strengthen tax oversight over enterprise groups. Based on reasoning mechanisms powered by knowledge graphs, authorities can infer unknown information and potential tax risks from known taxpayer data and tax rules. For example, if a knowledge graph shows that a certain enterprise has close business dealings with several high-risk enterprises, tax authorities can infer that it may also pose tax risks, prompting focused attention and investigation. Knowledge graphs can support tax-authority decision making. When formulating tax-administration strategies, authorities can analyze information in the knowledge graph to understand the characteristics and tax-risk distributions of taxpayers across different industries and categories, thereby formulating more scientific and reasonable administration strategies and improving overall tax-administration effectiveness.

5 PRACTICE PATHS FOR INNOVATION IN TAX COLLECTION AND ADMINISTRATION MODELS

5.1 Building an Intelligent Taxation System

In the digital era, tax collection and administration face challenges such as massive amounts of data and complex business processes, and traditional administration models can no longer meet the needs for efficient and precise administration. By leveraging big data and artificial intelligence technologies to construct an intelligent taxation system, the goal is to achieve intelligence, automation, and precision in tax collection and administration, improving collection efficiency, reducing administration costs, enhancing taxpayer service quality, and strengthening the scientific basis and fairness of tax administration.

Tax authority internal system data: integrate taxpayer registration information, declaration information, invoice information, and other data from internal databases such as the Golden Tax System and the Tax Administration System. For example, using data interfaces to clean and uniformly format data from different periods and versions of the Golden Tax System to ensure data consistency and accuracy. External third-party data: establish data-sharing mechanisms with industries, commerce, customs, banks, and other departments to obtain taxpayer registration records, import-export transactions, and capital flow information. For example, collaborating with banks to obtain real-time information on taxpayer account fund changes to provide more comprehensive data support for tax base monitoring. Internet data: employ web-scraping technologies to collect publicly available information about taxpayers on the Internet, such as corporate news reports, product sales information, and social media activity, to assist tax authorities in understanding companies' operating conditions and market reputation. Formulate unified data standards and specifications to perform extract, transform, and load (ETL) operations on all collected data. For example, standardize taxpayer names and addresses provided by different departments to remove duplicates, errors, and incomplete data. Classify and encode data, establishing a data dictionary to facilitate subsequent data queries and analyses. For example, classify and encode invoice information by industry and invoice type to improve data retrieval efficiency. Through mining the correlations among different business datasets of taxpayers, uncover potential tax risks. For example, analyze the relationships among a company's sales data, cost data, and invoice data to determine whether the company is issuing false invoices or concealing income. Cluster taxpayers based on factors such as operating scale, industry characteristics, and tax credit to provide a basis for implementing differentiated tax administration strategies. For example, group small and micro enterprises in the same industry into one cluster and formulate targeted tax incentive policies and administration measures according to their characteristics. Use time-series analysis and other methods to forecast trends in tax revenue and tax base changes. For example, predict the growth trend of tax revenue in a given region over the next period to provide a reference for tax planning. Employ machine learning algorithms such as decision trees and neural networks to build tax-risk assessment models. By learning and training on historical data, the model can automatically identify taxpayers' risk levels and generate risk warning information. For instance, use a decision tree algorithm to analyze a company's financial indicators and operational behavior to assess the possibility of tax evasion. Natural language processing technology: apply it to tax consultation and policy interpretation. For example, develop an intelligent tax customer-service system that uses natural language processing technology to understand taxpayers' inquiries and provide accurate, timely responses. At the same time, perform semantic analysis on tax policy texts to extract key information and offer taxpayers clearer policy interpretations. Based on the risk warning information generated by the data analysis layer, tax authorities promptly take corresponding countermeasures. For low-risk taxpayers, issue risk notifications via SMS or email; for high-risk taxpayers, carry out special investigations and tax audits. For example, when the risk assessment model identifies that a company's value-added tax burden rate is significantly lower than the industry average, the system automatically issues a warning, enabling tax personnel to closely monitor and investigate that company. Provide customized tax services based on taxpayers' personalized needs and behavioral characteristics. For example, push suitable tax policies and tax-processing guides to taxpayers according to their historical filing records and preferences. At the same time, use artificial intelligence technology to automate tax processes—for instance, automatically filling out tax declaration forms and automatically auditing invoices—to improve tax-processing efficiency. Offer data support and analytical recommendations for tax authorities' administration decisions. For example, by analyzing tax data from different regions and industries, evaluate the implementation effects of tax policies to provide a basis for policy adjustments and optimization. Concurrently, use forecasting models to predict the demand for tax administration resources and allocate administration forces rationally[11].

The implementation steps for the intelligent taxation system are divided into five phases.Planning and Design Phase (Months 1–3):1.Establish a project team for building the intelligent taxation system, clarifying each member's responsibilities and division of labor.2.Conduct comprehensive requirements research, communicating with various business departments within the tax authority and taxpayer representatives to understand their functional requirements and expectations for the intelligent taxation system. 3. Develop the overall architecture and technical solutions for the smart tax system, defining its functional modules, data workflows, and technology selection.4.Develop a project implementation plan and schedule, defining tasks and milestones for each phase.

Data Integration and Platform Construction Phase (Months4–6):1.According to the data collection layer design, establish data-sharing mechanisms with each data provider and complete data collection and integration.2.Build a big data storage and processing platform—such as a Hadoop distributed file system and Spark computational framework—to provide strong computing and storage capabilities for subsequent data analysis.3.Develop data standardization and preprocessing tools to clean, transform, and load the collected data, establishing a unified data warehouse.

Algorithm Development and Model Training Phase (Months7 –9):1.Organize professional data scientists and algorithm engineers to develop big data analysis algorithms and AI models according to the design of the data analysis layer.2.Use historical data to train and optimize models, continuously adjusting model parameters to improve accuracy and reliability.3.Test and validate the developed algorithms and models to ensure their effectiveness in practical application.

System Launch and Trial Operation Phase (Months 10–11) 1. Deploy the completed intelligent taxation system into the production environment, performing final checks and tests before going live.2.Select certain regions or business segments for trial operation, collect user feedback and system operation data, and promptly identify and resolve issues in the system. 3. Based on trial operation results, optimize and adjust the system to ensure stability and reliability.

Full Promotion and Continuous Optimization Phase (Month 12 and beyond):1. Promote the intelligent taxation system nationwide, covering all tax departments and taxpayers.2.Establish system operation, maintenance, and monitoring

mechanisms, regularly evaluate performance and data quality, and promptly address system failures and data anomalies.3. Continuously monitor developments in big data and AI technologies, introduce new technologies and algorithms, and upgrade and optimize the intelligent taxation system to adapt to the ever-changing needs of tax collection and administration.

Based on the macro environment of tax collection and administration and the micro-level subjects, and integrating technological innovation elements, construct a systematic foundational theoretical framework for tax collection and administration models in the digital economy era. This specifically includes: the mechanism by which the tax ecosystem in the digital economy era affects tax collection and administration models; the behavioral model theory of tax collection and taxpayer subjects; and the mechanism by which technological innovation impacts tax collection and administration models, as shown in Figure 2.

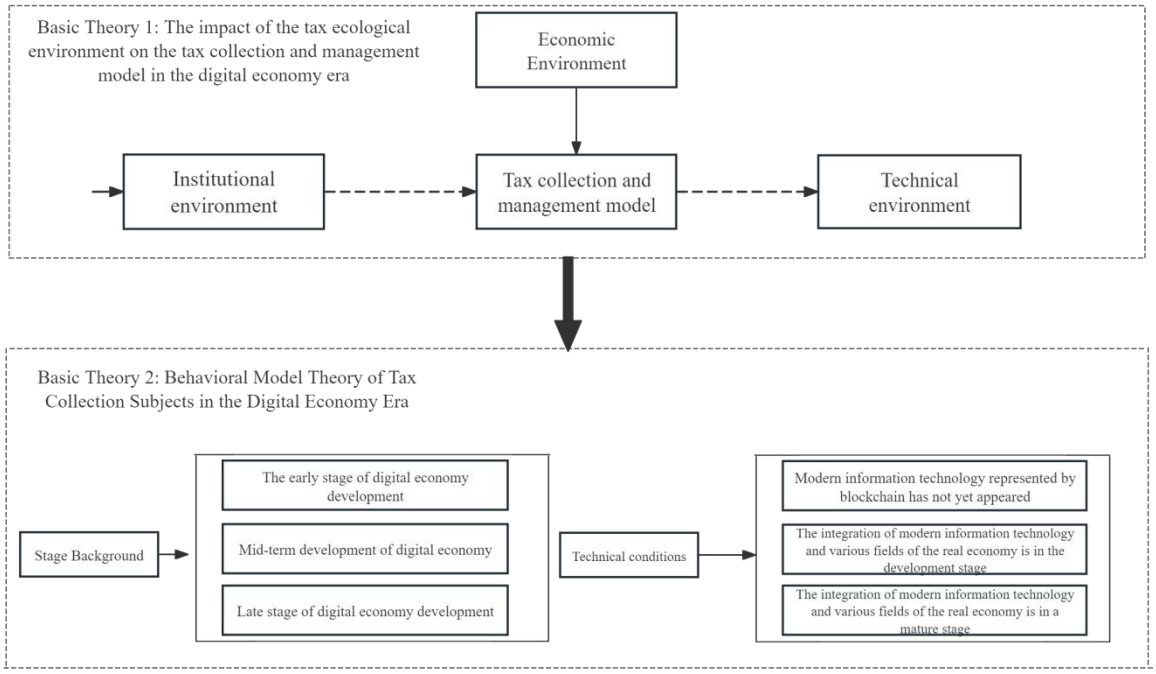

Figure 2 Basic theoretical Framework of Tax Collection and Management Model in the Digital Economy Era

Enhance collaboration with research institutions and enterprises in the fields of big data and artificial intelligence technologies, introducing advanced technologies and talent to ensure the technical sophistication and innovation of the smart tax system. Establish robust technology R&D and testing environments to thoroughly evaluate and validate new technologies and algorithms, guaranteeing their stability and reliability in practical applications. Strengthen data security and privacy protection through encryption, access control, and other measures to safeguard taxpayer data. Intensify training for tax officials in big data and AI technologies, elevating their technical application capabilities and data analysis proficiency—e.g., by organizing regular specialized training sessions and workshops with expert instructors. Recruit professionals in big data, AI, and software engineering to bolster the technical workforce of tax authorities, providing talent support for the construction and operation of the smart tax system. Implement incentive mechanisms to encourage active participation in building and innovating the smart tax system, recognizing and rewarding those who make outstanding contributions in technology application or operational innovation."Smart Taxation" is an innovative tax administration approach that fully adopts the "Internet+" mindset, transcending traditional service models by integrating tax modernization with mobile internet, big data, and cloud computing technologies. With the operation of the "Golden Tax Phase III System," tax authorities nationwide have begun exploring the "Internet + Taxation" concept, applying big data analytics, cloud computing, blockchain, and AI to tax administration, delivering an enhanced experience for taxpayers. According to survey results, 41.37% of respondents believe that "Smart Taxation" effectively "optimizes administration processes and significantly improves efficiency." Figure 3 illustrates the progress in tax administration transformation driven by "Smart Taxation" in surveyed regions.

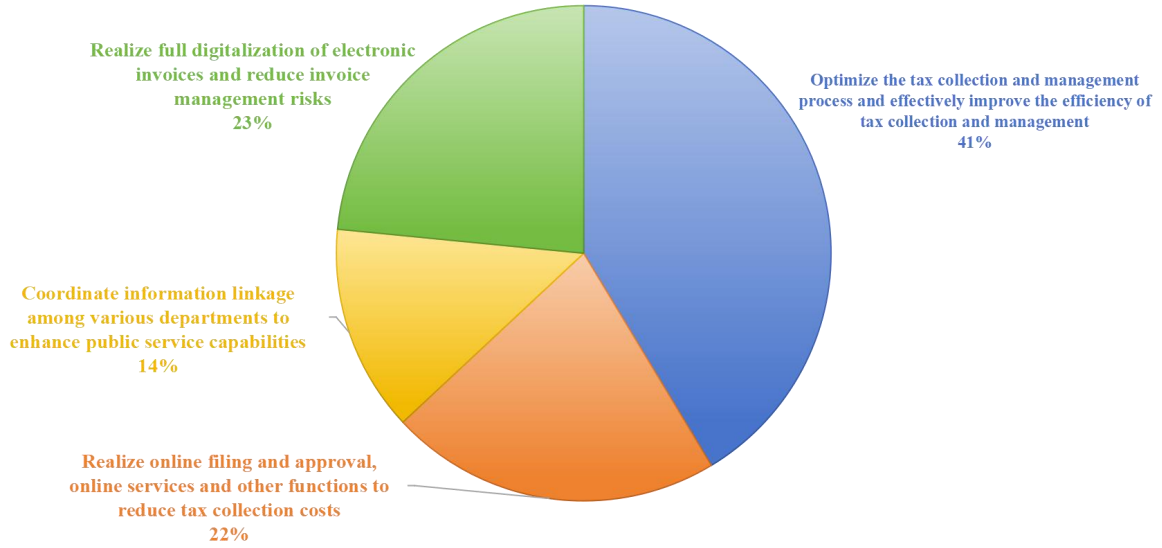

Figure 3 The Progress that "Smart Taxation" has brought about in the Transformation of the Tax Collection and Management Model in the Surveyed Areas

Develop and refine management systems and operational procedures related to the smart tax system, clarifying responsibilities and workflows for all departments and positions to ensure standardized system operations. Establish robust mechanisms for data sharing and exchange, defining rights and obligations of data providers and users to guarantee lawful and compliant data utilization. Strengthen coordination and collaboration with relevant agencies by instituting cross-departmental tax administration cooperation frameworks, collectively advancing the development and implementation of the smart tax system.

5.2 Strengthening International Cooperation

With the deepening of economic globalization, the business activities of multinational enterprises have become increasingly complex, and tax collection and administration face numerous challenges. Participating in the formulation of international tax rules is an important pathway for strengthening international cooperation and addressing the difficulties of cross-border tax administration. Currently, international tax rules are primarily led and formulated by international organizations such as the Organisation for Economic Co-operation and Development (OECD). China should actively participate in this process and fully express the interests and demands of developing countries during the formulation of international tax rules. For example, in the development of digital economy tax rules, the rapid growth of the digital economy challenges traditional principles for allocating tax jurisdiction. Multinational digital enterprises can conduct business without establishing physical entities, making it difficult for source countries to tax their income. As a major digital economy power, China should actively engage in the formulation of digital economy tax rules and promote the establishment of fair and reasonable digital economy tax administration regulations, thereby safeguarding the tax rights and interests of China and other developing countries in the digital economy field. At the same time, coordination and cooperation with other developing countries must be strengthened[12]. Developing countries often occupy a relatively weak position in cross-border tax administration and face issues such as tax base erosion. By enhancing cooperation among developing countries, they can form a united front and gain greater voice in the formulation of international tax rules. For example, a tax coordination mechanism for developing countries could be established to jointly study cross-border tax administration issues and propose solutions that align with the interests of developing countries.

Tax information exchange is a crucial aspect of international tax cooperation and plays a key role in combating cross-border tax evasion. China should further improve its tax information exchange mechanism and sign tax information exchange agreements with more countries and regions. Currently, China has established tax information exchange relationships with multiple countries and regions, but there remains room for improvement. The scope and depth of information exchange should be expanded to include not only taxpayers' basic information but also their transaction information, capital flow details, and so on, so as to obtain a more comprehensive understanding of the operations and tax compliance of cross-border taxpayers. Information technology should be leveraged to enhance the efficiency of tax information exchange. An efficient tax information exchange platform should be established to ensure rapid transmission and processing of information. For example, an intelligent tax information analysis system could be developed to automatically filter and analyze exchanged information, promptly identifying potential tax risks. Confidentiality in handling tax information must be reinforced. Tax information involves taxpayers' privacy and trade secrets, so confidentiality regulations must be strictly enforced. A comprehensive tax information confidentiality system should be formulated, and related personnel should receive education and management on confidentiality to prevent leaks of tax information.

International mutual assistance in tax administration is an effective means of resolving cross-border tax administration difficulties. China should actively engage in tax administration mutual assistance with other countries, including assistance in tax collection and service of tax documents. In terms of assisting with tax collection, when Chinese tax authorities discover that a cross-border taxpayer has taxes due and unpaid abroad, they can request assistance from the tax authorities of the partner country through the international mutual assistance mechanism. Meanwhile, China should actively cooperate with other countries' requests for mutual assistance in tax administration to jointly maintain international tax order. An international tax administration mutual assistance coordination mechanism should be established, clarifying the responsibilities and division of labor of each department in the mutual assistance process, and strengthening internal coordination and cooperation. At the same time, communication and collaboration with other countries' tax authorities should be enhanced by establishing regular exchange mechanisms to promptly resolve issues arising in mutual assistance for tax administration. Training for personnel involved in international tax administration mutual assistance should be strengthened. Tax officials should improve their professional level in international mutual assistance for tax administration, become familiar with the rules and procedures for international mutual assistance, and handle related matters proficiently.

Strengthening international cooperation to address cross-border tax administration challenges requires a large number of international tax professionals. In higher education, international tax curricula and instruction should be strengthened. Courses in international taxation, multinational enterprise tax planning, international tax treaties, and the like should be offered to cultivate students' global tax perspective and professional abilities. Practical teaching components should also be emphasized—through internships, case studies, and so forth—to improve students' hands-on skills. Tax authorities should bolster international tax training for in-service personnel. Regular international tax business training sessions should be organized, with domestic and international experts invited to lecture on the latest developments and administrative experiences in international taxation. Tax officials should be encouraged to participate in international tax seminars and training exchanges to broaden their global outlook. An international tax talent exchange mechanism should be established: outstanding tax officials should be dispatched to tax authorities in other countries for exchange and study to learn about their advanced tax administration experiences and technologies. Conversely, foreign tax experts could be invited to China to lecture and exchange ideas, promoting exchange and cooperation among international tax professionals.

5.3 Improving Laws and Regulations

Clarify the legality and legitimacy of innovations in tax collection and administration models so that innovative measures have legal backing, thereby reducing legal risks and uncertainties during the innovation process. Unified legal standards and norms can constrain the behaviors of tax authorities and taxpayers, ensuring that innovations in tax collection and administration models occur in a fair, just, and transparent environment. A stable legal environment can provide tax authorities and relevant departments with confidence and motivation to innovate and encourage them to actively explore new administration methods and technological means. With the rapid development of information technology, tax collection and administration models are also shifting toward digitalization and intelligence. Laws and regulations should adapt to this trend and clarify the legal status and application rules for digital administration methods such as electronic invoices, electronic filing, and big data analysis. Modern tax administration requires collaborative cooperation among tax authorities and other departments, such as banks, industry and commerce authorities, and customs, to share information and conduct joint enforcement. Laws and regulations should specify the responsibilities and cooperation mechanisms of each department to promote cross-departmental information flow and operational coordination. During the innovation of tax collection and administration models, the legitimate rights and interests of taxpayers must be fully protected. Laws and regulations should clarify taxpayers' rights and obligations, standardize tax authorities' enforcement procedures, and establish sound mechanisms for protecting taxpayers' rights and interests. The existing Tax Collection and Administration Law, Enterprise Income Tax Law, Individual Income Tax Law, and other relevant laws and regulations should be comprehensively reviewed to assess whether they meet the needs of innovating tax collection and administration models. Clauses that do not align with innovation requirements should be revised and improved in a timely manner. Laws and regulations should explicitly state the legal efficacy of digital vouchers such as electronic invoices, electronic contracts, and electronic signatures, and regulate digital tax filing and payment processes to provide legal support for digital administration. Relevant laws and regulations should be revised to clarify the scope, methods, and procedures for information sharing between tax authorities and other departments, ensuring the legality and security of information sharing. At the same time, taxpayer information confidentiality provisions must be strengthened to prevent information leakage and misuse.

With the widespread application of big data, artificial intelligence, and other technologies in tax collection and administration, specialized data management regulations need to be formulated to standardize the collection, storage, use, and security management of tax data, ensuring data quality and security. To strengthen collaborative cooperation between tax authorities and other departments, regulations on cooperative collaboration in tax collection and administration should be enacted, specifying each department's responsibilities and collaboration mechanisms and establishing sound cross-departmental information-sharing platforms and joint enforcement mechanisms. Special regulations for protecting taxpayers' rights and interests should be established to further clarify taxpayers' rights and obligations, institute robust mechanisms for taxpayer complaints, appeals, and remedies, and enhance the protection of taxpayers' legitimate rights and interests. For new issues and situations arising during the innovation of tax collection

and administration models, timely interpretative legal documents should be issued to clarify legal application standards and operational norms, providing clear guidance for tax authorities and taxpayers. Through multiple channels, laws, and regulations governing taxation and policies on innovating tax collection and administration models should be widely publicized to increase legal awareness and compliance consciousness among tax authorities and taxpayers, thereby fostering a sound environment governed by the rule of tax law. Legal and regulatory training and guidance should be provided to tax officials and taxpayers to enhance their understanding and application of new laws and regulations, ensuring their effective implementation.

With the development of economic globalization, international cooperation in tax collection and administration has become increasingly important. China should actively participate in the formulation of international tax rules to promote the establishment of a fair, reasonable, and transparent international tax order. Tax administration mutual assistance agreements should be signed with other countries and regions to strengthen international tax cooperation and jointly combat international tax avoidance. At the same time, drawing on advanced international experiences, China should improve its own tax laws, regulations, and administration models. Strengthening exchanges and cooperation with other countries and regions in tax law and regulation, promoting international coordination of tax laws and regulations, and reducing international tax disparities and conflicts will provide multinational enterprises with a more stable and transparent tax environment.。

6 CASE STUDIES

6.1 Shenzhen Municipality's Digital Innovation in Tax Collection and Administration

As a pioneer city of China's reform and opening-up and an important highland of technological innovation, Shenzhen's economy has developed rapidly, with numerous market entities and complex business forms. The traditional tax collection and administration model could not meet the ever-growing demands of tax management. To adapt to the digital era, the Shenzhen tax authorities actively explored digital innovations in tax collection and administration. The Shenzhen tax authorities integrated internal tax administration data, taxpayer declaration data, invoice data, and so on, and at the same time achieved data sharing with external departments such as market supervision, public security, and banks, thereby building a massive big-data-based tax administration platform. By analyzing and mining this vast volume of data, they can accurately identify taxpayers' risk levels and focus supervision on high-risk taxpayers. For example, by analyzing invoice data, illegal activities such as issuing false invoices can be detected in a timely manner. To improve tax service efficiency and taxpayer satisfaction, Shenzhen launched intelligent tax services. Taxpayers can handle most tax-related business via mobile apps and online tax platforms, achieving "contactless" tax services. Additionally, an intelligent customer service system was introduced to provide taxpayers with 24-hour online consultation, quickly answering their queries. For instance, if a taxpayer encounters problems when filing a tax return, they can immediately seek help through intelligent customer service. Leveraging big data analysis and artificial intelligence technologies, the Shenzhen tax authorities achieved precise supervision of taxpayers. By monitoring taxpayers' operational and financial data in real-time, abnormal behaviors can be detected promptly, and risk warnings issued. For example, if a company's financial indicators show abnormal fluctuations, the system automatically issues a warning, allowing tax officials to investigate and verify the situation immediately[13].

The digital innovation practice has significantly improved the tax collection and administration efficiency of Shenzhen's tax authorities. Through big data analysis and intelligent tax services, manual operations and tax processing time have been reduced, thereby increasing work efficiency. For example, transactions that once required taxpayers to visit tax service halls can now be quickly handled online, greatly shortening the time spent on tax procedures. The precise supervision model enables tax authorities to more accurately identify taxpayers' risk points, improving the precision of tax administration. By promptly cracking down on illegal activities such as issuing false invoices, tax order is maintained and state tax revenues are safeguarded. Intelligent tax services and high-quality consultation services provide taxpayers with more convenient and efficient tax handling experiences, boosting taxpayer satisfaction. Taxpayers can conduct tax-related business anytime and anywhere, and their issues can be resolved promptly, reducing the cost of tax processing.

6.2 Haier Group's Tax Service Center Innovation

Haier Group, as a large multinational enterprise, operates across multiple industries and regions. As the company's scale expanded continuously, the traditional tax management model faced high management costs, low efficiency, and difficulties in controlling risks. To optimize tax management, Haier Group established a Tax Service Center. Haier's Tax Service Center organized and optimized tax processes for all subsidiaries within the group, formulating unified tax operation processes and standards. Through standardized processes, the efficiency and accuracy of tax handling were improved. For example, in invoice management, unified procedures for issuing, certifying, and reimbursement of invoices were established, reducing human error and risks. Centralizing all subsidiaries' tax-related business in the Tax Service Center allowed for professionalization and economies of scale in tax services. The Tax Service Center was staffed with professional tax personnel who were well-versed in tax policies and regulations, thereby improving the quality of tax handling. For example, in tax filing, the Tax Service Center handled filings uniformly, avoiding tax risks caused by subsidiaries filing late or inaccurately. Haier's Tax Service Center introduced advanced information

management systems, achieving centralized management and sharing of tax data. Through these information systems, the tax status of each subsidiary could be monitored in real time, enabling timely identification of potential tax risks. For instance, by analyzing tax data through these systems, abnormal enterprise tax burdens and other issues can be detected immediately.

By unifying processes, centralizing handling, and implementing information-based management, Haier Group reduced tax management costs. The number of tax personnel across subsidiaries was reduced, work efficiency was improved, and costs from penalties due to improper tax handling were avoided. Standardized processes and professional handling significantly enhanced the efficiency and quality of tax management. Tax filings became timelier and more accurate, and tax risks were effectively controlled. Through real-time monitoring and data analysis, Haier Group could promptly identify and resolve tax risk issues, strengthening its tax risk control capabilities. At the same time, the Tax Service Center could stay abreast of changes in tax policies and provide enterprises with reasonable tax planning advice, thereby reducing the tax burden on the company.

6.3 United States: Application of Big Data and Risk Management in Tax Collection and Administration

The United States Internal Revenue Service (IRS) established a massive database that integrates taxpayers' filing information, financial transaction data, third-party reporting data, and other multi-source data. By applying advanced data analysis technologies, the IRS creates precise profiles of taxpayers' behaviors and risks. For example, machine learning algorithms analyze taxpayers' income sources, spending patterns, and historical tax records to identify potential tax fraud and evasion behaviors. The IRS uses risk assessment models to categorize taxpayers into low-risk, medium-risk, and high-risk groups based on their risk levels. For low-risk taxpayers, administrative processes are simplified and more self-service options are provided; for high-risk taxpayers, audits and investigations are intensified. This differentiated management approach improves administrative efficiency by concentrating limited resources on high-risk areas. Through big data analysis and risk management, the IRS can promptly detect and correct taxpayers' noncompliant behaviors, effectively improving tax compliance. Statistics show that in recent years the U.S. tax collection rate has increased, reducing tax leakage. Precise risk management allows the IRS to allocate administrative resources rationally, reducing unnecessary interference with low-risk taxpayers while intensifying enforcement against high-risk cases, thereby enhancing overall administration efficiency.

6.4 Australia: Innovation in Digital Services and Taxpayer Collaboration Models

The Australian Taxation Office (ATO) launched a powerful digital taxation service platform that allows taxpayers to conveniently complete tax filing, pay taxes, and query tax information. The platform also provides personalized tax advice and reminder services to help taxpayers better fulfill their tax obligations. The ATO proactively builds collaborative relationships with taxpayers and implements Tax Compliance Agreement (TCA) projects. For large enterprises and high-net-worth individuals, the ATO signs TCAs with them, clarifying the rights and obligations of both parties and jointly formulating tax compliance plans. This collaborative model encourages taxpayers to proactively disclose tax risks, improving transparency and efficiency in tax administration. The introduction of the digital service platform has greatly increased taxpayers' processing efficiency, reducing both time and cost for tax procedures. Taxpayers' satisfaction with tax services has significantly improved. Innovation in the taxpayer collaboration model motivates taxpayers to comply more proactively with tax regulations and actively cooperate with tax authorities. The implementation of TCAs has achieved good results, with participating enterprises' tax compliance notably increasing.

6.5 Singapore: Application of Artificial Intelligence and Blockchain Technologies in Tax Collection and Administration

The Inland Revenue Authority of Singapore (IRAS) introduced artificial intelligence technology and developed an intelligent tax assistant. Taxpayers can interact with the tax assistant via voice or text to obtain tax consultations and guidance. The tax assistant uses natural language processing technology to accurately understand taxpayers' questions and provide timely, accurate responses. IRAS is exploring the use of blockchain technology to establish an invoice management system. The distributed ledger feature of blockchain technology ensures the authenticity, integrity, and immutability of invoice information, effectively preventing invoice fraud and false issuance. Simultaneously, the blockchain invoice management system enables real-time sharing and circulation of invoice information, improving the efficiency of invoice management. The AI-powered tax assistant provides taxpayers with more convenient and efficient services, reducing the consultation burden on tax personnel. Taxpayers can access tax information anytime and anywhere, enhancing their tax service experience. The application of the blockchain invoice management system effectively curbs illegal activities in the invoice domain, enhancing the accuracy and reliability of tax collection and administration.

6.6 Comparative Analysis and Insights

The United States focuses on big data and risk management, integrating multi-source data for risk assessment and precise enforcement; Australia emphasizes building digital service platforms and innovating taxpayer collaboration models; Singapore leads in applying artificial intelligence and blockchain technologies, providing intelligent services to

taxpayers and ensuring the security of invoice management. The U.S. risk management model highlights categorized management and differentiated supervision of taxpayers; Australia's collaborative model emphasizes building mutual trust with taxpayers to jointly promote tax compliance; Singapore's technology-driven model improves administrative efficiency and service quality through the deployment of cutting-edge technologies. These successful international case studies all demonstrate that innovation in tax collection and administration cannot be separated from advanced technological support. Each country should select appropriate technological means according to its national conditions and administrative needs, continuously enhancing the informatization and intelligence levels of tax collection and administration. At the same time, focusing on taxpayer service and collaboration, and improving taxpayers' compliance awareness and proactiveness, are crucial pathways for achieving tax administration objectives. By comparing and analyzing the above international examples, China can draw on their advanced experiences, combined with its own realities, to promote innovation in tax collection and administration, improve administrative efficiency and service quality, and foster healthy development of the taxation sector.

By conducting an in-depth analysis of a series of domestic and international tax collection and administration case studies, numerous valuable insights can be summarized for innovating tax collection and administration models. These insights encompass multiple dimensions, including concepts, technologies, systems, and cooperation, and are instrumental in constructing a more efficient, fair, and modern tax collection and administration system. Some successful overseas cases show that treating taxpayers as clients and conducting tax administration with a focus on meeting taxpayer needs can significantly improve taxpayers' compliance and satisfaction. Tax authorities should abandon the traditional "management-centered" mindset and adopt a "service-centered" approach—proactively understanding taxpayers' difficulties and demands, and providing more convenient, efficient, and personalized services. For example, the Australian Taxation Office offers customized tax guidance and consultation services for enterprises of different scales and industries, helping businesses better understand and fulfill their tax obligations. Simplifying tax procedures is key to reducing taxpayers' burdens and improving administrative efficiency. Domestic and international advanced experiences indicate that using information technology to optimize tax procedures—promoting online tax services, mobile tax services, and other diversified channels—allows taxpayers to "use the Internet more and travel less." For example, the IRS in the United States has established a comprehensive electronic tax system through which taxpayers can complete most tax-related matters online, greatly saving time and costs. Through analysis and mining of vast amounts of tax-related data, tax authorities can accurately identify taxpayers' risk conditions and implement precise supervision. For instance, Her Majesty's Revenue and Customs (HMRC) in the United Kingdom uses big data analysis to monitor taxpayers' transaction data and financial data in real time, promptly detecting abnormal transactions and potential tax risks, thereby enhancing the targeting and effectiveness of tax administration. Simultaneously, artificial intelligence can be deployed for intelligent consultation and automated approval processes to improve service efficiency and quality. Blockchain technology, with its decentralized, immutable, and traceable characteristics, holds broad application prospects in tax collection and administration; several countries have already begun exploring blockchain-based invoice management and tax audit innovations. For example, South Korea's tax authorities have piloted a blockchain-based electronic invoice project, ensuring the authenticity and integrity of invoice data and effectively preventing invoice fraud and tax evasion. A sound legal and regulatory framework is the foundation and guarantee for tax collection and administration, and should draw on foreign experiences while being tailored to China's circumstances[14]. Tax laws and regulations should be updated and improved in a timely manner to clarify responsibilities and powers in tax collection and administration, and to standardize administrative procedures and enforcement behaviors. For example, Japan has established a relatively comprehensive tax legal system that makes detailed provisions for every link in tax collection and administration, providing strong support for law-based administration by tax authorities. Strengthening supervision and restraint over tax enforcement is an important measure to ensure fairness and justice in tax collection and administration. A sound enforcement supervision mechanism should be established, with both internal and external oversight, to prevent abuse of power and unjust enforcement. For instance, Germany's tax authorities have set up dedicated supervisory bodies to oversee the actions of tax enforcement officers throughout the process and to promptly correct and handle any identified issues. Tax collection and administration involve multiple departments, so enhancing collaboration and information sharing among departments is crucial. Successful practices in some domestic regions show that establishing cross-departmental collaboration mechanisms in tax collection and administration—achieving real-time information sharing and operational coordination among tax authorities, industry and commerce authorities, and banks—can effectively improve administration efficiency and close tax loopholes. For example, Shenzhen has built a multi-department joint tax administration information-sharing platform, enabling real-time sharing of enterprise registration, tax filing, and capital flow information, thus providing strong support for tax collection and administration. In the context of economic globalization, tax administration issues of multinational enterprises have become increasingly prominent. Strengthening international cooperation in tax collection and administration and jointly combating international tax avoidance is an inevitable requirement for safeguarding national tax rights and interests. China should actively participate in the formulation of international tax rules, strengthen cooperation with other countries and regions in tax collection and administration, and engage in tax information exchange and cross-border mutual assistance in tax administration. For example, the OECD's Base Erosion and Profit Shifting (BEPS) Action Plan provides an important framework and guidance for countries to strengthen international tax cooperation. The complexity and professionalism of tax collection and administration work demand that tax personnel possess solid professional knowledge and skills. Professional training for tax officials should be intensified to improve their tax business capabilities, information technology

application skills, and data analysis abilities. For instance, the Singapore Tax Academy offers systematic professional training courses in areas such as tax policy, administrative regulations, and information technology, continuously enhancing tax personnel's comprehensive quality. Tax officials should be encouraged to cultivate an innovative mindset and actively explore new administration methods and technological means. An innovation incentive mechanism can be established to recognize and reward units and individuals who have achieved outstanding results in tax collection and administration innovation, fostering a positive atmosphere for innovation. In summary, domestic and international tax collection and administration case studies provide China with abundant experiences and insights for innovating tax collection and administration models. China should combine these advanced practices with its national conditions and continuously advance innovation and improvement in tax collection and administration models to meet the new requirements of economic and social development, enhance the quality and efficiency of tax collection and administration, and provide strong support for stable growth of state fiscal revenue and healthy socioeconomic development.

7 CONCLUSION

This paper focuses on issues related to tax collection and administration models. Through in-depth research and analysis of tax collection and administration theory, current domestic and international models, and practical case studies, the following main research conclusions are drawn, while fully emphasizing the importance of innovating tax collection and administration models. Although traditional tax collection and administration models have played a role in long-term practice, their limitations have become increasingly apparent with rapid socioeconomic development. In terms of administrative methods, they have relied primarily on manual operations and exhibit low levels of informatization, resulting in low administrative efficiency and difficulty in handling massive tax data and complex business processes. For example, tax personnel must spend substantial time collecting, organizing, and reviewing paper documents, which not only increases workload but also easily leads to human errors. In terms of enforcement strength, the traditional model relies on ex-post inspections and spot checks, lacking real-time monitoring and dynamic management of taxpayer behavior, which causes a lag in tax collection and administration and makes it difficult to effectively prevent tax risks and combat tax evasion. Moreover, under the traditional model, information sharing between tax authorities and other departments is poor, creating information silos that prevent full integration of social resources for comprehensive tax governance, leading to higher administrative costs and suboptimal results. With the rapid advancement of information technology and the widespread application of emerging technologies such as big data and artificial intelligence, innovative tax collection and administration models have emerged. These innovative models place informatization at the core, establishing intelligent tax collection and administration systems that achieve automated collection, analysis, and processing of tax data, thereby greatly improving administrative efficiency. For example, big data analysis technology can be used to create precise profiles of taxpayers' operating conditions and tax records, promptly identifying potential tax risk points and providing strong support for precise supervision by tax authorities. Innovative models emphasize a taxpayer-centric approach, focusing on providing personalized and convenient tax services. By building online tax platforms, mobile tax terminals, and other diversified channels, taxpayers can handle various tax-related business anytime and anywhere, reducing both time and cost and increasing taxpayer satisfaction. In addition, innovative models promote information sharing and collaborative cooperation between tax authorities and other departments, optimizing the allocation of social resources and forming a powerful synergy for comprehensive tax governance. Through research on advanced international tax collection and administration models, we find that countries such as the United States and Australia have accumulated rich experiences in the informatization of tax collection and administration, risk management, and taxpayer services. For example, the United States has established a comprehensive tax information management system that achieves nationwide centralized management and sharing of tax data; Australia has adopted advanced risk management models to categorize and grade taxpayers for management, improving the utilization efficiency of administrative resources. Simultaneously, some domestic regions are actively exploring innovations in tax collection and administration models and have achieved significant results. For instance, Shanghai and Shenzhen have carried out intelligent tax construction, employing blockchain, artificial intelligence, and other technologies to enhance the intelligence level of tax collection and administration and optimize the business environment for taxation. These domestic and international innovative practices provide valuable references and experiences for China to comprehensively promote innovation in tax collection and administration models. Innovating tax collection and administration models is an inevitable requirement for adapting to new socioeconomic development contexts. With deeper economic globalization and the vigorous rise of the digital economy, enterprises' business models and transaction methods have become increasingly complex and diverse, and traditional tax collection and administration models can no longer meet administrative needs. Innovative tax collection and administration models can effectively respond to new challenges brought by economic development and ensure stable growth of tax revenue. Innovation in tax collection and administration models is a key measure to improve the efficiency and quality of tax collection and administration. By introducing advanced technological means and management concepts, innovative models can achieve automated, intelligent, and precise tax collection and administration, reduce manual intervention and errors, enhance administrative efficiency and quality, and lower administrative costs. Innovation in tax collection and administration models is an important pathway to optimize the business environment for taxation and improve taxpayer satisfaction. Innovative models, centered on taxpayers, provide more convenient, efficient, and personalized tax services, which enhance taxpayers' compliance and satisfaction and

foster harmonious tax administration–taxpayer relationships. Innovation in tax collection and administration models is an essential component of advancing the modernization of the national governance system and governance capacity. Taxation serves as the primary source of state fiscal revenue and an important tool of macroeconomic regulation; thus, innovating its collection and administration models is crucial for improving state governance capacity and achieving sustainable socioeconomic development. In conclusion, innovation in tax collection and administration models carries significant practical and far-reaching strategic importance. We should fully recognize the limitations of traditional models, actively learn from advanced domestic and international experiences, and accelerate the promotion of innovations in tax collection and administration models to adapt to new socioeconomic development contexts and requirements.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

REFERENCES

[1] Cheng Junfeng. Constructing Collaborative and Co-governance Smart Taxation: Practice and Exploration. Taxation Research, 2022(09): 38–42.
[2] Li Jialiang. Smart Taxation Helps Enterprises Accelerate the Digital Transformation of Tax Management. China Accounting News, 2022(014): 1–2.
[3] Liu Xiyou. New Governance: Institutional Construction and Future Development of the Digital Economy. Beijing: China Science and Technology Press, 2022, 03: 3–17.
[4] Sun Cunyi, Tan Ronghua. Brief Analysis of "Internet + Smart Taxation" Supported by Big Data. Taxation Research, 2018(04): 104–107.
[5] Zhang Jing. Deepening the Application of Digital Technology to Promote the Construction of Smart Taxation. Taxation Research, 2022(05): 128–130.
[6] Zhang Qing, Wang Qian. Constructing a New Ecosystem of Smart Taxation: Logical Starting Point, Basic Framework, and Key Links. Taxation Research, 2022(06): 51–56.
[7] Lucas Mas Cristian Óliver, Junquera Varela Raúl Félix. Tax Administration Issues of Taxing the Digital Economy. 2021: 73–84.
[8] Vernon Mukuwa, Jackson Phiri. The Effects of E-Services on Revenue Collection and Tax Compliance among SMEs in Developing Countries: A Case Study of Zambia. Open Journal of Social Sciences, 2020.
[9] Liang Xiaoqin. An Empirical Study on the Impact of Digital Inclusive Finance on Local Taxation. Auditing and Economics Research, 2020, 35(05): 96–104.
[10] Shi Yong. The Development and Future of the Digital Economy. Bulletin of Chinese Academy of Sciences, 2022, 37(1): 10.
[11] Ding Tianping. Research on the Innovation of Tax Collection and Management Models by Digital Transformation. The Chinese Certified Public Accountant, 2022, (12): 79–81.
[12] Chen Zhiyong, Wang Xirui, Liu Chang. Evolutionary Trends and Model Reconstruction of Tax Governance in the Digital Economy. Taxation Research, 2022(7): 57–63.
[13] Akbar Yusaf H, Tracogna Andrea. The digital economy and the growth dynamics of sharing platforms: A transaction cost economics assessment. Journal of Digital Economy, 2022, 1(3).
[14] González Aguirre Jazmín, Del Villar Alberto. Effect of the Complexity of the Customs Tax System on the Tax Effort. Economies, 2022, 10(3).