TAX COLLECTION MANAGEMENT STRATEGY BASED ON

BLOCKCHAIN TECHNOLOGY

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MASTER OF SCIENCE

IN DIGITAL INNOVATION AND FINANCIAL TECHNOLOGY

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AN INDEPENDENT STUDY SUBMITTED TO CHIANG MAI UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN DIGITAL INNOVATION AND FINANCIAL TECHNOLOGY

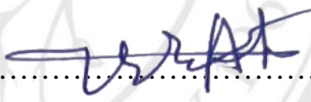**GRADUATE SCHOOL, CHIANG MAI UNIVERSITY**
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For my supervisors and Mentors who were the guiding light
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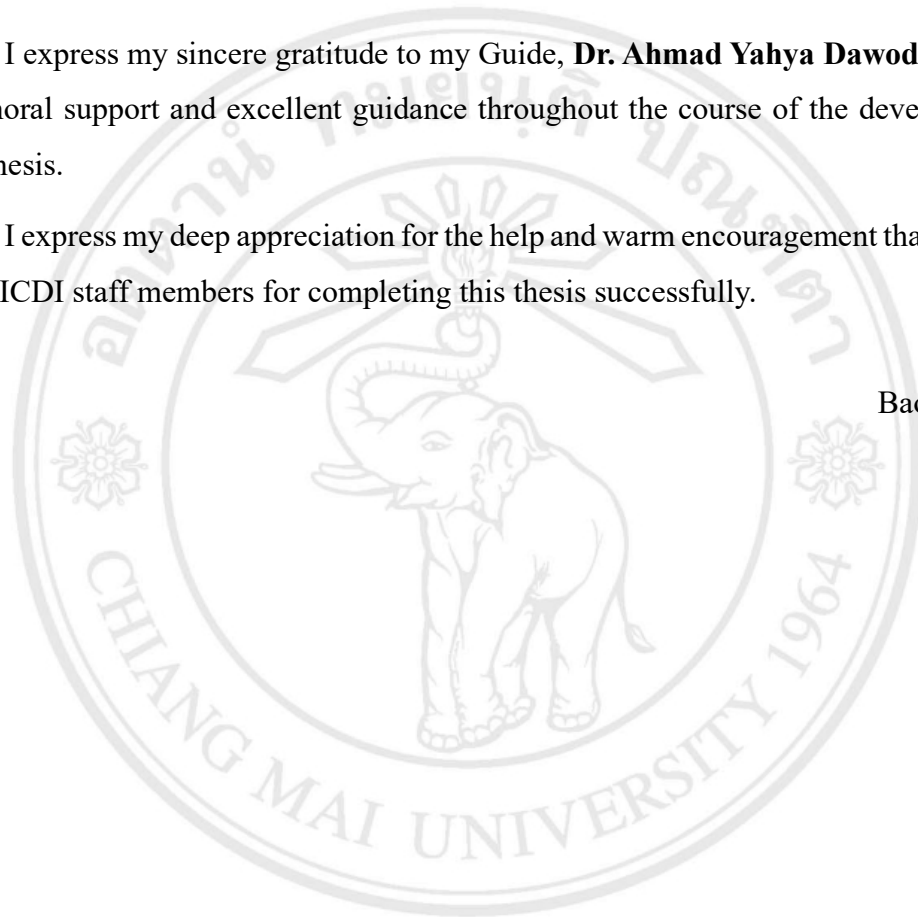
หัวข้อการค้นคว้าอิสระ	กลยุทธการจัดการกลุ่มภาษีด้วยเทคโนโลยีบล็อกเชน
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บทคัดย่อ

ในปัจจุบัน ด้วยการส่งเสริมการดำเนินการ "อินเทอร์เน็ต + ภาษี" ของจีนอย่างต่อเนื่อง ใบแจ้ง
หนี้อิเล็กทรอนิกส์จึงได้รับความนิยมมากขึ้นเรื่อยๆ เมื่อเปรียบเทียบกับใบแจ้งหนี้กระดาษ การใช้ใบ
แจ้งหนี้อิเล็กทรอนิกส์สามารถช่วยลดต้นทุนการดำเนินงานของผู้เสียภาษี ปรับปรุงระดับการจัดเก็บ
ภาษีและการจัดการของหน่วยงานของรัฐ และสร้างสังคมคาร์บอนต่ำและเป็นมิตรกับสิ่งแวดล้อมซึ่ง
ใช้ทรัพยากรมาก ด้วยการสนับสนุนนโยบายระดับชาติและการปรับปรุงสภาพแวดล้อมเทคโนโลยี
เครือข่ายอย่างต่อเนื่อง การส่งเสริมใบแจ้งหนี้อิเล็กทรอนิกส์อย่างครอบคลุมจึงเป็นแนวโน้มที่
หลีกเลี่ยงไม่ได้ของการพัฒนาสังคมสารสนเทศ แต่ในเวลาเดียวกันก็มีปัญหาบางอย่างในการใช้งาน
จริงของใบแจ้งหนี้อิเล็กทรอนิกส์ โดยเฉพาะอย่างยิ่งการชำระคืนซ้ำ ปัญหาทางบัญชี การเก็บรักษาที่
เชื่อถือได้ และปัญหาอื่นๆ ในปัจจุบันปัญหาเหล่านี้ส่วนใหญ่ได้รับการแก้ไขด้วยวิธีการจัดการเสริม
ซึ่งไม่สามารถขจัดปัญหาดังกล่าวโดยวิธีได้ ในปัจจุบันวิธีการและเทคโนโลยีในการจัดการใบกำกับ
ภาษีค่อนข้างล้าสมัย จังหวัดและเมืองส่วนใหญ่ยังคงใช้การกรอกด้วยมือที่วุ่นวายและเทคโนโลยี
ต่อต้านการปลอมแปลงทางกายภาพ ซึ่งเพิ่มความยากลำบากในการควบคุมของหน่วยงานด้านภาษี
และอาชญากรที่ปลอมแปลงใบแจ้งหนี้และใช้ใบแจ้งหนี้อย่างไม่เหมาะสมเป็นโอกาสสำหรับ
หน่วยงานด้านภาษีของประเทศในการปรับปรุงคุณภาพการจัดเก็บและตรวจสอบภาษี แพลตฟอร์ม
คลาวด์ใบแจ้งหนี้อิเล็กทรอนิกส์ที่ใช้บล็อกเชน หมายถึงการรวมกันของเฟรมเวิร์กบล็อกเชนและ
คลาวด์คอมพิวติ้งเพื่อสร้างแพลตฟอร์มคลาวด์ใบแจ้งหนี้อิเล็กทรอนิกส์แบบกระจายบล็อกเชน ซึ่ง
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เพื่อให้รัฐบาล วิสาหกิจ และบุคคลสามารถแบ่งปันผลประโยชน์ของใบแจ้งหนี้อิเล็กทรอนิกส์ ตระหนักถึงการพัฒนาศักยภาพระบบนิเวศของใบแจ้งหนี้อิเล็กทรอนิกส์ทั้งหมด งานวิจัยนี้จะกล่าวถึง ศักยภาพของเทคโนโลยีบล็อกเชนในการปรับปรุงกลยุทธ์การจัดการการจัดเก็บภาษีที่มีอยู่โดยการ จัดหาระบบที่ปลอดภัยและโปร่งใส นอกจากนี้ ยังจะจัดการกับความท้าทายและช่องว่างในการใช้ เทคโนโลยีบล็อกเชนในกระบวนการจัดเก็บภาษี นอกจากนี้ งานวิจัยนี้จะเสนอกลยุทธ์การจัดการการ จัดเก็บภาษีแบบใหม่โดยใช้เทคโนโลยีบล็อกเชน ซึ่งรัฐบาลสามารถนำไปใช้เพื่อปรับปรุง ประสิทธิภาพและความปลอดภัยของกระบวนการจัดเก็บภาษีของตน สุดท้ายนี้ การศึกษานี้จะแนะนำ มาตรการบางอย่างที่สามารถดำเนินการได้เพื่อให้แน่ใจว่าการดำเนินการตามกลยุทธ์ใหม่จะประสบ ความสำเร็จ

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ABSTRACT

Continuous promotion of China's "Internet + tax" action, electronic invoice is becoming more and more popular. this research will propose a new tax collection management strategy based on blockchain technology, which can be adopted by governments to improve the efficiency and security of their tax collection processes. Compared with paper invoices, the use of electronic invoices can help reduce the operating cost of taxpayers, improve the level of tax collection and management of government departments, and build a low-carbon and environmentally friendly resource-intensive society. With the support of national policies and the continuous improvement of the network technology environment, the comprehensive promotion of electronic invoices is the inevitable trend of the development of information society. There are a few problems in the practical use of electronic invoices, especially repeated reimbursement, accounting difficulties, reliable preservation, and other problems. At present, these problems are mainly solved by auxiliary management means, which cannot fundamentally eliminate the occurrence of such problems. The means and technology of tax invoice management are relatively backward. Most provinces and cities still adopt complex manual filling and physical anti-counterfeiting technology, which increases the difficulty of tax authorities' control. And the criminals who forge invoices and improperly use invoices provide an opportunity for the national tax authorities to improve the quality of tax collection and monitoring. An electronic invoice cloud platform based on blockchain refers to the combination of blockchain framework and cloud computing to build a distributed electronic invoice cloud platform. Blockchain, the underlying

technology of Bitcoin, is a natural fit with electronic invoices, which have the attributes of both electronic vouchers and digital assets. Blockchain solves the problem of electronic invoice security and repeated reimbursement. By developing the e-invoice cloud platform, the issuing, circulation, storage, and reimbursement of e-invoices can be realized. By using e-invoices for various service platforms, the e-invoices between self-built platforms, third-party platforms, and self-built platforms can be realized, as well as the data exchange between third-party platforms, the e-invoice chain can be built to realize the government, enterprises, and individuals can share the dividend of an electronic invoice, realize the healthy development of the whole electronic invoice ecology. This research will discuss the potential of blockchain technology to improve the existing tax collection management strategies by providing a secure and transparent system. It will also address the challenges and gaps in implementing blockchain technology in the tax collection process. Finally, this study will suggest some measures that can be taken to ensure the successful implementation of the new strategy.

Keywords: Blockchain technology; Tax bureau invoice management; Internal control

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LIST OF ABBREVIATION

E-invoice	Electronic invoice
A	Tax department
B	Social Security Department
C	Other agencies
D	Payment agency
E	Enterprise
F	Employee
G	Smart contract
INATBA	International Association for Trusted Blockchain Application
P2P	Peer to Peer
B2B	Business to Business
DES	Data Encryption Standard
ECDS	Electron Capture Detector
VAT	Value-added Tax
APP	Application
ITIL	Information Technology Infrastructure Library
API	Application Programming Interface
GDP	Gross Domestic Product
SOA	Service-oriented Architecture
JD	Job Description
ODS	Operational Data Store
EDM	Email Direct Marketing

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Electronic invoices were created with the onset of the information age, mostly to meet the business requirements of e-commerce. JD.com released the first electronic invoice in China in May 2013, and the Beijing Municipal Bureau of Internal Revenue started accepting them in June 2014. Since then, our nation has started to enter the electronic invoice era. An E-invoice, like a traditional invoice, is issued by the tax bureau for the use of businesses, its invoice number is by the tax department to formulate a unified distribution, and use a unified encryption and signature mechanism to provide users. Generally speaking, its legal effect, basic use, use regulations, and so on are the same as the traditional paper invoices supervised by the tax authorities. From the birth of e-invoice, its convenience, high efficiency, ease of query, and low-carbon environmental advantages are gradually recognized by businesses and consumers, increasing usage rate [1].

The idea of "Internet tax" has made the electronic invoice a necessary component of the new electronic tax eco-system. E-invoice usage reduces costs, conserves resources, and boosts effectiveness. For the tax department, an electronic invoice is also more conducive to the information of tax collection and administration, reducing management costs. Therefore, the country has been vigorously promoting electronic invoices, especially since December 1, 2015, the country began to implement value-added tax electronic invoices, it can be said that the era of electronic invoices has come [2].

However, the large-scale application of electronic invoices inevitably has some problems, which is mainly caused by the electronic invoice can be completely copied, therefore, the problems of data consistency, repeated reimbursement, and reliable preservation of electronic invoices are caused. At present, the expedient measure is to solve it by employing auxiliary management means, but it cannot be eliminated, which

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to some extent has affected the promotion of electronic invoices, and has also affected the process of tax informatization in our country, so it is urgent to solve these problems [3].

The application of e-invoice mainly depends on various e-invoice service platforms, the main difficulties in the application of e-invoice data flow and enterprise management. At present, there are many e-invoice service platforms and many self-built platforms in China, and the data between the service platforms have not yet been connected and shared, which leads to the difficulties of e-invoice data flow, application, and mutual trust, in the aspect of Enterprise Management, e-invoice has to be reimbursed, recorded and archived by printing version, which brings confusion to management in the application of file copy, repeated printing, and multiple reimbursements. Therefore, how to solve the current electronic invoice application of these problems have a very practical significance [4]. The blockchain, which is at the heart of bitcoin, has drawn more and more attention as the digital currency has grown in popularity. The main advantage of blockchain technology is decentralization, which enables decentralized peer-to-peer transactions and collaboration based on public-key cryptography, timestamps, P2P networks, distributed storage, consensus, and incentives, in addition, the former electronic invoice management system has the problems of over-centralization, over-load, and low efficiency, so the blockchain technology provides a new way to solve these problems. It is hoped that the combination of blockchain technology and the e-invoice service platform can solve the problems in the practical use of e-invoices [5]. The goal of this research is to explore how blockchain technology can be used to develop a tax collection management strategy. We will first discuss the features of blockchain technology, including its distributed ledger system, smart contracts, and privacy features. We will then analyze how these features can be used to create a secure and efficient tax collection system. We'll examine how blockchain technology can be used to track and monitor activities, manage tax payments, and lower the expenses related to tax collection. In order to increase overall efficiency and security, we will explain how this method might be implemented in conjunction with current tax collection systems.

1.2 Problem Statement

The current tax collection management strategies adopted by governments around the world are outdated and inefficient. Tax collection processes are often plagued with a lack of transparency and corruption [6]. The use of blockchain technology can provide a secure and transparent solution to the existing tax collection management strategies. The difficulty of research on blockchain technology for tax collection management strategy lies in the fact that there is a lack of existing research on this topic [7]. As blockchain technology is still relatively new and is often used for financial transactions and payments, there is not a lot of research done on how it can be used for tax collection management [8]. Additionally, it is difficult to predict the exact potential applications of blockchain technology for tax collection management or its effectiveness in this area [9]. Furthermore, this paper requires an in-depth understanding of the technology and its implications for the tax collection process. Finally, it is also necessary to consider the implications of blockchain technology for governments, businesses, and individuals in terms of taxation. The implementation of an online tax collection and administration system presents some challenges. For example, governments must ensure that the system is secure and that individuals' and businesses' data is protected from unauthorized access. Additionally, governments must ensure that the system is accessible and user-friendly for taxpayers. Furthermore, governments must ensure that the system is able to keep up with technological advancements and changes in regulations [10].

1.3 Research Objective and Significance

By building the electronic invoice cloud platform based on blockchain technology, we can make full use of the characteristics of blockchain decentralization, consensus algorithm, and distributed broadcasting. This will be helpful to solve the pain point of e-invoice Application Ecology: first, the distributed storage based on the blockchain network is realized by using the decentralized characteristics of blockchain technology, through the common encryption and algorithm of the vast number of nodes to ensure the trusted flow of data, consistency, and tamper-proof; The second is to use the public account book jointly maintained by all nodes to solve the problems of double reimbursements, double entries, and data inconsistency in electronic invoices, and the

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third is that electronic invoices involve invoices, invoices, and consumers, it can avoid the inconsistency of electronic invoice data, prevent data tampering, and improve the accuracy and efficiency of data [11].

Based on the research of e-invoice, cloud computing, and blockchain, this paper proposes a feasible scheme for building an e-invoice cloud platform based on blockchain, and describes the application flow of the platform in detail, and then the main problems may appear in a more systematic explanation, hoping to provide a new idea for the overall promotion of electronic invoice in our country [12]. After the large-scale centralized collection and management of data, the informatization degree has been greatly improved, and the advanced idea of digital management tax has been carried out in every link of tax collection and management. This paper makes use of modern information technology to combine the management of the invoice with the network, so as to standardize the operation, simplify the steps of execution, reduce the cost of use and maintenance, and control the operation under low risk, in order to realize the innovation mode of the management of the network invoice, and to further promote the information construction of the tax system, the optimization design and research of the network invoice system of the tax bureau are carried out, improve the existing tax collection and management system of digital management and tax application level, comprehensively promote the new reform of tax invoice network. As an important part of the reform of the fiscal and taxation system, e-invoice received great attention when it was carried out, since 24 December 2015, the General Office of the Communist Party of China and State Council General Office issued the "Plan for deepening the reform of the system for the collection and administration of state and local taxes" requiring the full implementation of e-invoices, however, in practice, there are some problems [10] in the promotion of electronic invoices, such as the unclear legal effect of electronic invoice and the lack of unified platform, etc.

Based on the analysis of theory and practice, this paper analyzes the problems of electronic invoice and puts forward some practical optimization measures; To propose solutions for integrating blockchain technology into existing tax collection management systems; To develop a strategy for implementing blockchain technology in tax collection management; To provide an overview of the current state of tax collection management and the challenges faced by tax authorities; To identify and analyze potential risks

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associated with using blockchain technology for tax collection management; To discuss the potential of blockchain technology as a tool to address the challenges associated with tax collection management; To provide a comprehensive review of existing blockchain-based solutions for tax collection management.

1.4 Research Questions

The research questions in this thesis are as follows: How does blockchain technology enable the sharing of data between government agencies and other organizations for tax collection; How does blockchain technology make tax collection management more efficient and secure; How can the implementation of blockchain technology help to improve tax compliance; How can blockchain technology be used to reduce the costs associated with tax collection management; How the challenges exist in the implementation of a blockchain-based tax collection management system; How do apply types of data can be stored on a blockchain-based tax collection management system?

1.5 Research Contents

Through the establishment of a game model, the problems existing in tax management in 2019, 2020, and 2021 will be mined, and the reasons will be analyzed, so as to adopt the framework of blockchain + tax collection and management system based on the blockchain system architecture The design enables the tax collection problem to be solved.

1.6 Research Methods

In the research process, this paper takes "theoretical overview-status elaboration-proposing problems-analyzing problems-solving problems" as the research idea, and mainly adopts the methods of literature research, empirical research, and comparative analysis. Blockchain technology can be used to develop a tax collection management strategy to improve the accuracy, security, and efficiency of tax collection. By leveraging the power of distributed ledger technology, this strategy would reduce the amount of

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paperwork, increase the accuracy and security of tax collection, and reduce the amount of time and effort required for tax collection.[14] Additionally, this strategy would provide an immutable record of all transactions and make it easier to track and audit payments. Finally, the use of blockchain technology would also reduce the cost of tax collection, since it would eliminate the need for third-party intermediaries, such as banks or payment processors.

1.6.1 Literature Research Method

By reading a large number of relevant books, journals, and papers at home and abroad, collecting government work reports, documents, and internal documents of the tax system related to this research, sorting out the relevant theoretical framework, and maximizing the understanding of the theoretical research on tax collection and management under the background of big data Based on the current situation, draw on advanced experience, and prepare a sufficient and accurate data basis for the research on perfect tax management under the background of big data.

1.6.2 Empirical Research Method

The third chapter of this thesis summarizes the possible problems of tax collection and administration in theory by establishing a game theory model by means of empirical research.

1.6.3 Comparative Analysis Method

This work uses the comparative analysis method to compare the traditional tax credit management process with the tax credit management method using blockchain technology, and further explores the compatibility of applying the sovereign blockchain technology to tax management, in order to further optimize the tax management evaluation work. and application system construction to provide a reference basis.

1.7 Conceptual Framework
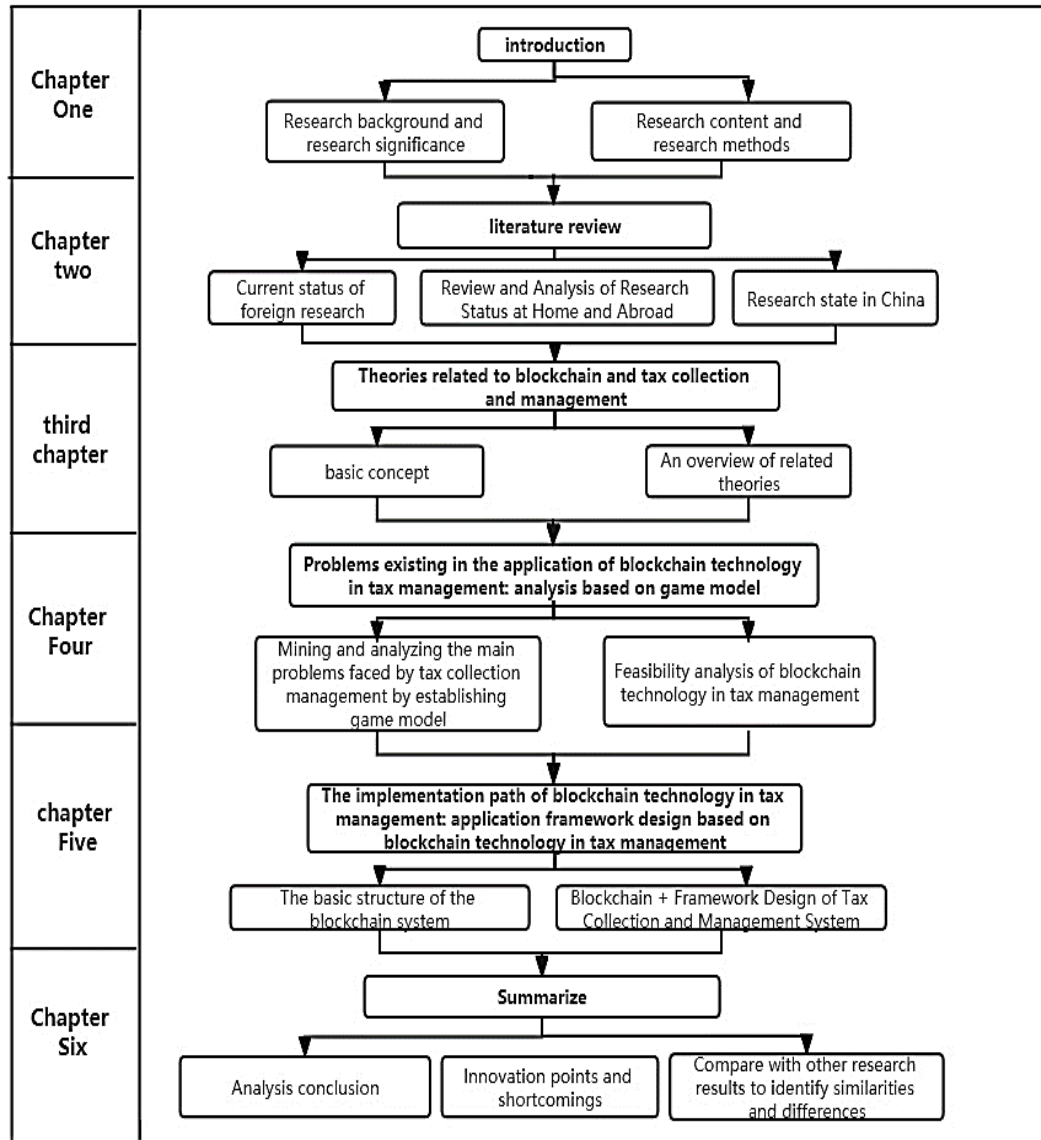
Figure 1.1 Conceptual Framework

1.8 Thesis Outline

According to Figure 1.1: Conceptual Framework. This thesis is mainly divided into six chapters. The specific research framework is as follows:

Chapter One Introduction and describes the research context and significance of the study then elaborates on the primary research topics and research methodologies.

The second chapter is a literature review. This chapter introduces the relevant research experience at home and abroad, sorts out the relevant literature gives an analysis of the research experience at home, and abroad, and points out that there is a long way to go for the management of tax collection and management based on blockchain technology.

The third chapter expounds on the theory of blockchain and tax collection management. This part first explains the related concepts of taxation, taxation management, blockchain, taxation, and blockchain; then it introduces taxation management theory, tax compliance theory, information asymmetry theory, and other related theories of taxation management and blockchain. This chapter provides the theoretical basis for the follow-up research of the thesis.

The fourth chapter explores and analyzes the main problems faced by tax collection and management by establishing a game model. And conduct a feasibility analysis of blockchain technology in tax management.

The fifth chapter designs the framework of the blockchain + tax collection and management system based on the blockchain system architecture, applies it to the problems found in the tax collection and management, and gives solutions.

The sixth chapter analyzes the research conclusions and research defects of this paper, and points out the innovations and shortcomings of this paper. And compare the research results of related scholars at home and abroad in this field to find out the similarities and differences.

CHAPTER 2

LITERATURE REVIEW

2.1 Foreign Research

(1) "Internet + tax collection and administration

Under the current social background, tax collection, and administration have gradually changed to the direction of information tax management, and tax collection and administration work is carried out by mastering relevant tax-related information through big data. The developed national tax administrations mainly study how to apply the Internet, big data, and other technologies into practice, apply electronic taxation to the overall management and service, promote information tax management, and improve the efficiency of tax collection and administration. In Japan, for example, the government in 2008 required the use of various e-tax services, such as e-tax filing and payment verification, to reach about 65 percent by 2013.

Wang M [5] has proposed using Internet technology as support to promote the implementation of tax information exchange and ensure data security.

Zang A [6] proposed that big data technology could provide technical support for public services and government decision-making, so as to improve the overall efficiency of tax administration under the background of the Internet. However, it should be noted that more scientific and accurate methods and technologies should be adopted to further improve tax-related information sharing.

Yan K [7] believes that current tax collection and administration should use big data analysis to control tax evasion, and they developed a regression model that can use big data information to detect and analyze tax evasion.

Xi-fan AI [8] believes that the current society is in the information age, and based on the continuous development of Internet technology, the online platform of tax collection and management makes people more convenient for people to pay taxes.

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Uhunoma G [9] believes that Internet + technology can be applied in the European VAT system, which will prevent some underground black-market transactions from being hidden, thus increasing the transparency of transaction information. For the research on transfer pricing and payroll tax, relevant tax payments can be deducted automatically through the smart contract and other functions of blockchain technology, which reduces the cost of tax compliance and thus achieves the purpose of improving tax compliance.

(2) Blockchain and tax collection

In terms of foreign studies, Gong Y L et al. [10] have pointed out that blockchain technology will become a general-purpose technology and form vivid practice in the tax field in a way of exponential growth, digital progress, and combinatorial innovation. Cai C [11] points out that blockchain can provide reliable real-time tax information, especially at the international level. On the one hand, it changes the relationship between taxpayers and tax authorities, and on the other hand, it changes the way tax information is registered, submitted, and stored. Based on blockchain technology, Chen J et al. [5] innovatively proposed the idea of a value-added tax coin, a government-issued cryptocurrency, and the creation of a value-added tax electronic invoice system. Bitjoka G B et al. [12], through the study of beneficial owner registration, transfer pricing, and payroll tax, believe that the automatic execution of blockchain technology, decentralized control of data and other functions can significantly reduce transaction costs, and effectively reduce tax compliance costs, providing a solution for improving the quality and efficiency of tax administration. Dona J [13] believes that the application of blockchain technology in the tax field will provide more possibilities for the formation of a new unified global tax collection mechanism. Deloitte identified blockchain technology practices such as increasing tax compliance, imposing VAT and payroll taxes, enabling transfer pricing adjustments, and combating tax fraud as key global concerns.

Zheng-Xun J [14] puts forward a proposal to optimize the participatory budget path by using blockchain taxation technology, thus improving tax transparency. In April 2019, the European Union officially launched the International Association for Trusted Blockchain Applications (INATBA). In March 2020, the European Union launched the Trusted Blockchain Application Association, which aims to support blockchain interoperability, develop industry norms, and optimize rent regulation and standard

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convergence. In April 2019, the European Union officially launched the International Association for Trusted Blockchain Applications (INATBA). In March 2020, the European Union launched the Trusted Blockchain Application Association, which aims to support blockchain interoperability, develop industry norms, and optimize rent regulation and standard convergence. Voas J [15] looks forward to the good development prospect of blockchain in the tax field and believes that blockchain will change the traditional processing methods of payroll tax and value-added tax. Invoices will no longer exist, auditing will no longer be necessary, and manual intervention will be replaced by automated mode.

2.2 Domestic Research

(1) "Internet + tax collection and administration

The impact of the Internet on tax administration and collection will be looked at in the literature study for this article. The tools, techniques, and technology that tax authorities around the world employ to take advantage of the Internet for tax administration and collection will be the main emphasis of this assessment. Also, it will look at the advantages and disadvantages of using the internet for tax administration and collection, as well as how the Internet affects taxpayer behavior Wang, J [16].

The review will start by discussing the different strategies and tools used by tax authorities to leverage the Internet for tax collection and administration. This includes the use of e-filing, e-payment, and e-auditing systems, as well as the use of social media to improve taxpayer compliance and collect data [17]. It will also discuss the challenges associated with the use of the Internet for tax collection and administration, such as the lack of taxpayer education and the need to ensure the security of sensitive taxpayer data.

The existing foreign research literature on "Internet Plus" mostly focuses on the impact of big data, and the number is small. The reason may be that the research object and context are different, because "Internet Plus" is a national development strategy with Chinese characteristics. Yu Bo [18] pointed out that the development of Internet finance in China is relatively short, but the development momentum is rapid, and it has penetrated all walks of life. Internet financial business activities are divided into Internet financing

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business, third-party payment business, and Internet financial management business. Take the Internet financing business as an example. Due to its rapid development, some Internet financial platforms are not standardized, and their business scope is illegal, resulting in losses for many investors. The country has been cracking down on Internet finance platforms, especially P2P lending platforms. After the concentrated outbreak of platform risks from the second half of 2015 to 2016, the supervision of online lending platforms has been tightened, and online lending platforms are required to make compliance arrangements and pass the compliance filing on June 30, 2018, otherwise, they will not continue to operate. As a tool of economic operation supervision, taxation plays a supervisory and administrative role in the operation and internal operation of market economy subjects. Taking a P2P lending platform as an example, this paper analyzes the problems of tax collection and management in its operation, and puts forward suggestions on these problems. Li Xiangnan [19] pointed out that with the rapid development of information technology, China has stepped into the Internet information age, which has exerted a far-reaching influence on China's financial industry and promoted the birth of Internet finance in China. Taking Internet finance tax collection and administration as the object of analysis, this paper introduces the current situation of Internet finance tax collection and administration, expounds on the existing problems in Internet finance tax collection and administration, and discusses the suggestions to improve Internet finance tax collection and administration, so as to better do the work of Internet finance tax collection and administration.

(2) Blockchain and tax collection

Tan Jiayi [20] points out that tax collection and administration has always been faced with problems such as subject limitation, false violence, information risk, and high cost. Blockchain technology has the characteristics of traceability, smart contract, and so on. Its application in the tax field will help to broaden the scope of tax subjects, innovate the way of data tax management, strengthen tax risk identification, and build a tax credit system, so as to solve the problems of tax collection and management.

Zhu Shurui [21] pointed out that distributed ledger of blockchain, decentralization, incapability and automatic execution of smart contracts can solve many problems in tax collection and management and further improve the modernization of tax collection and

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management. At present, the application scenarios of blockchain in tax collection and management are gradually increasing in our country. However, as a new technology, blockchain still has many defects in the integration of law, and the behaviors of both parties need to be regulated.

CAI Chang [22] pointed out that Based on the compatibility of blockchain technology and tax collection and administration activities, the practical application of blockchain technology in tax collection and administration is investigated, and a new tax collection and administration system is constructed. Through the integrated application of the basic data module, VAT management module, enterprise income tax management module, and tax macro-control module, the technological advantages of blockchain are played to promote the construction and mode innovation of tax collection and administration system.

Zhang Wei [23] pointed out that inaccurate existing data of tax authorities, unreliable taxpayer declaration information, and opaque tax information sharing are bottlenecks restricting the modernization of China's tax collection and administration. From the technical level, blockchain technology has the characteristics of decentralization, untampered information, and complete traceability of the whole process, which can effectively solve the asymmetry of tax information, and is in line with the collection and management requirements of tax modernization from the macro and micro perspectives. From the perspective of application strategy, only when the essence of blockchain technology is fully understood and rooted in sovereignty control and legal regulations, can blockchain technology effectively serve China's tax modernization.

Cheng Hui [24] pointed out that the emergence of blockchain as an emerging Internet technology not only puts forward new requirements for the modernization of tax administration but also provides great application value for the continuous deepening of "Internet + tax". Further improving and enhancing modern tax collection and management ability provides a new opportunity, through the construction of distributed ledger, completely break the situation of tax information asymmetry on both sides, effectively eliminate tax evasion, solve the bottleneck of collection and management, reduce the rate of tax loss and a series of roles, to provide a technical basis for tax collection and management. The author analyzes the impact of blockchain technology on tax collection and administration, and puts forward the application and innovation path of blockchain in the development of tax

collection and administration. [25] The use of the Internet for tax administration and collection will increase in 2022 as governments work to improve the effectiveness and efficiency of their tax systems. The application of advanced analytics, data mining, and artificial intelligence is likely to lead to a rise in the sophistication of digital tax collection and administration systems. It's also conceivable that the application of blockchain technology in tax administration and collection will be investigated. As more individuals use their smartphones to access government services, mobile applications will also remain a crucial component of tax administration and collection. Finally, as governments work to strengthen the security of their tax data, the use of digital identity systems.

2.3 Analysis of research status at home and abroad

After analyzing the relevant literature, it is found that the relevant research on "Internet +" tax collection and management mainly focuses on electronic invoices, tax risk management, tax compliance, and tax informatization applications. The significance and realization path of service, or the analysis of how enterprises conduct tax risk management under the background of "Internet +", the research on "Internet +" tax collection and management mainly focus on the theoretical aspect Hacioglu, U.

Through the reading and analysis of the above literature, it is not difficult to find that imperfect information management is one of the important problems to be solved urgently in tax collection and management, and the security of the system and the confidentiality of data are extremely important in the process of promoting tax informatization. Blockchain technology offers new avenues for this. At present, there are domestic research on the application of blockchain in the taxation field compared with other fields [26]. Mainly because the blockchain, as an information technology that has just emerged in recent years, is not yet mature, and the blockchain originated from Bitcoin, so its applications are mostly concentrated in the financial industry, and the application research of blockchain in academia Most are also aimed at the financial sector. However, judging from the recent development trend, the application of blockchain technology in the field of taxation has gradually become a hot research topic in academia. However, at present, the research on blockchain technology in the taxation field in my country is still in its infancy, and it mainly focuses on the value research of blockchain.

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CHAPTER 3

THEORIES RELATED TO BLOCKCHAIN AND TAX COLLECTION AND MANAGEMENT

3.1 Concept of Blockchain Technology

Blockchain is a new application mode of computer technology such as distributed data storage, point-to-point transmission, consensus mechanism, and encryption algorithm [27]. The Blockchain, an important concept of Bitcoin, is essentially a decentralized database, and as the underlying technology of Bitcoin, a series of blocks of data that are related using cryptographic methods, each block contains a batch of Bitcoin network transactions to verify the validity of the information (anti-counterfeiting) and generate the next block [28]. The original Bitcoin white paper did not use the word blockchain, but the chain of blocks. In the original Chinese translation of the Bitcoin white paper, a chain of blocks was translated. This is the earliest appearance of the Chinese word "Blockchain"[29].

Blockchain technology is a new distributed infrastructure and computing paradigm that verifies and stores data in a chained data structure, ensures secure data transmission and access in a cryptographic manner, and programs and manipulates data with smart contracts (consisting of automated scripting code). Based on the above technical principles, blockchain technology has the following features, as shown in Table 3.1.

Table 3.1 Overview of Blockchain Technology

Feature	Description
Immutability	All transactions are cryptographically secured and are immutable, meaning they cannot be modified or reversed.
Decentralization	The system is decentralized, meaning there is no single authority that controls the network
Transparency	All transactions are visible to everyone on the network and cannot be hidden or tampered with
Security	Blockchain technology provides a high level of security, as it is resistant to tampering or hacking

Generally speaking, the main technical architecture of a blockchain system consists of six layers: data layer, network layer, consensus layer, incentive layer, contract layer, and application layer, as shown in Figure 3.1.
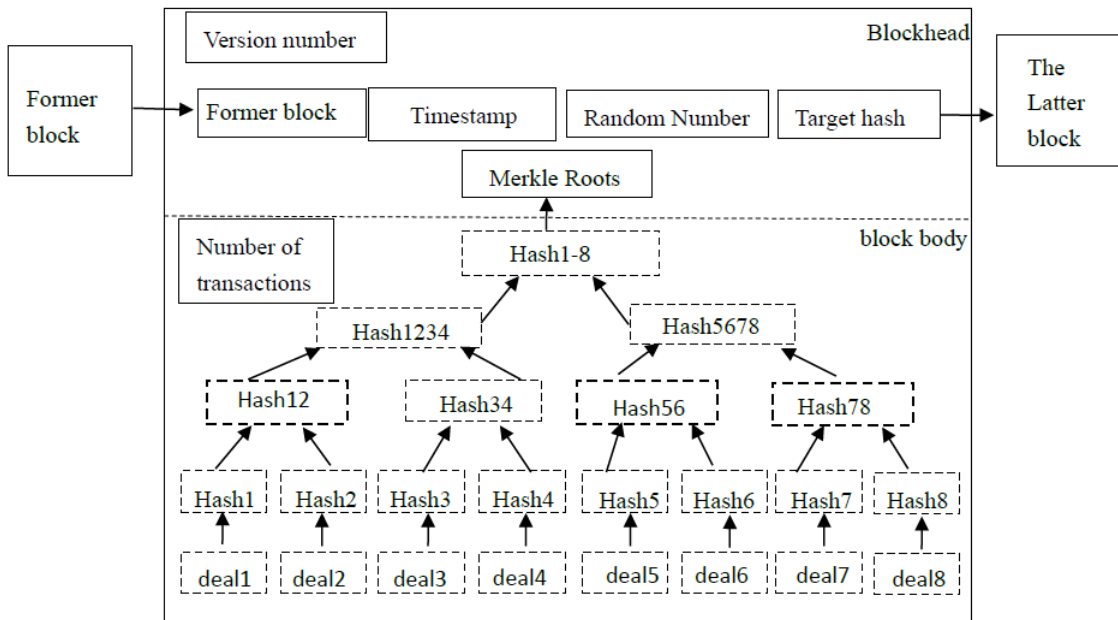
Figure 3.1 Structure map of Blockchain

Block diagram The state Internet Information Office issued the regulations on the management of blockchain information services on 10 January 2019, which came into effect on 15 February 2019 [30]. In a narrow sense, blockchain is a kind of distributed account which cannot be tampered with or forged by cryptography and is composed of data blocks in chronological order. Broadly speaking, the technology of blockchain is a new distributed infrastructure and computing method, which uses blockchain data structure to verify and store data, uses distributed node consensus algorithm to generate and update data, uses cryptography to ensure the security of data transmission and access, and uses intelligent contract composed of automatic script code to program and operate data.

3.1.1 Categories of Blockchain

Blockchains are currently divided into three categories, in which hybrid blockchains and private blockchains can be considered generalized private chains:

(1) Public blockchains mean that any individual or group in the world can send transactions, And the transaction can obtain the effective confirmation of the blockchain, and anyone can participate in the consensus process. The public blockchain is the earliest and the most widely used. All the bitcoins are based on the public blockchain. There is only one blockchain in the world.

(2) Consortium blockchains: Within a group, several pre-selected nodes are designated as bookkeepers, and the generation of each block is determined by all pre-selected nodes (pre-selected nodes participate in the consensus process), other access nodes can participate in the transaction, but regardless of the accounting process (essentially still managed accounting, only to become distributed accounting, a pre-selected number of nodes, how to determine each block of bookkeepers become the main risk point of the blockchain), anyone else can make qualified queries through the blockchain's open API.

(3) Private blockchains: only the blockchain ledger technology is used for bookkeeping, which can be either a company or an individual with exclusive write access to the blockchain, this chain is not much different from other distributed storage schemes. At present (Dec 2015) conservative giants (traditional finance) are trying to experiment with a private blockchain, while public-chain applications such as Bitcoin have been industrialized and private-chain applications are still being explored [31].

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3.2 Encryption Technology

3.2.1 The Development of Cryptography

Cryptography is concerned with the confidential transmission of information. It is an ancient subject. At the same time, as an important branch of information security, it is a very dynamic research field at present. The origins of cryptography can be traced back to ancient Greece, when the "Spartan code stick" was the earliest device for encrypting and decrypting information. Until 1949, cryptography was confined to military and diplomatic communications. In 1949, Shannon published Communication Theory of Secrecy Systems, which comprehensively elaborated digital information secrecy from the point of view of information theory, and then cryptography was upgraded to a discipline with a theoretical basis. Modern cryptography began with the publication of new directions in cryptography by Diffie and Hellman in 1976 and the release of the DES encryption standard in 1977 [32]. In recent years, with the continuous improvement of various integrated circuit equipment and Internet infrastructure, coupled with the continuous development of cryptography theory, cryptography has entered a new era of the explosion, related research results continue to emerge, and both theory and application have been widely involved in mathematics, computer, communication, and other interdisciplinary disciplines.

Cryptography can be divided into cryptography and cryptanalysis. Cryptography mainly studies how to design new encryption algorithms for secure communication, including protecting its confidentiality, authentication, integrity, etc. Cryptanalysis, on the contrary, attacks the defects of the existing cryptosystem by means of cryptanalysis and proposes a cracking method so that the attacker can crack the ciphertext even when the attacker does not have the key.

Figure 3.2 shows a secure communication model. The plaintext is the unencrypted original data, the ciphertext is the encrypted data, and the key-shaped symbol in the figure is the key used for encryption or decryption. There are three parties: sender, receiver, and attacker. The sender encrypts the original plaintext data using the encryption key and sends it to the receiver. After receiving the ciphertext data, the receiver uses the resolution key to decrypt the plaintext data. The encrypted ciphertext data is transmitted in the open channel. During the transmission, the attacker may steal and intercept the encrypted ciphertext data and carry out attacks through cryptanalysis.

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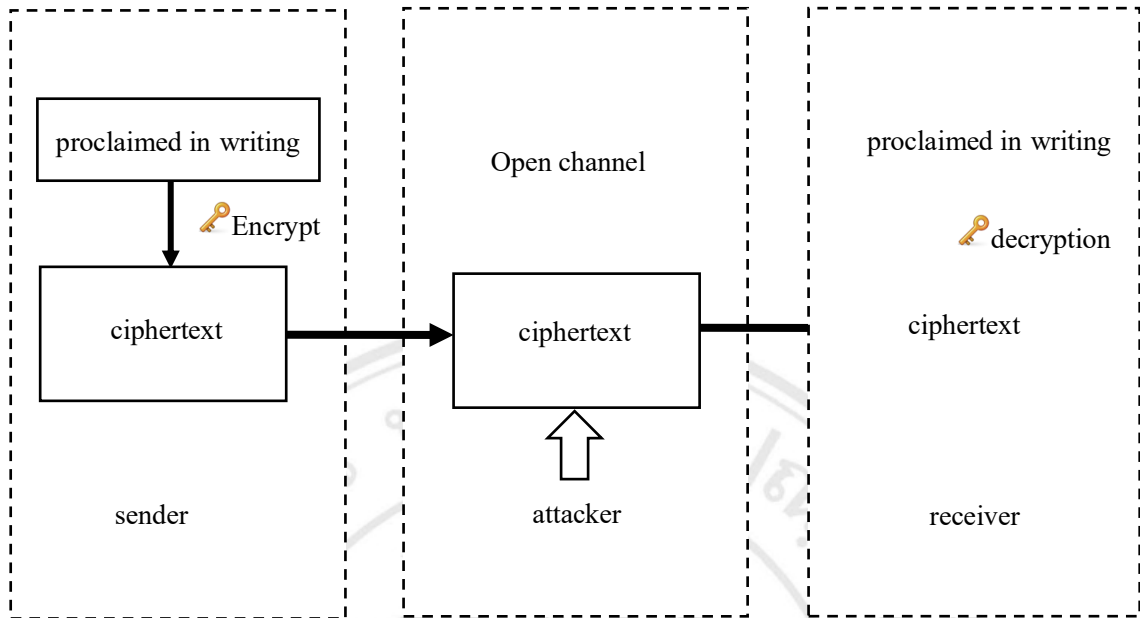
Figure 3.2 Secure Communication Model

3.2.2 The composition of the encryption system

The whole system consists of four parts: plaintext source, encryption transform, decryption transform, and cryptanalysis. The cryptosystem model is shown in Figure 3.3. The plaintext source provides the plaintext information that needs to be encrypted. The encryption transform uses the corresponding key to encrypt the plaintext, and the decryption transform uses the corresponding key to decrypt the plaintext. The ciphertext has eavesdropped during transmission, which is called cryptanalysis. The cryptanalyst can introduce plaintext or interfere with ciphertext by illegal means through the eavesdropped information, so as to change the ciphertext in the transmission process, thus damaging the integrity and confidentiality of the ciphertext. The method to ensure the confidentiality of information is to use a cryptographic algorithm for encryption, while the method to ensure the integrity of information is to use the authentication and authentication mechanism.

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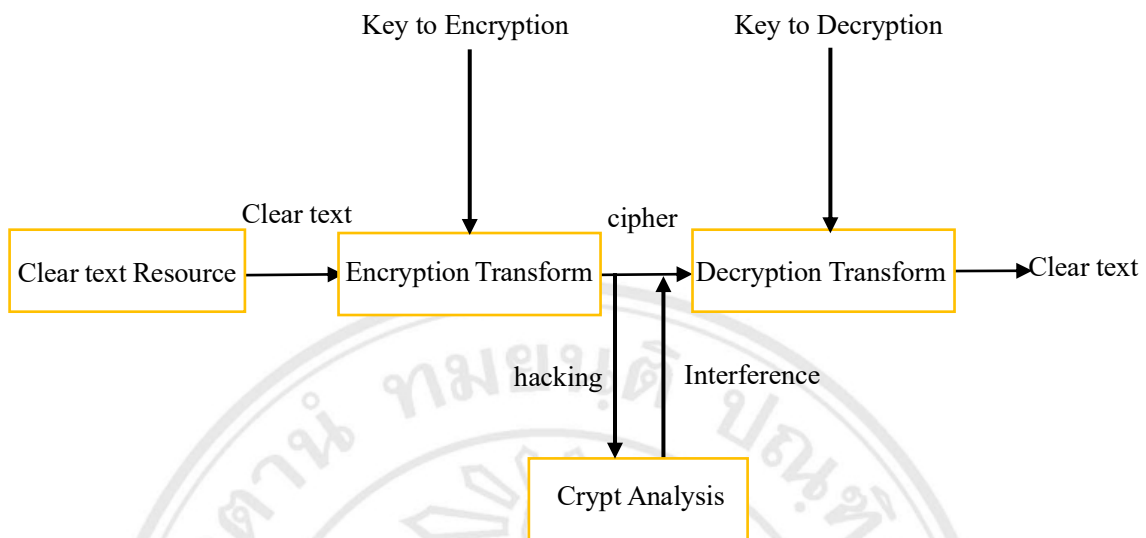
Figure 3.3 Password System Model

3.3 Digital Note

Digital notes have emerged in the last two years, and their theoretical concept is very crucial. The digital notes proposed in this paper are not new actual notes, but an enhanced form of notes based on blockchain technology. A new form of digital notes has been developed based on the characteristics of modern notes and the corresponding legal provisions, which is quite different from the current technical structure of electronic notes. At the same time, on the one hand, it integrates all the advantages and functions of electronic notes, and on the other hand, it organically connects with blockchain technology to become a more efficient and convenient form of notes.

Therefore, digital notes are very different from previous paper-based notes. They are presented in the form of electronic data based on digital note trading platforms developed by financial institutions and others. However, there is an independent relationship between "digital notes" and the concepts of "bills of exchange" mentioned in China's "Negotiable Instruments Law". In addition, under the condition of the ECDS system of the People's Bank of China, the creation of the electronic commercial bill is only in the form of departmental regulations, so it is classified into the bill form of the bill transaction management. Although it has not been separated from the digital bill, it is difficult to produce a relatively stable corresponding relationship. Moreover, the digital

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bill has a very powerful payment and settlement function, which has many similarities with the current electronic payment business in e-commerce.

Therefore, the author thinks that if we want to interpret the concept of "digital bill", we need to make a comprehensive and systematic comparison with the related concepts of "electronic payment".

3.3.1 Comparison of digital notes and Electronic notes

At present, the concept of "electronic instrument" has not been clearly defined in Chinese law. According to Chinese expert Du Qingchun "From a broad perspective, electronic bills can be divided into two categories. The first is the electronic of traditional bills. In short, electronic information is used to withdraw traditional written vouchers based on computer technology, so as to spread the electronic information transfer of cash flow. Second, electronic information can completely replace traditional bills [33]. Information transmission is actually a process of capital circulation. Both can be unified into the informational and monetary aspects of electronic notes." In fact, from a narrow perspective, electronic bills simply refer to the monetary level of electronic bills. However, the information aspect of the electronic bill refers to the bill image exchange system developed by the People's Bank of China. Its mechanism is to scan the original paper bills. After that, data exchange will be conducted with the major banks by means of data messages. Finally, these data messages will be transformed into bill information through the terminal equipment, and the subsequent bill business will be carried out. Therefore, Chinese expert Wu Jinghui believes that electronic bills in a narrow sense are the process of converting traditional paper bills into electronic data based on computers and other technologies. Electronic notes refer to the design and circulation of notes by electronic means [34]. By defining the connotation of digital note in the above way, we can find that digital note itself is a new form of note which takes blockchain technology as an important prerequisite. However, fundamentally, it is still consistent with the concept of electronic notes. Therefore, it needs to be included in the category of electronic notes.

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3.3.2 The Similarities and Differences Between Digital Notes and Traditional Notes

According to the characteristics of Chinese bills, the Negotiable Instruments Law divides them into three types, including promissory notes and checks, etc. The concept of "bill of exchange" is only explained in Article 19 of the Negotiable Instruments Law: "A bill of exchange is a bill signed by the drawer, and the entrusted payer must pay a certain amount to the payee within a specific time range." Literally, this regulation refers to an "instruction" that the entrusting payer must pay under special circumstances, and is not limited to the form of the instrument. In this case, the comprehensive comparison and analysis of the concept of "bill of exchange" and "digital notes", so that we can summarize the relevant conclusions. In other words, in essence, the digital notes are still consistent with the legal essence of the "directive" above.

For example, Chinese scholar Zhao Yifen believes that the Negotiable Instruments Law is mainly based on a certain kind of promise when expanding the theory of negotiable instruments [35]. In other words, it is a kind of payment promise made by the acceptor to the holder. As for the form of recording of such a promise, as long as there is an exact promise, the amount of payment is specific. The payment function of bills has been given full play. The basic function of digital bills' function is payment. With the help of programming smart contracts, the financing function of traditional bills can be fully demonstrated. Therefore, although digital notes are different from traditional notes in many aspects, such as delivery methods and other contents, from the legal perspective, some important functions of notes are basically the same.

3.3.3 The Difference Between a Digital Bill and an Electronic Payment

The emergence of electronic payment has changed people's way of life. It is based on computer technology and uses some tools, such as mobile phone terminals, to operate the capital flow in the accounts of individuals and related organizations. As digital notes exist in the form of data messages and so on, it is also necessary to include them in the category of electronic payment. However, the payment and settlement function is only limited to a certain kind of function of the digital bill. The bill behavior is programmed in the way of a smart contract, and the holder can adopt a means of endorsement when the digital bill expires, so as to show its short-term financing function. This kind of

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general electronic payment method is difficult to achieve such an effect. Therefore, fundamentally speaking, digital bills have a close relationship with general electronic payment. They have functions such as credit and financing, and are consistent with the characteristics of payment tools. However, they are quite different from single fund flow tools. Therefore, the concept of digital notes can not only be limited to the level of "payment instrument", its financing functions and attributes in the economic category are the core of our discussion.

3.4 Basis of Theory

3.4.1 The Digital Economy

In 1996, the concept of the digital economy was first proposed by Tapscott, and specifically outlined that the digital economy is a brand-new economic system in the information age. The digital economy is essentially the digital representation of all information and knowledge. The development of the digital economy is an economic competitive activity with digital technology as the core. Under the condition of giving full play to the influence of digital technology, digital economic activities are carried out in production and other fields, so as to achieve the goal of common development of diversified industries. Blockchain financial development theory is an important condition for the operation of the digital economy. To some extent, blockchain technology helps to promote the effective connection between it and communication technology, improve the digitalization level of all kinds of assets, and notarize and register them on the blockchain, so as to promote the development and marketing of goods and services to meet the digitalization requirements. This link promotes the economic development system innovation and reform. It can be said that blockchain technology integrates the core theories of the digital economy and has been fully applied in the digital era.

3.4.2 Theory of Free Money

In 1976, Hayek put forward the theory of free money and systematically described the mechanism of private money creation with the support of various technologies in relevant literature [36]. In practice, this system will result in the emergence of multiple types of currency within a country. He proposed that currencies should be non-

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international and not regulated by governments or other institutions. The monetary system in the process of continuous improvement will give birth to the establishment of some new monetary systems. Within the scope of blockchain technology practice, free money theory provides scientific theoretical guidance for it. In this economic model, anyone needs to issue a digital currency, which can be circulated without any cost to each other, and the process of rapid development and expansion in a short time frame.

3.4.3 Datasets

Taxpayer Data the dataset contains comprehensive information on taxpayers including their income, assets, financial activities, and tax liabilities. The taxpayer Transactions dataset contains detailed information on the financial transactions of taxpayers including payments, transfers, and other forms of exchange. Tax Authority Data is a dataset that contains detailed information about the policies and procedures of the relevant tax authorities including filing deadlines and penalty structure. Taxpayer Compliance is a dataset that contains information on the compliance of taxpayers with the various laws, regulations, and procedures related to the filing and payment of taxes. Tax Collection Data is a dataset that contains information on the collection of taxes from taxpayers by the relevant tax authorities. Blockchain Data is a dataset that contains information on the use of blockchain technology for the collection and management of taxes. Government Spending Data is a dataset that contains information on the spending of government on various public services such as healthcare, education, and infrastructure. Economic Indicators: This dataset contains information on the economic indicators of the country such as GDP, inflation, and unemployment [37].

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CHAPTER 4

A PROBLEM IN THE APPLICATION OF BLOCKCHAIN TECHNOLOGY IN TAX MANAGEMENT: AN ANALYSIS BASED ON THE GAME MODEL

The use of blockchain technology in tax collection management could help to streamline and improve the process of collecting taxes. To start, a blockchain-based system could be used to provide a secure and transparent means of tracking and verifying tax payments. This system could be used to provide an immutable record of all tax payments, making it difficult for tax evasion or fraud to take place. In addition, the use of a blockchain-based system could also enable governments to automate certain aspects of the tax collection process. For example, smart contracts could be used to automate the payment of taxes from taxpayers. This could significantly reduce the burden of manual processing and collecting taxes, as well as reduce the chances of human error or discrepancies. Finally, the use of blockchain-based systems could also improve the accuracy and speed of tax collection. This could help to reduce errors, eliminate discrepancies, and allow governments to collect taxes more quickly and efficiently. By leveraging the power of blockchain technology, governments could streamline their tax collection processes and ensure that taxpayers are paying their fair share.

4.1 Mining and Analyzing the Main Problems by Tax Collection Management by Building a Game Model

Game theory, also known as response theory, is both a new branch of modern mathematics and an important discipline of operations research. The game theory focuses on the study of interactions between formulaic incentive structures. It is a mathematical theory and method for studying phenomena of a struggle or competitive nature. The game theory considers the predicted and actual behavior of individuals in a game and studies their optimization strategies. Game theory has become one of the standard analytical tools in economics.

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The theoretical analysis is carried out by establishing a game model, and it is carried out in three stages: model assumption, model establishment and solution, and model reasoning, so as to obtain the main problems existing in tax collection and management, as follows:

4.1.1 Model Assumptions

(1) The participants in the game, although multi-party behaviors are involved in the tax collection and management work, this paper only considers the two most basic actors when constructing the model, namely tax authorities and taxpayers. The behavior strategies of the tax authority and the taxpayer are respectively: the behavior strategy of the tax authority = {check, do not check}, and the behavior strategy of the taxpayer = {tax evasion, no tax evasion}.

(2) Assume that both taxpayers and tax collectors are completely "rational" in the game, that is, they both want to maximize their own interests. Specifically, for taxpayers, in order to maximize tax revenue, they will choose between auditing and non-auditing; while for taxpayers, in order to maximize after-tax income, they will choose between tax evasion and non-inspection. Choose between not tax evasion.

(3) Assuming that the actual taxable income of the taxpayer in a certain tax period is n, the income declared to the tax authority is $m(n > m)$, and the tax rate is r, then the amount of tax evasion is $r(n-m)$.

(4) Assuming that the tax authority does not fully understand the taxpayer's real income, and there is information asymmetry between the two parties, that is, the tax authority does not know whether the taxpayer will pay tax accurately following relevant laws, and at the same time, the taxpayer does not. Know if the tax authorities will audit their tax practices. Suppose that the probability of the tax authority conducting an audit is $p(0 \le p \le 1)$, and the probability of the taxpayer evading tax is $q(0 \le q \le 1)$.

(5) Assuming that the tax authority has a probability of successfully discovering the taxpayer's tax evasion during the audit process, and imposes a certain fine on him, set the amount of the fine to be f times the tax evasion amount $(f \ge 1)$, and the tax authority The audit cost is a constant $C(C \ge 0)$, and, $C \prec r(n-m) + fr(n-m)$, because only the audit cost is less than the audited income, the tax authority will be "profitable" and will choose to conduct an audit.

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4.1.2 Model Establishment and Solution

Table 4.1 Game Model Diagram

		tax authority B		
		Audit (p)		no audit (1-p)
		success (a)	unsuccessful (1-a)	
taxpayer A	Tax evasion (q)	{ (1-r) n-fr (n-m, nr+fr (n-m) -c}	{n-mr, mr-c}	{n-mr, mr}
	Pay taxes according to the law (1-q)	{(1-r)n, rn-c}		{(1-r)n, nr}

Through the game model analysis, different strategies chosen by both the tax collector and the taxpayer will lead to different results, which are as follows:

(1) If the taxpayer evades tax and the tax authority chooses to audit and succeeds, the taxpayer gains are $(1-r)n - fr(n-m)$ and the tax authority gains are $nr + fr(n-m) - c$.

(2) If the taxpayer evades tax and the tax authority chooses to audit but is unsuccessful, the taxpayer gain is $n - mr$ and the tax authority gain is $mr - c$.

(3) If the taxpayer evades tax and the tax authority chooses not to audit, the taxpayer's gain is $n - mr$ and the tax authority's gain is mr.

(4) If the taxpayer pays tax according to the law and the tax authority chooses to audit, the taxpayer's gain is $(1-r)n$ and the tax authority's gain is $rn - c$.

(5) If the taxpayer pays tax according to the law and the tax authority chooses not to audit, the taxpayer's gain is $(1-r)n$ and the tax authority's gain is nr.

From this, the game tree of the two sides of tax collection and management can be obtained:

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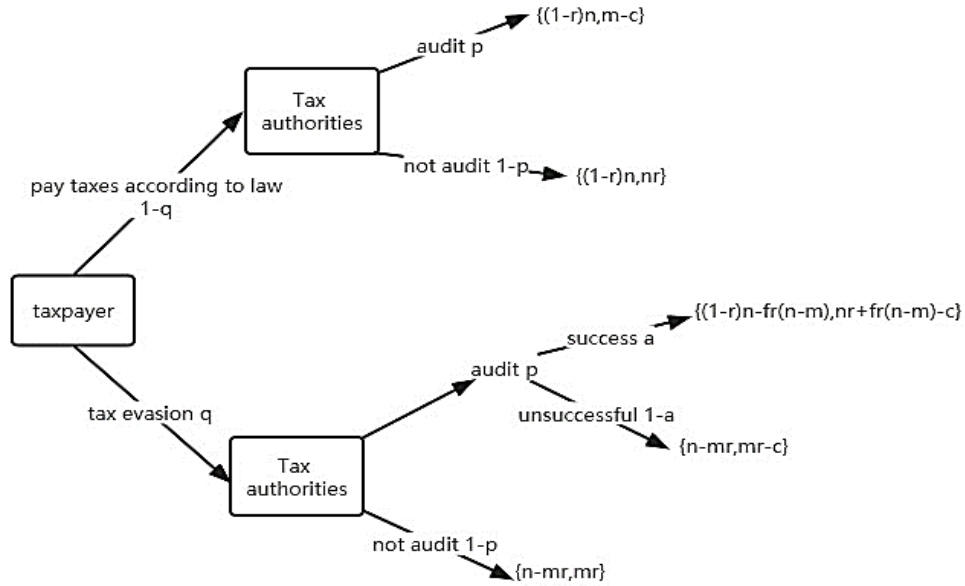
Figure 4.1 Game Tree

According to the above game model, we can get:

The expected utility function of tax authority B is:

$$U_B = (rn-c)p(1-q)(1-p) + qpa[nr + fr(n-m) - c] + qp(1-a)(mr-c)$$

make U_B Taking the partial derivative with respect to p and equal to 0, we get:

$$q = \frac{c}{mr + ar(n-m)(1+f)} \quad (4.1)$$

Taxpayer A expected utility function is:

$$U_A = paq[(1-r)n - fn(n-m)] + pq(1-a)(n-mr) + (1-p)q(n-mr) + p(1-q)(1-r)n + (1-p)(1-q)(1-r)n$$

Make U_A Taking the partial derivative with respect to q and equal to 0, we get:

$$p = \frac{1}{a(1+f)} \quad (4.2)$$

In summary, the refined Bayesian equilibrium solution of this model is:

$$p^• = \frac{1}{a(1+f)} \quad (4.3)$$

$$q^• = \frac{c}{mr + ar(n-m)(1+f)} \quad (4.4)$$

Therefore, when the taxpayer evades tax with probability $\dfrac{c}{mr+ar(n-m)(1+f)}$,

When the tax authority conducts an audit with probability $\dfrac{1}{a(1+f)}$, the model has reached

a Nash equilibrium of mixed strategies, but this result is not static. In theory, the main

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problems faced by tax collection and administration can be analyzed from the results, and the government and tax authorities can solve them according to the changes of relevant factors. These problems are to maximize the total social benefit.

4.1.3 Model analysis to draw conclusions

First of all, we can see from the analysis that the expected utility of the taxpayer is inversely proportional to the probability P of the tax audit. The proof is as follows: ,dUA/dp= qmra (1- f)- qnra (- a - af -1)- n ,And because of the multiple $(f \geq 1)$, so $dUA/dp \prec 0$, Therefore, it can be shown that the expected income of this tax is a decreasing function of the expected tax rate of return p, which means that the current probability of tax inspection is low, which leads to a smaller risk of tax evasion and a larger expected utility of the taxpayer. Therefore, the tax authorities' low probability of inspection is one of the problems in the current collection and management. The factors affecting the probability of tax audit can be seen from the above result $p^{\bullet} = \dfrac{1}{a(1+f)}$, the inspection probability of the tax authority is not directly related to the taxpayer's actual taxable income n and the income m declared to the tax authority. The real situation is not understood, and there is information asymmetry between taxpayers and taxpayers, which is also a fundamental problem in the process of collection and management. According to the above result $q^{\bullet} = \dfrac{c}{mr+ar(n-m)(1+f)}$, it can be seen that the taxpayer's probability of tax evasion is proportional to the current tax audit cost, which shows that the possible expenses and costs incurred during the current tax audit work will directly affect whether the current taxpayer has evaded tax. At present, due to the high cost of tax audits, the probability of tax evasion activities by current taxpayers may increase, and the cost of tax audits depends on labor costs, the formulation of procedures, and the cost of mining taxpayer-related information., which shows that there are problems in the current tax collection and management, such as high cost of collection and management and low information mining, collection, and utilization. On the other hand, from the perspective of the formula, the low success rate of tax audits is also another important reason for the success of taxpayers evading tax, and there may be many reasons for the low efficiency

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of audits, such as the degree of information symmetry between the taxpayer and the taxpayer. If it is too low, the tax authorities won't fully understand the taxpayer's transaction information and there is little chance that tax evasion will be discovered, which will increase the likelihood that the taxpayer will succeed in evading taxes and lower the degree of tax compliance. The inaccurate positioning of the audit objects by the tax authorities and the inadequate analysis of audit cases will also lead to low audit efficiency and further increase the probability of tax evasion. To sum up, the main problems faced by tax collection and administration are (1) Information asymmetry, (2) High cost of collection and administration, (3) Low information mining, collection, and utilization rate, and (4) Inefficient inspection by tax authorities.

4.1.4 The Application Of Blockchain Technology in the Tax Management Model

Application of blockchain data. The distributed account or intelligent contract features of blockchain provide a solution for improving the quality and efficiency of tax administration, it points out the direction for making tax policy scientifically and further improving tax Macroeconomic regulation and control ability.

The following flow chart can be shown.

A=tax department, B=Social Security Department, C=other agencies, D=payment agency, E=Enterprise, F= Employee ,G=a smart contract
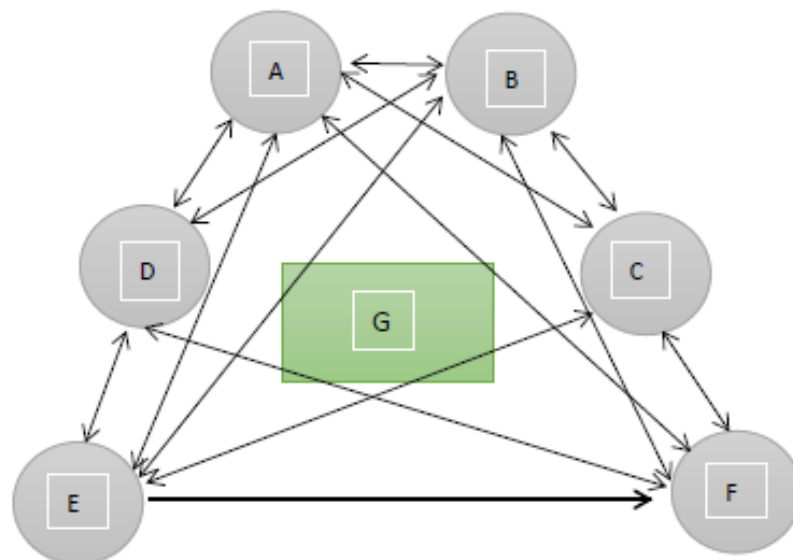
Figure 4.2 Application of blockchain data.

(1) Risk Identification. The tax department and the Market Supervision Department use AI to identify the risk through access to the blockchain, and one day there is a risk transaction, the government can still identify risks and effectively regulate the market by invalidating a trading chain by recording an equivalent transaction in the opposite direction (a negative one), as well as by soft and hard forks.

(2) Managing Tax Incentives Through Smart Contracts. In recent years, in order to promote regional economic development, some regions and sectors have implemented various preferential policies in respect of tax revenue, main tax revenue and fiscal expenditure for specific enterprises and their investors (or managers). To some extent, the implementation of preferential tax policies has promoted economic growth and industrial agglomeration, but the complex and diverse preferential tax policies have also increased the workload of tax collection and management. In the technology of blockchain, all contracts can be intelligent, using intelligent contracts can ensure the reliable execution of all contracts and avoid tampering, repudiation and default. All kinds of tax incentives need to be set up in different smart contracts to achieve, one day reached the conditions that will automatically trigger the contract. On the one hand, it reduces the discretion of the tax preference policy; on the other hand, it avoids all kinds of tax evasion because of the tax preference.

(3) To Improve the Tax System Design and Optimization Ability Through Blockchain Technology. First of all, on the basis of a large number of tax system implementation data and information-based means to support, the effect of tax system implementation is better tested, the existing problems are easier to be found, and at the same time, it is convenient to put forward optimization measures. Secondly, under the condition of informatization tax system design is more easily supported by calculation and simulation, so as to correct the deficiency as soon as possible. Thirdly, because of the informatization of tax collection and administration, the complicated and well-regulated tax system can be carried out smoothly, and the tax system and the target of regulation that cannot be carried out smoothly can be improved. Finally, we can further make the tax system design and its optimization ability more in line with the needs of tax participation in economic regulation and distribution.

(4) Scientific Decision-Making and Fine Management can be Achieved through Blockchain Technology. The distributed ledger of x blockchain provides massive data. Integrating all kinds of economic activity information of market players, the market supervision information of industry and commerce, taxation and quality supervision departments, as well as all kinds of social management and family population information, forms a unified micro-data warehouse of economy, society, and population. Using big data, machine learning, artificial intelligence, and other technologies, intelligent analysis of economic operation, social management, and population data is carried out, so as to achieve a statistically intelligent decision support system with scientific decision-making, accurate economic and social governance, and efficient public services.

4.2 The Application of Blockchain Technology in Invoice Management

4.2.1 Application Status quo

The introduction of blockchain technology in the field of invoice management, on the premise of transaction subject control, can solve the current electronic invoice authenticity, reuse, and other problems is the application direction of the current consensus. As for the application of blockchain technology in invoice management, I think more consideration is needed.

4.2.2 Technology Development Perspective

At present, blockchain technology is still developing. Under the premise of seeking truth from facts and under the overall framework of the new generation of information technology, we should dare to innovate and explore the application of blockchain technology in the tax field with pioneering ideas, rather than simply copying the existing application ideas and schemes in other fields.

4.2.2.1 Get Rid of the Traditional Thinking of "Managing Invoices on Invoices"

If there is only invoice information in the blockchain, perhaps based on blockchain technology, more participants can set up a self-restraint mechanism. However, the phenomenon of "true invoice and false invoice" cannot be solved by blockchain technology itself. Only by integrating enterprise business information, financial

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information, and tax information through blockchain technology can it ensure the authenticity of the information in the process of information transformation from business to tax.

4.2.2.2 Tax Administration and Technological Innovation Should be Planned as a Whole

The application of various new technologies, such as blockchain, requires technical cooperation among tax-related entities. Nowadays, the financial management of enterprises is mostly independent, which brings the blocking point to the promotion and application of new technology. Only by promoting the unified tax administration concept of all tax-related entities can a blockchain invoice application pattern featuring unified rules, joint cooperation, and win-win results be formed. In conclusion, for tax administration, blockchain is a major technological change with challenges and opportunities. We should properly study its technical characteristics, combined with the business characteristics of the tax field, make full use of the new technology, do a good job in the interactive integration of management and technology, improve our tax modernization level, and explore a better tax system design.

4.3 The Application Works

4.3.1 The Relationship at the Institutional level

From the perspective of the accounting system, the VAT electronic invoice system implemented by the State Administration of Taxation has solved the problem of generating legal electronic original vouchers, and the management functions provided by the industry financial system such as reimbursement review have solved the problem of informatization of accounting vouchers. The two unified constitute electronic accounting vouchers, which can be recorded and archived. The revised Measures for the Management of Accounting Archives have solved the problem of the recognition of electronic accounting vouchers as accounting vouchers. The above part is equivalent to solving the first half of the electronic invoice management. The second half of the problem lies in that, in terms of account entry and archiving, electronic vouchers are different from paper vouchers, they are not unique and unchangeable, and there is a lack of authoritative

electronic ledger and electronic accounting voucher archiver. If it is like manual operation, any database or any computer hard disk folder can be stored, although it is reasonable, but the actual business is not feasible. It is a bit like that when the national VAT system was introduced, but the VAT anti-counterfeiting tax control system was not implemented, manual operation provided an opportunity for VAT invoice counterfeiting because the inspection cost was high. Ideally, the core modules that provide electronic vouchers for bookkeeping and archiving in the financial system of each service provider will have a better effect if they have been certified or issued by the Ministry of Finance and the National Accounting Association or prepared with unified standards. In this way, a complete closed loop of electronic voucher accounting management can be formed fundamentally. This is also the reason why there are differences in the current electronic invoice printing and reimbursement processing according to paper invoices. Schematic diagram of electronic invoice management system based on blockchain technology:
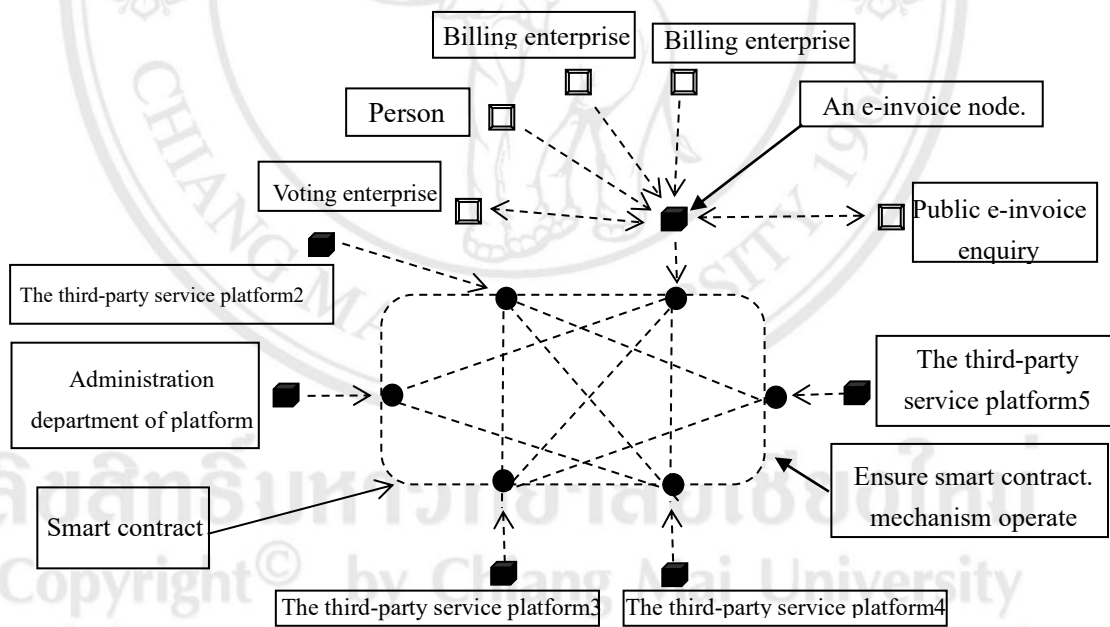
Figure 4.3 Schematic Diagram of the electronic Invoice Management System of Blockchain Technology

4.3.2 The Relationship Between Blockchain E-invoice Management and VAT E-invoice System

The current VAT electronic invoice system, which is part of the new invoice management system of the State Administration of Taxation, provides complete functions of VAT invoice issuing and information tax management based on the digital certificate of taxation and the electronic bottom account database. Even when viewed in conjunction with blockchain technology, the current new invoice management system is the best solution. What blockchain technology can contribute to e-invoice management is that the latter half of the demand for e-invoice as electronic accounting documents is actually the connection supplement and extension of the VAT e-invoice system.

4.3.3 Development Direction of Application

The "Internet + Tax" action plan was advanced rapidly, and electronic ordinary VAT invoices were widely promoted with the support of the state. Electronic invoices not only save energy and protect the environment, reduce the cost of an invoice for enterprises, and improve the quality and efficiency of financial and tax management, but also become the core element of information technology of tax collection and administration, and improve the level of tax collection and administration. "The implementation of electronic invoicing" has been written into the national "13th Five-Year Plan" outline, but the application of electronic invoicing has not reached full coverage and effect maximization. For example, after the "replacing the business tax with a value-added tax", enterprises have issued VAT special invoices in large quantities that are widely used, but they have not realized the electronic, so they still need to use paper special invoices. These enterprises still need to spend time and energy collecting and issuing invoices. And prone to error. Take Jingdong as an example.Jingdong issued more than 20 million special VAT invoices, which cost more than 200 million yuan based on the average paper, labor, and mailing cost of about 10 yuan for each special invoice. In addition, it takes two or three days to mail the invoice. If the invoice is lost, damaged, or issued in a non-standard way, it needs to be sent back and re-issued, which will affect the timely certification, deduction, and reimbursement of the enterprise.

Table 4.2 Business process Comparison Between paper Invoice and Electronic Invoice

NO stage business process		Electronic invoicing business process
1 receive	Companies receive paper invoices	Enterprises receive electronic invoice format documents
2 claims	Paper invoice Paste paper reimbursement form	Import into the electronic reimbursement system as the attachment of the electronic reimbursement form, or print the electronic invoice format file and reimburse according to the paper invoice (there are differences)
3 checks	Check on the website of the tax bureau of the invoice-issuing party	Check on the website of the tax bureau of the invoice-issuing party
4 filter	There is no duplication of reimbursement	In the case of electronic processing, the enterprise reimbursement system cannot verify whether the invoice document is tampered with or whether the invoice has been reimbursed by the enterprise or other enterprises, so it needs to rely on the trusted tax bureau or the third-party service platform to identify the invoice status
5 records	The approved reimbursement form and the paper invoice shall be used as accounting vouchers for archiving	The approved reimbursement form and the paper invoice are recorded together as accounting documents and filed in the electronic accounting system database or computer hard disk
6 reviews	there will be a business review and annual routine audit review Within 1-2 years	there will be a business review and annual routine audit review within 1-2 years

Table 4.2 Business process Comparison Between paper Invoice and Electronic Invoice
(Cont.)

NO stage business process		Electronic invoicing business process
7 audits	There may be an annual routine audit review triggered by senior management reassignment within 5-7 years	There may be an annual routine audit review triggered by senior management reassignment within 5-7 years
8 stores	The filing cabinet is kept for 30 years	Electronic accounting system database, computer hard disk, third-party bookkeeping service platform, keep 30 years
9 destroy	Destroy according to regulations	Delete and destroy as required

It can be seen that the advantage of traditional paper invoices is that there is no repeated reimbursement problem, and it is easy to save, while the advantage of an electronic invoice is convenient processing, saving a lot of manpower and material resources and improving the overall efficiency, but it has certain disadvantages in the aspects of repeated reimbursement and preservation.

4.4 Risk Analysis of the Application of Blockchain Technology in Invoice Management

4.4.1 Application Security Risk Analysis

Security is the core goal of e-invoice cloud platform construction. Ensuring the information security of e-invoices is the basic premise of the construction of an e-invoice cloud platform. Therefore, the data protection mechanism of the cloud platform should have a high degree of security, and strict permission settings and management should be carried out on the information stored and exchanged in the block. In addition, in terms of technology, efficient, reliable and comprehensive security emergency mechanisms, and

solutions should be used to ensure the security of e-invoicing data and cloud platforms. In the blockchain, when a node obtains the right to account, the ledger will be broadcast in every node to realize backup. Take Bitcoin as an example. Only when more than 51% of the nodes in the system are attacked at the same time can the security of the blockchain be affected, and this possibility is extremely small. However, in contrast to the centralized system, only the central node needs to be attacked to crash the system, so blockchain security is extremely high.
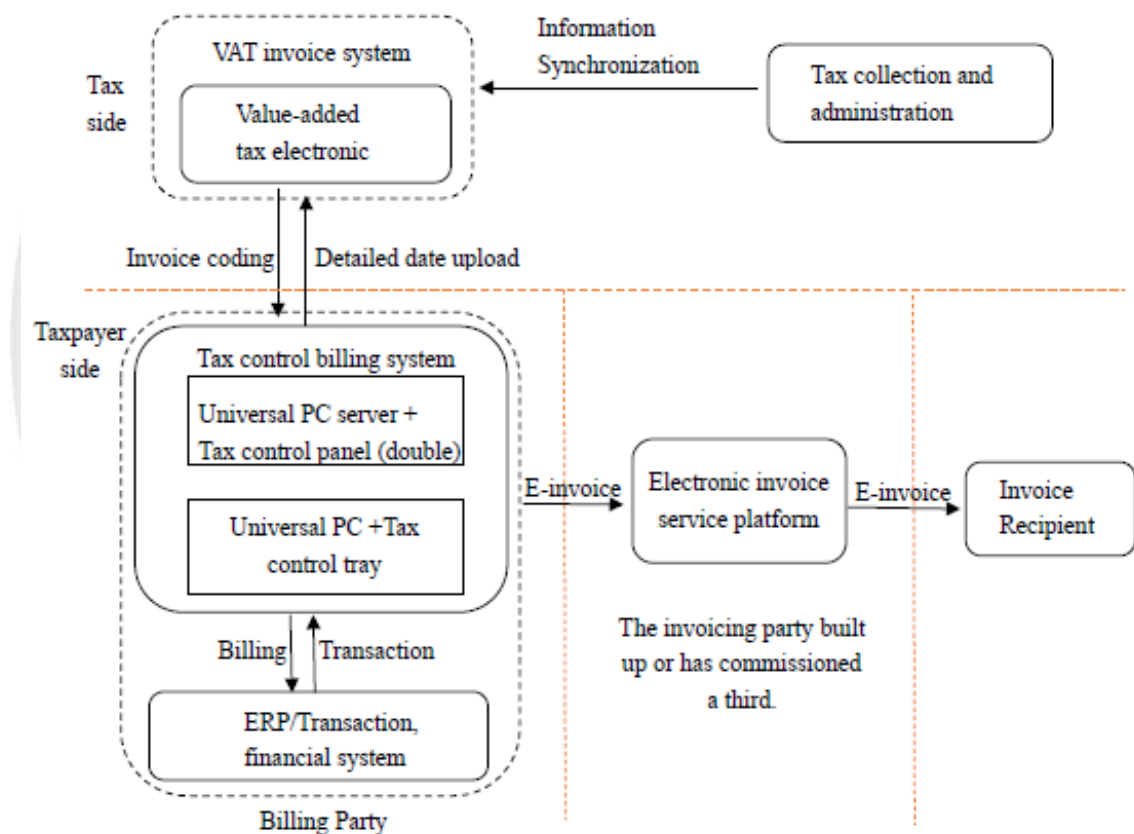
Figure 4.4 Business Flow Logic Diagram of VAT Electronic Invoice

If an electronic invoice is widely promoted and applied, tax authorities will be faced with massive data that they have had little contact with before. The security of network security and the safe storage and use of business data of invoicing enterprises are other difficult problems for tax authorities to face. In the aspect of data information sharing, because the application of big data is a complex project, there is no system or system for which level of users have what permissions to use the data, and a reasonable mechanism

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between data query and data security has not been established. If the invoice inquiry module is established in the online tax platform website of the tax authority, criminals may use illegal means to steal VAT invoice information and specific data; If only the invoice flow query is provided, but the invoicing information query is refused, the invoice recipient will be unable to judge the authenticity of the invoice information. In the application of big data, how to protect the business secrets reflected in the invoicing data of enterprises needs the tax authorities to make preparations in advance.

4.4.2 Risk Analysis of Key Loss Management

4.4.2.1 Limited Application Scope, Electronic Invoice Platform is Not Unified

Although all parties are working hard on the promotion of electronic invoices, there are many provinces and cities in our country, and the development is different, which implements electronic invoice operation lag and different, and the electronic invoice management system between provinces and cities do not contact each other, and the cross-province and cross-region long-distance transaction information cannot reach the information sharing. At present, pilot projects are carried out in different regions, and the pilot regions are governed separately. There is no unified standard system and basic platform in the country, and the management of electronic invoices is not standardized, making IT difficult to obtain and exchange national invoice data. In addition, it is necessary to consider the impact of electronic defects and taxpayers' IT application status on the promotion and implementation of electronic invoices. Therefore, it is necessary to comprehensively standardize the use and management of electronic invoices and establish a national unified access and exchange platform to interconnect with the collection platform at the office end. However, the current invoice information collection systems such as the tax control machine collection system and the network invoice system are established by each province, and lack national unified standards.

Most enterprises do not have their own e-invoice service platform, so they cannot effectively connect with the provincial bureau's invoice collection platform. Moreover, the unified format and content, operation specifications, and safety standards of electronic invoices have not been clearly specified, which makes it impossible to achieve quick collection and reliable exchange of invoice information. However, the

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existing accounting policy requires the paper invoice as the basis of the enterprise account, so the electronic invoice from the beginning is faced with the problem of difficult accounts. Otherwise, even if the electronic invoice is received, it still needs to print out the paper version to carry out the normal financial reimbursement and other work, so the so-called advantage of saving resources and a convenient and fast electronic invoice will no longer exist, and once the electronic invoice is printed, the authenticity and uniqueness of the invoice cannot be guaranteed.

4.4.2.2 Electronic Invoice Double-Track System, Implementation Cost is a Problem

The electronic invoice is a new product of "Internet + tax", which belongs to high-tech electronic products. It takes time for consumers to accept this kind of new thing, and some consumers even do not understand the meaning of electronic invoices. Since electronic invoices are stored in the network media, giving people the feeling of being "invisible and untouchable", consumers will also doubt the security of the network storage, further leading to a low degree of consumer recognition.

Our current "accounting basic work standard" and other accounting policies require reimbursement documents to be attached to the original voucher, and the original voucher is in paper form, so the main problem encountered in the promotion process of an electronic invoice is reimbursement, account is difficult. In the actual financial work of enterprises, financial personnel usually need to review the face information on the paper invoices, so as to judge the authenticity of economic business, and check the authenticity of invoices with doubts on the relevant tax bureau website. The electronic invoice needs to check the basic information of the invoice online one by one, which increases the workload of financial review bills. At the same time, the paper invoice will be stored in the accounting files along with the reimbursement documents, while the electronic invoice will always be stored in the network in the form of electronic, so there is the possibility of repeated reimbursement of the electronic invoice. If electronic invoices are printed out for use, the original intention of promoting electronic invoices will be lost. These practical problems in financial accounting lead to the implementation of electronic invoicing difficulties.

In the process of enterprise audit, auditors often need to check accounting books, accounting vouchers, and other accounting files, check the authenticity of invoices, verify the authenticity of economic business, and track and collect audit evidence by using the method of direct examination and reverse examination. The electronic invoice is stored in the form of electronic records. How do the auditors carry out the audit work, and what kind of audit methods and audit techniques can be used to successfully complete the audit work? All this poses new challenges for auditors.

4.4.2.3 Data Association is not Comprehensive, and Security into a Hidden Danger

With the development of technology, Chinese online invoices can realize the function of checking the old and receiving the new through interworking with the collection and management system. However, there is still a certain gap between the electronic invoice management system and the requirement to fully realize the correlation between all tax declaration data and invoice data.

On the whole, China's online invoice management has achieved initial results. It has realized the functions of real-time collection of invoice information, checking the old and receiving the new, etc., which lays a good foundation for the construction of the national e-invoice platform in the next step. However, the application and management mode of paper invoices is still adopted, and the tax authorities are still responsible for the printing and supervision of invoices. The information management of paper invoices is only realized, so the effect in terms of anti-counterfeiting, monitoring and cost saving is not ideal.

The invoice information of taxpayers involves the trade secrets of taxpayers. Some invoicing enterprises have a lot of data in the internal management system which is highly confidential, and enterprises need to call a large amount of data through the internal management system when issuing invoices. Therefore, when the electronic invoice system is invaded or attacked by illegal elements or malicious persons, it may lead to the issue of electronic invoice or the download and receiving cannot be completed, the whole system will be paralyzed and crash, affecting the normal business activities of enterprises, and may even lead to the disclosure of business secrets of online enterprises, bringing serious security risks to enterprises and even the entire economic market.

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In the aspect of real-name invoices, due to the restriction of traditional concepts and the original management system, the real-name invoice system has not been implemented yet, which also causes problems such as false invoice writing and reselling invoices. Therefore, the establishment of electronic invoice accounts for enterprises, organizations, and even individuals can well solve the problem of real-name invoice systems. The association between invoice data and actual tax payment information also needs to be based on the premise of the real-name invoice, so as to realize the comparison of invoice issuing, receiving, and complete the data association of tax payment information.

4.4.3 Risk Analysis of Data Information Errors

For e-commerce companies such as Amazon, Dangdang, and Jingdong, the promotion of online invoices and e-invoices is conducive to expanding consumer groups and allowing more individuals and even enterprises to accept online shopping. For brick-and-mortar stores, the application of online invoices and electronic invoices not only saves tax costs, but also improves the operation process of brick-and-mortar stores, thereby shortening the turnover period of funds and improving the utilization efficiency of funds.

Another advantage of the implementation of e-invoicing is the regulation of e-commerce enterprises and the realization of the tax on e-commerce transactions. Formal B2C enterprises, such as Jingdong Mall, Tmall, and other online stores, or platform companies, such as regular brand flagship stores, as well as physical stores, have long been included in the government's tax payment. These enterprises, either on e-commerce platforms or online marketing stores of physical brands, pay taxes just like traditional enterprises. They can issue paper invoices or electronic invoices to consumers in online transactions. In addition, the former non-tax payment e-commerce refers to personal online stores, among which there are a large number of unregistered customers. Due to the convenience of opening online stores, they do not register for industry and commerce, and tax payments at all. Therefore, the tax department has no way to check its business information, so it is naturally impossible to carry out reasonable tax collection.

For example, in book sales, where the turnover of e-commerce accounts for a large proportion, consumers often cannot get the invoice when they buy books in their personal

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stores on Taobao.com. After the implementation of the "Online Invoice Management Measures", if individual online stores still do not register for industry and commerce, if the tax department can not realize the connection with all online stores' transaction data, or if e-commerce companies have not updated the VAT invoice system upgraded version of the electronic invoice, still cannot control the issue of invoice and tax payment on individual websites. Therefore, the implementation of the network invoice has no impact on the original legal tax payment of e-commerce companies. For unlicensed physical stores and personal online stores, it is estimated that the recent cannot have a big impact.

Moreover, the present implementation of "tax control by ticket" collection and management means, in fact, is the income tax must be calculated, but not only the income tax. In essence, the invoice is verifiable and verifiable proof of payment issued to consumers when an enterprise sells goods. It only reflects the taxable situation of an enterprise to a certain extent, but it is not the whole basis of the taxable situation. Therefore, the implementation of electronic invoices will not increase tax costs for the entity stores and online stores that regulate business and pay taxes according to regulations. For example, regulated enterprises such as Xinhua Bookstore and large e-commerce companies pay taxes based on actual sales rather than invoicing. In other words, even if a consumer does not need or choose to issue an invoice when purchasing books in a physical store or its corresponding online store, the enterprise still pays taxes according to the law. Therefore, the implementation of electronic invoices does not play the role of monitoring tax sources, and it is still unable to effectively control the phenomenon of omission and non-invoicing.

Chinese consumers have a poor understanding of the laws, rights, and obligations of taxpayers, and lack self-protection awareness. A large number of consumers do not have the habit of asking for electronic invoices or even paper invoices consciously when shopping online. Some even choose not to receive invoices directly. For example, when shopping on e-commerce such as Jingdong and Amazon, there is a choice of "issuing paper invoice" or "issuing electronic invoice". Of course, there is also a choice of "not issuing invoice". In most cases, consumers set the system as "no invoice" by default. Therefore, for the management of electronic invoices, in order to better control the comprehensiveness and integrity of tax sources, a reasonable and perfect invoice

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management system should be designed, so that when consumers shop, the system will automatically issue electronic invoices by default and send the corresponding information to the mailbox or mobile phone bound to the account, which will become the confirmation information feedback to consumers after the completion of similar orders. On the other hand, there are a large number of returns and exchanges for e-commerce and B2B enterprises. If a paper invoice is issued, the seller will ask for the paper invoice to be returned with the item. However, as for the issued electronic invoice, it is only the data information in the computer or mobile phone, which cannot be withdrawn by the enterprise. Consumers who have returned the invoice can still download and print the invoice information without the actual shopping fact, resulting in the existence and circulation of invalid electronic invoices in society, resulting in confusion and false reimbursement of enterprises.

4.4.4 Risk Analysis of Data Platform Openness

4.4.4.1 Electronic Invoices are Difficult to Claim

Recently, the "Internet + tax" action plan has been implemented across the country. As the product of modern informatization, electronic invoice makes the tax source monitoring method realize the transformation from "tax control by ticket" to "tax control by information flow", which also means that the tax bureau has fundamentally changed its inferior position relative to the taxpayer information asymmetry. In the stage of "tax control with invoices", the government takes issuing invoices or not as the statistical basis, and the regulatory strength largely depends on the integrity of taxpayers. Therefore, the regulatory ability of enterprise income is weak, because enterprises can conceal their income as long as they do not issue invoices. Cao Haisheng. However, nowadays, in the era of information construction and the Internet as the basic way of life, all transactions are reflected as information stored in the computer or cloud, which makes it possible to "control tax by information flow". As long as the tax bureau can connect with the computer platform, it can seize the initiative of information and realize comprehensive supervision over the transaction income of enterprises. Electronic invoices have become the inevitable product of the tax information age.

The implementation of electronic invoices will inevitably become an important measure in the era of "Internet + tax". Indeed, the popularity of electronic invoices has improved the tax bureau's ability to supervise the income of enterprises, but there are operational loopholes in the supervision of enterprise expenditure because the traditional paper invoice has been replaced. First of all, the electronic invoice does not have the physical anti-counterfeiting performance of the original paper invoice, so the financial personnel needs to identify the authenticity by themselves. In addition, the electronic invoice can be copied and reprinted, and if used for repeated reimbursement will not be recognized by the financial staff. The implementation of electronic invoices makes enterprises face the entry risk of authenticity and uniqueness of invoices, and weakens the tax bureau's supervision of enterprise expenditure to some extent.

4.4.4.2 The Standard of an Electronic Invoice is not Uniform

Following the pilot study on the application of e-invoice in the field of e-commerce in China, the Chongqing Branch of China Life Insurance issued the first e-invoice in early July this year, which is the first time the e-invoice pilot in Chongqing to go from online to offline entity enterprises. Compared with the traditional invoice, the electronic invoice has the natural advantages of low cost and high efficiency, and it will be widely promoted in the country in the next few years. According to the pilot situation, e-invoices have played the expected role in maintaining data security, saving costs, and environmental protection. This not only affects the cost measurement of the operation of e-commerce enterprises, but also the meaning of reducing the social burden and energy consumption. It also conforms to the trend of the application process of the international electronic invoice. As of the first quarter of 2015, reports from all walks of life on e-invoicing show that the e-invoicing pilot is entering the stage of multi-dimensional expansion. In terms of industry, from e-commerce, and retail to finance and insurance, and then to the telecommunications industry; In terms of region, there have been 8 cities including Chongqing to carry out the first batch of electronic invoice pilot. However, under the good development momentum, we must see that in general, the application area and the number of electronic invoicing are still small. At the same time, there are still some obstacles in the promotion of e-invoices.

Firstly, the legal status of electronic invoices has not been fully resolved. China's current "Tax Law" and "Accounting Law" require that reimbursement invoices must appear in paper form. The current "Accounting Archives Management Measures" of the Ministry of Finance has not recognized the legal status of electronic accounting archives. "Accounting Archives Management Measures (Draft)" has just solicited public opinions at the end of June this year. The widespread promotion of electronic invoices in the country still needs more authoritative legal recognition.

Secondly, electronic invoice reimbursement is still difficult to account for. Although the electronic invoice, like the current paper invoice, can also be used as a legal transaction voucher and warranty voucher, and has the same legal effect as the paper invoice, the specific operation process of the reimbursement voucher is still in the exploration stage. At present, the general situation is that the electronic invoice cannot be recorded and reimbursed in the actual operation, which makes most of the enterprise purchasers have to give up, and also makes the application value of the electronic invoice greatly discounted.

Thirdly, the regulatory department supporting measures support strength is insufficient. Enterprises that use electronic invoicing need to transform the existing financial system. Enterprise electronic billing system often has some personalized needs on the basis of the core billing function, such as the need to connect with a variety of financial accounting system, enterprise resource management system or e-commerce system, and electronic payment system, in the non-core function, may be different due to the size, industry and other differences. At present, the relevant departments and regions have no relevant encouraging policies and supporting measures, which will affect the initiative of enterprises to upgrade their enthusiasm.

Finally, the standard of an electronic invoice is not uniform. At present, the main reason why e-invoices have not been effectively promoted is that pilot projects are carried out in different places, which leads to different standards and management methods. Therefore, e-invoices are not universal, and e-invoices cannot be transferred to different places. In addition, e-commerce platforms are generally cross-regional enterprises, and the attribution of tax sources is also an issue that needs to be considered. Therefore, more comprehensive thinking is needed to realize the promotion and construction of the national platform.

Tax Identification is the first step in tax collection management to properly identify the taxpayer. This includes gathering information such as the taxpayer's name, address, Social Security number, and other relevant information. Tax Assessment is Once the taxpayer is identified, the tax authority will assess the amount owed by the taxpayer based on their income, deductions, and other relevant factors. Payment Collection the tax authority will then collect the payment from the taxpayer. This can either be done through direct payment or other collection methods such as garnishing wages, bank levies, or property lines. Record Keeping is the tax authority must also keep records of the taxpayer's payments and other relevant information. This is important in order to ensure that the taxpayer is paying the correct amount and that they are not attempting to avoid paying taxes. Auditing is the tax authority that may also audit taxpayers in order to ensure that they are paying the correct amount of taxes. Enforcement If a taxpayer fails to pay the taxes they owe, the tax authority may take action to enforce payment. This could include filing a lawsuit, seizing assets, or other enforcement methods shown in Table 4.3.

Table 4.3 Tax Collection Management Process

Step	Description
Taxpayer Identification	Identification of the taxpayer and their financial information.
Tax Assessment	Calculation of taxes are due based on the taxpayer's income and financial status.
Tax Collection	Collection of the taxes due from the taxpayer.
Tax Enforcement	Enforcement of tax laws if the taxpayer fails to pay the taxes due.

The traditional tax collection and administration process is cumbersome, taxpayers' tax compliance is low and tax evasion is easy to occur, and taxation authorities are backward in carrying out audit work, which not only takes a lot of time but also has low working efficiency; if blockchain technology is used for tax collection and administration, the above problems will be effectively solved, and the specific comparative analysis is shown in the following table:

Table 4.4 Tax Collection: Using Blockchain vs. not Using Blockchain

	Not Using Blockchain	Using Blockchain
Tax compliance	In reality, taxpayers are more or less likely to evade taxes, leak taxes or even avoid their tax obligations through the processing of financial accounting accounts for various reasons.	Using the technology of a decentralized distributed ledger of blockchain, there is a separately kept real-time updated ledger at each node, and the ledger also ensures that there is a true and complete record and the transaction information cannot be tampered with, which is convenient for tax administration authorities to inquire and solve the situation of tax leakage and under-taxation of taxpayers and improve tax compliance.
Taxation process	In the actual tax administration, taxpayers need to fill in their own forms to declare their taxes and are prone to untimely and inaccurate tax filing and payment, as well as other similar tax non-compliance behaviors.	Using blockchain technology, there is no need for taxpayers to fill in forms for declaration, and the real information recorded in detail in different periods, such as transactions, income details, and details of both parties to the transaction, is automatically obtained from the chain. This tax information is traced and analyzed, and the tax payable is calculated through established algorithms to automatically complete the declaration and simplify the tax process.
Cost of Taxation	Without using blockchain technology, tax authorities cannot finish grasping the real transactions of tax subjects, there is information asymmetry	Blockchain technology can record transaction information accurately in real-time to ensure that the transaction information is accurate before the tax return is filed, the tax return is filed in time when it occurs, and all transaction

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Table 4.4 Tax Collection: Using Blockchain vs. not Using Blockchain (Cont.)

	Not Using Blockchain	Using Blockchain
	between tax collectors and taxpayers, a lot of human and material resources are needed in the verification process, and tax administration needs to conduct audits on taxpayers, which greatly increases the cost of collection and low efficiency of tax collection.	information is recorded on the blockchain together with this tax return information after the tax is completed to form a new data backup to complete the archiving. It greatly reduces various costs of tax collection, various intermediary fees, and learning costs, and also improves filing efficiency and saves time costs.

Increased Transparency is the blockchain process that involves a distributed ledger system that is transparent and immutable, which makes it difficult for any entity to manipulate the records. This means that the data that is stored on the blockchain is transparent and publicly accessible, which allows for easier tax collection and verification Improved Efficiency is using blockchain technology for tax collection can streamline processes by eliminating the need for manual data entry, which can be time-consuming and prone to errors. Increased Transparency By using blockchain technology, government agencies can provide transparency to taxpayers by providing a secure and immutable ledger of transactions. This can help reduce fraud and ensure accurate tracking of tax payments. Reducing Costs by eliminating manual processes, blockchain technology can help reduce costs associated with tax collection. Increased Security is Blockchain technology that provides an additional layer of security for tax payments by encrypting transactions and preventing tampering or manipulation of data. This can help reduce fraud and make it easier to track payments. Improved Accuracy by reducing the need for manual data entry, blockchain technology can help improve accuracy in tax payments and reduce errors. This can help ensure the accuracy of tax payments and help reduce costs associated with inaccurate payments. Indicated by Table 4.4.

Table 4.5 Benefits of Blockchain Technology in Tax Collection

Benefit	Description
Increased Transparency	A blockchain-based system can provide a transparent and immutable record of all aspects of the tax collection process.
Reduced Fraud	Using blockchain technology to store and track tax collection data can help to reduce fraud by ensuring that all transactions are securely recorded and can be easily audited.
Improved Efficiency	A blockchain-based system can help to streamline the tax collection process, allowing for faster and more efficient collection of taxes.
Reduced Costs	Using blockchain technology to store and track tax collection data can help to reduce costs associated with managing the tax collection process.
Improved Auditing	Enables improved audit processes by providing an immutable and transparent record of transactions.

Blockchain technology has the potential to revolutionize the way that tax collection is managed. In Table 4.5 By using distributed ledger technology, governments can track and record all financial transactions, enabling them to assess and collect taxes accurately and efficiently. This technology can also provide transparency to both taxpayers and governments, allowing for improved communication and collaboration in the tax collection process. In order to implement a successful blockchain-based tax collection management strategy, governments should first consider the specific needs of their jurisdiction. This includes identifying the types of taxes that need to be collected and the processes used to calculate and collect these taxes. This information can then be used to create a blockchain-based system that is tailored to the specific needs of the jurisdiction. Once the system is in place, governments can start using blockchain-based smart contracts to automate the tax collection process. Smart contracts can be used to store and track all financial transactions, enabling governments to accurately assess and collect taxes. Additionally, governments can use blockchain-based tokens to reward taxpayers for filing their taxes on time. These tokens can be used to incentivize taxpayers to remain

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compliant with their tax obligations. Governments should ensure that the blockchain-based tax collection system is secure and reliable. This can be achieved by implementing measures such as encryption, secure authentication, and secure data storage. Additionally, governments should ensure that the system is scalable and can handle large volumes of transactions. The system should also be able to easily integrate with existing systems, such as tax filing software, to make it easier for taxpayers to file their taxes. Furthermore, governments should ensure that the system is transparent and open to citizens, allowing them to view their transactions and tax payments.

Table 4.6 Tax Collection Management Strategy Based on Blockchain Technology

Field	Description
Data Storage	A blockchain ledger is used to store information about tax collection, including the amount of tax collected, the date it was collected, and the entity from whom it was collected.
Tax Calculation	The system uses a set of rules and algorithms to accurately calculate the amount of tax due from each entity.
Payment Processing	The system is capable of processing payments from entities, including credit cards, digital wallets, and other payment methods.
Audit Trail	The system generates an audit trail of all transactions and activities related to tax collection.
Security	The system utilizes blockchain technology to ensure the security of the data and transactions.
Reporting	The system provides detailed reports on the status of tax collection, including the amount of tax collected and the entities from whom it was collected.

Tax Collection Database stores all the records related to the collection of taxes from taxpayers. It includes information such as the amount of taxes collected, the type of taxes collected, the dates of collection, etc. The Taxpayer Management System handles the registration and management of taxpayers. It contains all the information related to taxpayers, including their contact information, payment history, and other relevant data.

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Taxpayer Portal allows taxpayers to access their information and manage their accounts online. It also allows them to make payments, view their tax statements, and do other related activities. The payment Processing System processes the payments made by the taxpayers. It verifies the payments, processes them, and records the payments in the database. Reporting System provides reports on tax collection activities. Table 4.6 contains information such as the total amount of taxes collected, the types of taxes collected, the dates of collection, and other relevant data. The Tax Auditing System is responsible for ensuring compliance with applicable laws and regulations. It performs audits and reviews of the tax collection activities to ensure accuracy and detect any discrepancies.

Table 4.7 Tax Collection Management System Components

Component	Description
Taxpayer Database	Stores data related to taxpayers, including their personal information and tax filing records.
Revenue Authority Database	Stores data related to the revenue authority, including their policies and procedures.
Tax Collection Platform	Provides a secure and reliable platform to facilitate the collection of taxes.
Blockchain Technology	Enables secure and transparent transactions between taxpayers and revenue authorities.
Smart Contracts	Enables automated execution of transactions between taxpayers and revenue authorities.
Analytics	Provides insights into the performance of the tax collection system and identifies areas for improvement.

CHAPTER 5

THE IMPLEMENTATION PATH OF BLOCKCHAIN IN TAX MANAGEMENT

5.1 Internal Environment Research and Recommendations

5.1.1 Establish a Taxpayer-Oriented New Service Concept

(1) Establish the concept of "Management is a duty, service is an obligation" in tax work, management is the duty of tax authorities, and service for taxpayers is its legal obligation. The staff of tax authorities are not only managers and law enforcers, but also service providers for taxpayers. They should change the traditional concept of tax work and pay attention to the importance of service. Under the guidance of the new public service theory, it should be integrated into the daily tax payment service work, establish the modern and new service concept, and highlight the subject position of taxpayers, the system formulation and process operation should first consider the requirements of taxpayers, for the sake of taxpayers, and always establish the taxpayer-centered service concept. Meet all legitimate needs of taxpayers within the scope of tax law and relevant laws and regulations.

Deepen the level of tax payment services. Lu Honglin believed that the taxpayer should be transformed from management to service, so as to enable taxpayers to fulfill their tax obligations actively in accordance with the tax law and relieve the tension between tax collection and payment. In the process of service, tax authorities should understand the needs of taxpayers and actively provide services for taxpayers. Give consideration to the particularity of each taxpayer and meet the legitimate individual needs of taxpayers; Change the traditional face-to-face service to zero contact information service; To provide taxpayers with whole process tracking services, and tax payment services throughout the whole process of tax collection and administration.

(2) Improve the awareness of tax payment service informatization.

Although the development of modern information technology has provided a powerful means for tax service, if the tax staff does not fully realize the necessity of information construction of tax service, it will not be able to fundamentally achieve this goal. Taxpayers' new demands for tax services in the Internet era are the embodiment of Adam Smith's famous "Four principles of taxation" fairness, certainty, convenience, and economy. In order to realize the deep integration of the Internet and tax service and realize zero service area for tax collection and administration, tax authorities should actively introduce or train computer talents at the present stage and expand the Internet thinking and modern vision of information technology group staff. At the same time, it is also necessary to continuously improve the informatization quality of other tax staff, vigorously carry out Internet application training and guidance, enhance the ability to apply the "Internet + tax" working mode, improve the working ability, actively respond to the needs of taxpayers, and provide informatization tax service conforming to the development of modern society.

5.1.2 Realize the Online Calling Mode and Promote the Business Package

At present, Shenzhen National Tax Administration is still the traditional entity calling machine mode, and the single function makes the calling machine unable to meet the needs of current taxpayers. Based on the one-window operation of a tax-related business, the author believes that the online calling and queuing APP platform of tax service should be developed and utilized, and it is no longer subject to the calling machine service of the tax service hall. The real sense of "mobile tax handling", such as the opening of the "mobile tax handling", enables taxpayers to reasonably arrange the time of tax handling. It not only alleviates the congestion of the tax handling service hall and long queuing time but also improves the timeliness of tax booking.

(1) The background server is connected to the calling machine of the tax service hall

It can make real-time statistics of the dynamic data of the tax service hall, master the queuing situation of the tax service hall, analyze the average processing time and average waiting time of each work item through the data, and analyze the road condition combined with the electronic map, so as to accurately predict the arrival of taxpayers at

the service hall. At the same time, taxpayers can also query the information of staff on duty, waiting for numbers and other information through the mobile phone calling APP, and make an appointment to call the number according to their actual work needs. At the same time, the APP can also realize the reminder service. For example, when taxpayers make an appointment for tax-related business, the APP can inform them of the required information at one time and specify the relevant matters for attention, so as to prevent the phenomenon of excessive running due to the taxpayer bringing less or no information.

(2) To promote the comprehensive handling of some tax-related business packages

The comprehensive management of tax-related business packages means that through the process of tax reduction and tax-related reduction, multiple related matters with a high frequency of taxpayer application, complex business, high upstream and downstream correlation, and cross-system operation need to be integrated into business packages. On January 20, Nanjing Gulou (2017) District National Tax Bureau and Wuxi National Tax Bureau piloted the comprehensive application package for new enterprises. On March 1, 2017, on the basis of trial operation experience, the implementation of a "Comprehensive application package for new enterprises" has been launched across the province. So far, Shenzhen National Tax Administration has vigorously promoted and guided taxpayers to adopt tax-related business packages comprehensive handling matters through the tax hall bulletin board, WeChat public account, publicity brochures, etc., and has been included in the training plan of the tax school. The comprehensive handling of tax-related business packages is not only an important measure to promote convenient tax handling, but also an important measure to further promote "Internet + tax". It can effectively solve the problem of taxpayers' repeated trips and tax authorities' repeated handling, alleviate the occurrence of hall exclusion and congestion, and maximize to meet the need of taxpayers for convenient, fast, and efficient tax handling.

5.2 Study and Suggestion for Risk Assessment

5.2.1 Promote the Construction of Electronic Base Supplement Facilities with a Focus on Creating Data

Infrastructure construction is the premise of e-tax application. The construction of electronic tax infrastructure should follow the overall plan of the "Golden Tax Phase III" project, adhere to the principle of "meeting demand, maintaining redundancy and moderately forward-looking", establish a coordinated and efficient infrastructure platform with resource sharing, safety and stability, and strong guarantee, to support the sustainable, rapid and healthy development of tax revenue business.

(1) Planning the overall architecture of the infrastructure platform. The overall structure of the infrastructure platform should meet the needs of the continuous development of the tax administration business strategy. The overall architecture physical computing system, storage system, and network system, logically includes the physical resource, the resource pool layer, middle layer management, the service-oriented architecture (Service Oriented Architecture, SOA) layer, etc. Fully deploy computing systems, storage systems, network systems, security systems, and data backup systems with good performance, and build provincial data centers and prefecture-level data centers.

(2) Improve the electronic tax disaster recovery backup system. Adhering to the construction principles of "overall planning, resource sharing, hierarchical management and combination of peacetime and war", the government fully mobilizes and gives play to the enthusiasm of all parties, uses the data center, telecom mc room and the South China Sea disaster recovery center to build an electronic tax disaster recovery system of "two places and three centers", and comprehensively improves the ability to withstand disasters and recover from disasters.

(3) Improve infrastructure service delivery capacity. Based on the strategic goal of building an e-tax cloud, relying on provincial and municipal data centers, effectively integrating infrastructure resources, providing support for e-tax with sustainable, safe, and stable service forms, and leading the innovative development of tax administration.

(4) Give full play to the leading role of electronic tax application. Keep up with the development pace of e-taxation, explore and study the new development and new trend of e-taxation, and combine the work practice, actively introduce, practice, and apply new technologies to promote the process of tax modernization. Build a perceptive tax infrastructure support platform, promote visual management capacity building, explore the realization of mobile tax, promote intelligent operation and maintenance of data centers, and optimize the construction of data centers.

(5) Implement strategic management of infrastructure construction. To formulate provincial and municipal guidelines for infrastructure construction, realize the whole-life cycle management of infrastructure, protect infrastructure investment, and strengthen the dynamic expansion capacity of infrastructure.

5.2.2 Promote the Construction of an Electronic Tax System with Business Value Creation as the Orientation

According to the requirements of tax administration reform, through continuous improvement and optimization of the management process, to achieve the normalization, standardization, and efficiency of various business process operations, establish a management process system with tax compliance management as the core, covering tax payment services, tax law enforcement, legal management, law enforcement supervision, human resources, information technology and administrative security and other major management fields. To build a new generation of tax administration information systems, adhere to the importance of business leadership and technology guidance, comply with the development requirements of modern tax administration, actively build two portals of internal and external networks, build a tax administration platform integrating online tax bureau, business operation process management, and decision support management, and strengthen the four defensive lines of process, error correction, verification, and accountability. Comprehensively support the reform and innovation of tax administration business.

(1) Construction of standard and standard general technical support platform. Based on the concept of SOA, taking specification as the premise, service as the orientation, and reuse as the means, through unifying the architecture model and establishing the development standard, it provides the basic supporting environment for the information

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system, and finally builds the general technical support platform of standards and specifications, so that the information system is easy to maintain and expand, and better adapt to the needs of business changes. Unified system architecture model, standardized system development standards, establish a common support integration environment.

(2) Build an integrated and unified internal and external network portal. Relying on the general technical support platform, various information resources are integrated to build an internal and external network portal with unified entrance, authentication, and management, so that the information system is easy to maintain and expand, and better adapt to the needs of business changes. Strengthen the construction of a service-oriented Internet portal, and build a standard and standardized integrated business Intranet portal.

(3) Strengthen the construction of functional areas of the online tax bureau centering on taxpayers. Firmly establish the taxpayer-centered customer concept, fully rely on modern information technology, integrate and optimize tax service system resources, and gradually build an online tax bureau integrating standardized tax consultation, diversified tax service, intelligent demand analysis, scientific tax service performance evaluation, and other functions, strive to reduce the cost of tax collection, and constantly improve taxpayer satisfaction. The integration of online declaration, remote copy, online certification, direct reports of key tax sources, ordinary invoice issuance, and other systems, vigorously promotes the diversification of modern tax service interaction. Realize the integration of the online tax bureau and the entity tax bureau. In accordance with the requirements of further clarifying the relationship between the rights and obligations of taxpayers and tax authorities, as well as the return of responsibilities and rights to taxpayers, a core tax compliance management process based on the taxpayer self-assessment system and oriented by risk management has been established, and the functions of the online tax bureau have been further expanded. Taxpayers can submit tax-related matters through the online tax bureau. Bad records and tax-related reminders can be automatically pushed through the online tax bureau. Promote the comprehensive electronic of taxpayer information and explore the intelligent perception of tax-related information.

(4) Promote the construction of business operation process management function domain focusing on management innovation. Centering on the core process of modern tax administration and modern administrative management concepts, a unified and standardized tax business support platform should be established to improve and innovate the tax administration and administrative office mode, so as to ensure the standard operation of the tax business operation process. Through the integration and expansion of the functional domain of the business operation process, external tax compliance should be effectively promoted, the tax loss rate and tax cost should be gradually reduced, and the quality and efficiency of tax collection and administration should be continuously improved. Internally, we should constantly improve and optimize the process of administrative management, strengthen the supervision and restriction of administrative power, and constantly improve the efficiency of administrative management. Integrate business operation information systems, promote the optimization and transformation of collection and management processes, improve the "two rights" supervision system, and realize mobile and paperless offices.

(5) Strengthen the construction of the decision support management function domain to improve auxiliary decision-making. Comprehensive use of data warehouse, online analysis processing, data mining, model library, database, knowledge base, and other technologies, continuous optimization of tax data warehouse, integration of monitoring and decision system functions, further improve the level of auxiliary decision support, and step forward to intelligent decision making and group decision making based on neural network. Promote the integration of the decision support system, expand the function of the data warehouse, actively try the application of new technologies such as data mining tools, further improve the construction of the data mart, optimize system performance and operation efficiency, continue to deepen data analysis and application, build a complete decision, evaluation, and feedback closed loop, explore the application of intelligent decision and group decision.

5.2.3 The Basic Structure of the Blockchain System

Advantages of using blockchain technology in bill business of Shenzhen Tax Bureau.

(1) Policy advantages

In recent years, in order to further increase the convenience of micro, small, and medium-sized enterprises financing, our country's financial regulatory authorities issued a series of policy documents, which provided a lot of help for micro, small, and medium-sized enterprises financing, increasing the scale of loans to micro, small and private enterprises which are not strong economic strength and slow capital flow speed. In 2018, the People's Bank of China increased the quota of commercial banks' re-lending, rediscount, and collateralized supplementary loans by a total of 400 billion yuan, lowered the re-lending rate by 0.5%, and guided financial institutions to actively support the financing of micro, small and medium-sized enterprises, reduce their financing costs, and enhance their vitality. Effectively promote the economic strength of relatively weak micro, small and medium-sized enterprises development. In terms of the application of blockchain technology, since 2016, our government departments have strongly supported the application research of blockchain technology. At present, government departments have issued many policy guidance documents to promote the development of blockchain, as shown in Table 5.1. Shenzhen Taxation Bureau faces a favorable policy environment. In addition, Shenzhen Taxation Bureau launched a landing project of the application of blockchain technology in the bill business of commercial banks -- ticket chain business, which complied with the development direction of national policies and played a leading role to a certain extent, during the critical period when China vigorously promoted the development of blockchain technology and supported financial institutions to increase the loan quota for companies with poor financing ability.

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Table 5.1 China's Blockchain Industry Policy Document

time	Documents and contents
2016.12	A circular issued by The State Council on the issuance of the 13th Five-Year Plan for National Informatization points out that blockchain is an important technology that will change people's way of life.
2017.1	The General Office of the State Council proposed to improve the application level of blockchain technology in its opinions on innovating management and optimizing services to foster and strengthen new drivers of economic development and accelerate the continuous transformation of old drivers into new ones.
2017.7	The State Council issued a notice on the development plan for the new generation of artificial intelligence, proposing to promote the coordinated development of blockchain technology and artificial intelligence.
2017.8	The State Council has issued a guideline on further expanding and upgrading information consumption and continuously releasing the potential of domestic demand, proposing pilot applications based on emerging technologies such as blockchain and artificial intelligence.
2017.11	The Guiding Opinions of The State Council on deepening the "Internet plus Advanced Manufacturing Industry" to develop the industrial Internet are put forward to Promote the application research and exploration of the emerging blockchain technology in the industrial Internet.

Source: Gov. cn

(2) Social Advantages

Relevant data show that the number of enterprises specializing in the application of blockchain technology and related businesses in the field of blockchain has increased by 65.2% compared with 2012. Many Chinese enterprises actively conform to the social trend and seize the opportunity. According to the 2018 annual blockchain research statistics "White Paper on the Development of China's Blockchain Industry", 178 companies specializing in the operation of blockchain technology were officially established in China in 2017. By the end of March 2018, there were a total of more than

450 blockchain technology innovation enterprises. The Chinese blockchain industry has formed a complete upstream and downstream industry chain, and many enterprises have joined the team of blockchain applications. Tencent, Alibaba, JD, and Baidu Finance successively launched blockchain application projects, as shown in Table 5.2, which promoted the development of China's blockchain industry.

Table 5.2 Blockchain Application Status of Chinese Internet of the Leading Company

Company	The Application of Blockchain
Tencent	Supply chain finance, healthcare, digital assets, logistics information, legal documentation.
Alibaba	Public welfare, authentic product tracing, rental housing tracing, mutual insurance.
Baidu finance	China's first asset securitization products use blockchain technology as the underlying technology and exchange asset securitization products.
Jingdong	A blockchain information verification platform has been established to solve the trust problem of commodities.

Source: China's Blockchain Industry Development White Paper

In addition, the number of blockchain application projects in financial, medical, industrial, energy, and other industries is also increasing, which can be seen that Chinese enterprises attach great importance to blockchain technology. In this context, the combination of blockchain and commercial banks is a direction for the future development of blockchain, and blockchain notes are considered to be the most typical scenario in which blockchain is applied to commercial banks. On January 25, 2018, the experimental products of a digital bill trading platform with blockchain technology as the main technology have been successfully put into market operation, and the issuance, acceptance, discount, and transfer discount of digital bills have been successfully completed [38]. In the future, blockchain bills will have broader prospects for development. Chinese commercial banks attach great importance to blockchain technology. China Merchants Bank, China Minsheng Bank, and other banks began to

enter the blockchain field in 2015, when blockchain technology developed rapidly, and launched application projects one after another. Social factors have played a certain role in promoting the launch of Shenzhen Tax Bureau's ticket chain products [39].

Tax loss has existed since tax revenue came into being. With the rise of the digital economy, tax loss has a new form. Law-abiding economic activities are called aboveground economy, while illegal and illegal economic activities are called underground economy, and both kinds of economy have their own fixed size. Some aboveground economic participants, in order to obtain maximum benefits, through tax loopholes, amount to tax fraud, resulting in aboveground economic tax loss. As the participants of the underground economy are separated from the legal boundaries in their economic activities, the scale of the tax loss caused by the underground economy is often difficult to be monitored the tax authorities. Therefore, it is difficult to calculate the scale of tax loss caused by the underground economy with a special suitable method in the actual economic activities. At present, only the cash ratio method is relatively suitable.

The cash ratio method calculates the scale of tax loss in the underground economy according to a certain premise, that is, the cash amount and demand deposit ratio do not change, while the monetary stability, deposit reserve ratio, tax rate, transaction costs, and other factors should also remain basically stable. According to market rules, the formula of the cash ratio method is as follows:

$$Y_u = \frac{1}{B} Y_O \frac{(K_u+1)(C-K_O D)}{(K_O+1)(K_u D-C)}$$

(5.1)

In Formula (5.1), C is real currency holdings; D is the actual demand deposit. Ko and Ku represent the ratio of above-ground and underground currency to demand deposits respectively. Y_O and Y_u respectively represent above-ground and underground economic scales.

However, when calculating the scale of the underground economy, it is impossible to estimate the trading media other than cash, so all underground transactions are generally regarded as cash transactions, that is, the value of Ko in formula (5.1) is regarded as 0 and the value of Ku is regarded as infinity. In social economic activities,

the amount of cash and the number of demand deposits will change due to various economic factors. Here, to calculate the size of the underground economy, we assume that this ratio (Ko) is relatively stable. In addition, in order to facilitate calculation, the underground economic velocity, and the above-ground economic turnover velocity are also regarded as relatively equal in formula 5.2, namely, B=1. According to the above preconditions, the cash ratio formula can be optimized as follows:

$$Y_u = Y_O = \frac{C - K_O D}{(K_O + 1)D} \qquad (5.2)$$

Table 5.3 Cash in Circulation and Demand Deposits (2009-2021)

Time(year)	Cash in circulation(C)	Current account(D)
2009	34218.96	131998.17
2010	38246.97	183198.84
2011	44628.17	221993.37
2012	50748.46	239099.24
2013	54659.77	254004.46
2014	58574.44	278716.61
2015	60259.53	287796.88
2016	63216.58	337736.86
2017	68303.87	418253.37
2018	70645.6	473144.55
2019	73208.4	478477.51
2020	77189.47	498819.68
2021	84300	541300

Data source: Eastmoney.com

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As shown in Figure 5.1, there is a certain correlation between cash in circulation C and demand deposit D (not related to time), and the correlation trend can be predicted by drawing a graph on the coordinate axis and a linear formula can be obtained:

D=8.6105C-179691 According to the relation between cash in circulation C and demand deposit D in Formula (5.2), it can be seen that C/D is coefficient K by using the limit method, and cash ratio Ko can also be redefined as a constant L1, namely:

L1 = C/D = 0.116

L1=0.116 is substituted into Formula (5.2), where Yo is generally represented by gross domestic product (GDP). Table 5.4 can be obtained from this equation.

Current account

Trend chart of demand deposits and cash in circulation

y=8.6105x-179691
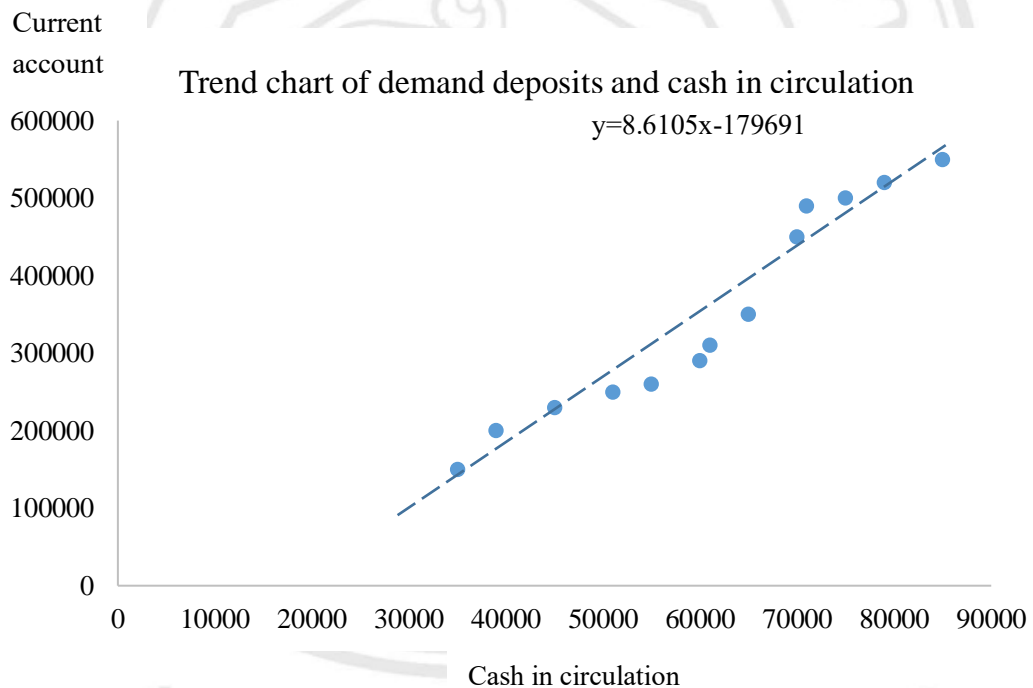
Figure 5.1 Linear relationship between cash in circulation and demand deposits

D, Yu calculated the scale of the underground economy in Table 5.4 and then calculated the scale of the annual tax loss of the underground economy. Tax loss scale of underground economy = scale of underground economy × rate of the macro tax burden, in which rate of macro tax burden = current tax revenue /GDP, the scale of tax loss over the years can be calculated according to the above formula, and Table 5.5 is shown below.

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Table 5.4 Statistical Table of the Scale of Underground Economic Activities

(2009-2021) Unit: 100 million yuan

year	Tax revenue	GDP	C	D	The scale of the underground economy (Yu)
2009	54223.79	319244.60	34218.96	131998.17	40974.91
2010	59521.59	348517.70	38246.97	183198.84	28972.19
2011	73202	412119.30	44628.17	221993.37	31401.50
2012	89720.31	487940.20	50748.46	239099.2	42082
2013	100600.88	538580	54659.77	254004.46	47870
2014	110497	592963.2	58574.44	278716.61	50028.72
2015	119158	643563.10	60259.53	287796.88	53850.63
2016	124892	688858.20	63216.58	337736.86	43934.48
2017	130354	746395.10	68303.87	418253.37	31638.40
2018	144360	832035.90	70645.60	473144.55	24834.94
2019	156402	919281.10	73208.40	478477.51	30480.27
2020	157992	986515.2	77189.47	498819.68	34248.91
2021	154310	1015986.2	84300	541300	36175.11

Data source: GDP, C from Eastmoney.com,

According to Table 5.5, the scale of the underground economy tax loss over the years and its proportion in the total tax revenue can be calculated, as shown in Table 5.6. As can be seen from Table 5.6, the proportion of underground tax loss began to decline from 12.82% in 2009, stabilized at about 8% during 2010-2015, and began to decline in 2015 with the promotion of tax administration digitization and information technology. From 2018 to 2021, the proportion of underground tax loss showed a sharp decline.

Table 5.5 Statistical Table of Tax Loss Scale of the Underground Economy (2008-2020)

Unit: 100 million Yuan

year	Tax revenue	GDP	Macro tax burden rate	The Scale of the underground economy	The scale of underground tax revenue loss
2009	54223.79	319244.60	16.97%	40974.91	6953.44
2010	59521.59	348517.70	17.08%	28972.19	4948.45
2011	73202	412119.30	17.76%	31401.50	5576.91
2012	89720.31	487940.20	18.39%	42082	7738.88
2013	100600.88	538580	18.68%	47870	8942.12
2014	110497	592963.2	18.63%	50028.72	9320.35
2015	119158	643563.10	18.52%	53850.63	9973.14
2016	124892	688858.20	18.13%	43934.48	7965.32
2017	130354	746395.10	17.46%	31638.40	5524.06
2018	144360	832035.90	17.35%	24834.94	4308.86
2019	156402	919281.10	17.01%	30480.27	5184.69
2020	157992	986515.2	16.02%	34248.91	5486.68
2021	154310	1015986.2	15.19%	36175.11	5495

Data source: Tax revenue and GDP are from Eastmoney.com, and the rest are calculated.

Table 5.6 Proportion of Underground Tax Scale in Tax Revenue

year	Tax revenue	The scale of underground tax revenue loss	ratio
2009	54223.79	6953.44	12.82%
2010	59521.59	4948.45	8.31%
2011	73202	5576.91	7.62%
2012	89720.31	7738.88	8.62
2013	100600.88	8942.12	8.89%
2014	110497	9320.35	8.43%
2015	119158	9973.14	8.37%
2016	124892	7965.32	6.38%
2017	130354	5524.06	4.24%
2018	144360	4308.86	2.98%
2019	156402	5184.69	3.31%
2020	157992	5486.68	3.47%
2021	154310	5495	3.56%

The existence of tax loss in the underground economy leads to a large amount of tax that cannot be deposited in time, and the social economy will also be affected. To a large extent, the persistence of tax loss is due to the fact that the working information of tax departments is not able to timely and comprehensively disclose tax-related units, organizations, or individuals in social and economic events, which leads to the conscious or unconscious tax evasion of taxpayers in order to maximize the benefits. The decentralization of blockchain, indocility, distrust, traceability, and the natural properties of the smart contract can well guarantee the reliability and openness of data on each node of the blockchain, effectively solving the problem of information asymmetry between the two parties in tax administration from the technical level, and reduce the incidence of tax loss to the greatest extent. Indirectly improve the tax compliance degree of taxpayers and their satisfaction with the work of tax authorities, so as to improve the efficiency of tax collection and tax governance. In the process of tax administration, the application of blockchain technology to update the tax administration work system, optimize the tax risk

research and judgment mechanism, and improve the level of tax work will play a decisive role in basically realizing the information symmetry pattern of tax administration work and enhancing the awareness of taxpayers to cooperate with tax work.

5.3 Research and Recommendations on control activities

5.3.1 To Achieve Smart Taxation as the Goal to Promote The Construction of Information Resources Management

Adhere to the status of data as the core resource in tax administration, do a good job in data source management and external data intelligence collection, improve the quality of data, carry out multi-level data analysis and application, and give full play to the supporting function of data in tax administration. Build a data processing center, promote the construction of a data warehouse, strengthen the management of tax data information, explore the application of big data, build a big data analysis application platform, and ultimately provide intelligent data information resources.

(1) Expand and integrate data and intelligence sources. Expand the way of data and information collection. To further expand the collection scope of internal data information of national tax authorities, adopt the means of Internet uploading, video, manual input, etc., to realize the diversification of data collection channels and carriers. Use the data exchange platform to conduct sufficient data exchange with other government departments, enhance the comprehensive service capacity of information resources, and meet the needs of the development of tax administration. Promote effective integration of source data. Unified integration of all kinds of isolated and heterogeneous data sources, the use of reasonable data extraction tools and data conversion tools, targeted writing of data conversion code, completing the original data collection, error data clearing, heterogeneous data integration, data structure conversion, data dump, and data regularly refresh the whole process. Provide efficient and standardized data interface. Construction of standard interface, unified data acquisition, output channels, and standards. Pay attention to interface permission management to ensure data access is controllable and secure. Focus on strengthening the connection with the "Gold tax Phase III" project data interface, to ensure the seamless and efficient flow of data information.

(2) Optimize the architecture of the data warehouse system. Continuous improvement of operational data storage (ODS). By means of information classification standardization, user view standardization, concept database standardization, logical database standardization, and data logical structure standardization, the data element standardization of source data is realized. After unified integration, the data source information is filtered and identified, and the data is classified and defined according to the needs of tax business, so as to form a unified standard ODS for multiple business topics, and realize the "co-construction and sharing" of the database. Promote the construction of enterprise-level data model (EDM), build departmental and prefecture-level data mart according to demand, and build a complete data warehouse management mechanism.

5.3.2 To Standardize the Management Process as a Means to Promote the Construction of Electronic Service Capability

Centering on the basic framework of e-tax governance, with process standardization and system science as the main line, the construction of an e-tax project management process and ITIL management process as the focus, the establishment of a sound scientific e-tax service system and the continuous improvement of e-tax service quality.

(1) Implement electronic tax project management. Introduce advanced project management theories, improve the construction of e-tax project management process system, fully implement e-tax project management standards and norms, implement project process control, monitor project development track, correct the deviation between goals and status quo, improve the control and implementation ability of project management, and realize the project management method covering the whole project life cycle. According to the actual implementation of e-tax projects, from the strategic level of project management, the controllable management of e-tax projects should be promoted mainly from the following aspects: standardized project process management, e-tax project risk management, standardized project quality management system, standardized project process document management, and standardize project performance evaluation mechanism.

(2) Improve the e-tax service process. In accordance with ITIL standards, the system operation and monitoring platform should be integrated, and the e-tax service organization system should be improved by establishing the e-tax service management system, further standardizing the e-tax service process and content, and strengthening the e-tax service audit analysis. Establish the e-tax service management system, improve the e-tax service organization system, establish the ITIL management process, standardize the e-tax service content, strengthen the e-tax service audit analysis, and realize the service standard filing and upgrading.

(3) Enhance the quality and effectiveness of e-tax services. Strengthen the construction of information systems, evaluate the effectiveness of the implementation of rules and regulations, constantly improve the e-tax service system, and realize the overall improvement of the quality of e-tax service. Improve the e-tax service system, promote the effectiveness assessment of the system implementation, support the continuity management of e-tax service, form a proactive response service model, and promote standardized service provision.

5.4 Information and communication research and Recommendations

5.4.1 Attach Importance to Electronic Invoice Data Processing

Attach importance to electronic invoice data processing, as shown in Figure 5.5:

First of all, the electronic invoice information system should strengthen the maintenance and operation of the electronic invoice database system and invoice issuing, tax copying, tax declaration, and other sub-application systems. To realize the closed management of ordinary invoices such as examination and approval, purchase, issuance, old inspection, payment and cancellation, examination and comparison, and monitoring, accelerate the informatization, standardization, and paperless of enterprise office, so as to truly realize the electronization of invoices.

Secondly, it should strengthen the recording, analysis and comparison of electronic invoice data information, use big data and cloud computing processing technology, introduce data processing talents, improve technical personnel's skills in financial accounting, tax law, law, and other aspects, and effectively master the knowledge of

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computer, VAT electronic invoice system, and third-party platform construction. And continue to deepen the technical staff to the actual operation of the electronic invoice management system master's degree.
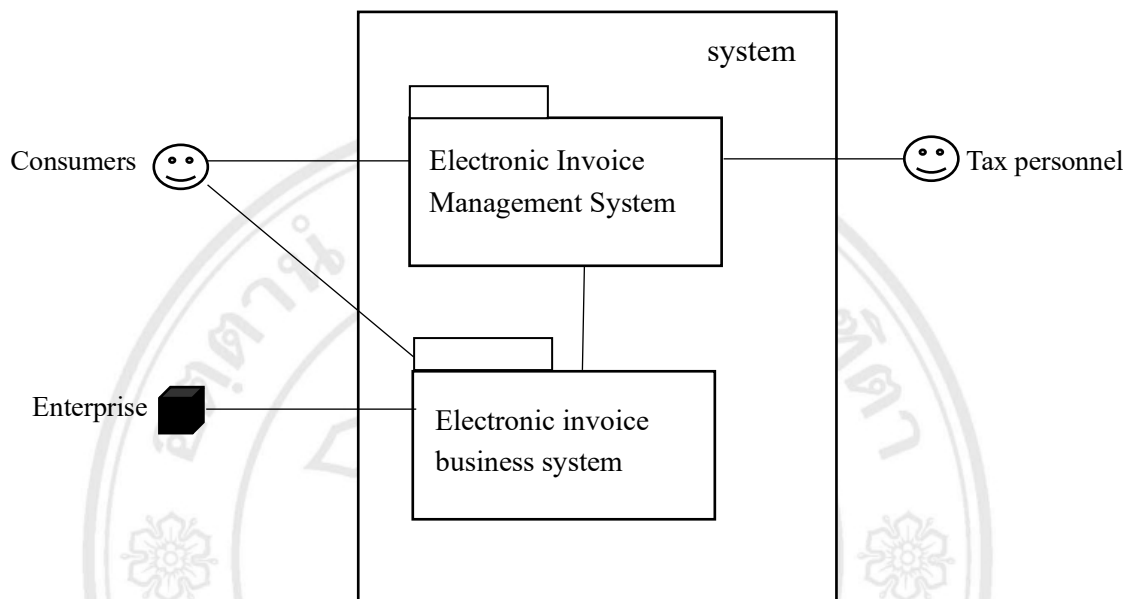

Figure 5.2 Overall System Use Case Diagram (explained above)

Finally, the ability and level of tax authorities to use big data to serve tax collection and administration should be improved. Connect the data processing application results with the actual tax collection and administration, study the connection between invoice data and tax declaration and other aspects of tax collection and administration, and constantly accumulate, analyze, and summarize the data processing experience. Establish a national unified electronic invoice application service organization and comprehensive technology platform. Any registered enterprise can log in to this platform to input relevant invoice information and transfer it to the invoicing and tax authorities. All data will be included in this platform to facilitate the timely processing of corresponding data by the tax authorities. On the basis of data processing and analysis, the analysis results are used to establish the risk control model of billing information, and the invoice information is used to strengthen the supervision of tax sources and gradually improve the tax governance system, so as to improve the tax compliance degree to achieve the goals and requirements of the modernization of governance capacity.

5.4.2 Optimize the user experience of e-invoices

First of all, the national tax authorities should create an application market for the taxpayer software, open up ways to release the official website software, provide release channels and display tutorials for the endless taxpayer software platforms, and provide a free download experience for the taxpayer units, so as to reduce the operation and maintenance costs of the taxpayer developing related software and the third-party platforms. Ensure the sharing of application software platforms in different regions, avoid repeated development and construction, and simplify the functions of the software platform system to improve the user experience and recognition of e-invoices. For example, in the aspect of mobile billing, multiple social forces are encouraged to participate in the development of applications, research multiple billing terminals, reduce excessive reliance on special equipment for billing, realize the use of mobile phones, tablets, and other communication tools and equipment for billing, and avoid excessive binding of special equipment.

In addition, from the standpoint of purchasers, tax authorities understand that the motivation that can promote the successful application of electronic invoices is the facilitation and diversification of purchasers' access to invoice information carriers. The membership card and VIP card issued by the business can be used as the media to apply for invoices, check the authenticity and issue rewards; In addition, consumers pay special attention to the usage rate of the information carrier. Firstly, the inducement factors of the information carrier should be increased to enable users to raise their awareness of the active use of the information carrier to obtain a higher degree of user satisfaction. For example, the incentive system for the use of electronic invoices should be established, improved, and promoted. In the first 6 months of the promotion of electronic invoices, partial rewards will be given to the invoicing users. If the number of electronic invoices issued by the invoicing users reaches a certain number or the invoicing amount of electronic invoices exceeds a certain limit, quota or fixed rate incentive measures will be given. Second, it is necessary to expand the memory rate of the information carrier, such as proactively verifying the approval authority of the electronic invoice, and giving corresponding subsidies according to the cost of different information carriers consumed by different enterprises. The third need is to improve the integrity of the information

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carrier system platform. If the enterprise does not choose the third-party platform of e-invoice, it can choose to build its own e-invoice management system platform, which can connect with the enterprise ERP or business management system to obtain sales information and automatically connect with the electronic invoice management system of the tax authority.

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CHAPTER 6

CONCLUSION AND PROSPECT

6.1 Conclusion

The emergence of the electronic invoice has brought a very far-reaching effect on the whole of society. For taxpayers, electronic invoices reduce paper costs, improve work efficiency, and optimize the tax experience. For the government, e-invoice promotes the process of "Internet + tax", improve the level of tax collection and administration, and enables the government to better realize the transition from "tax controlled by vote" to "information tax"[40]. For society, electronic invoices save social resources and reduce environmental pollution. It can be said that electronic invoices meet the needs of economic and social development. Therefore, with the introduction of relevant laws, the development of science and technology, and the continuous optimization of the network environment, an electronic invoice will truly realize the inclusive tax and smart tax. However, before e-invoicing became widespread, there were still some problems: repeated reimbursement and record keeping. At present, these problems mainly rely on spontaneous or third-party auxiliary management means to solve, and cannot be fundamentally avoided. In addition, in the aspect of e-invoice management, although there are many kinds of e-invoice service providers, each has advantages and disadvantages, and cannot really realize the popularization of the functions of e-invoice.

With Bitcoin fever sweeping the globe, society seems to be entering a new phase. As the underlying core architecture of Bitcoin, blockchain technology has also received more and more attention. At present, blockchain has been increasingly applied in various fields of society, especially in currency, finance, payment, charity, and other aspects. Blockchain technology is a decentralized distributed database in essence. Relying on technologies such as asymmetric encryption, P2P network, and consensus mechanism, it can well realize point-to-point transactions and distributed storage with low trust cost.

By building an electronic invoice cloud platform based on blockchain technology,

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it can give full play to the characteristics of blockchain decentralization, consensus algorithm, and distributed broadcasting. This will help solve the pain points existing in the application ecology of e-invoice: first, the decentralized characteristics of blockchain technology are utilized to realize distributed storage based on the blockchain network, and the reliable flow, consistency, and tamper-proof data are guaranteed through consensus encryption and algorithm of the vast number of nodes; The second is to use the public account book jointly maintained by all nodes to solve the problem of repeated reimbursement, repeated entry and data inconsistency of the electronic invoice; Third, electronic invoicing involves invoicing parties, issuing parties and consumers. The dissemination of blockchain-distributed networks can avoid the inconsistency of electronic invoicing data, prevent data tampering, and improve the accuracy and efficiency of data.

Although there are many benefits of using blockchain technology in tax management, there are also certain limitations: firstly, the cost and efficiency problems brought by distributed storage. The distributed storage of blockchain means that each node stores all the information, which will lead to the redundancy of a large amount of data. Secondly, the unsoundness of laws and regulations. China's current attitude towards blockchain is to strongly support the development of blockchain, but it is only a policy provision for blockchain from some security perspectives, and no corresponding strong laws and regulations have been introduced to restrain it. As an emerging technology, blockchain has legal gaps and even conflicts with existing laws. Thirdly, the problem of network security. Blockchain de-trusting will be highly transparent information, but also brings various privacy and security issues to be exposed. Fourth, is the problem of enterprises' willingness to disclose data. The chain established by blockchain requires all enterprises to disclose their transaction information, and financial data are generally regarded as trade secrets and not willing to be released to the public, which is a problem for certain enterprises that need a high degree of confidentiality.

6.2 Innovation Point and Shortcomings

The speed of science and technology penetrating into life is getting faster and faster, With the rapid development of the Internet, new technologies emerge in an endless stream. In the era of "Internet plus", we should also take advantage of the easterly wind of science and technology to better change our lives. Our country is facing a deep-water period and overcoming major difficulties of tax reform at present, so it is particularly important to realize tax modernization faster and better.

Electronic invoices, as an important step in the realization of Tax electronic, play a pivotal role. The combination of the emerging technology of blockchain and electronic invoices is only the first step to opening a new way of thinking. At present, the research on e-invoice platforms has not solved the problem of information sharing, which is easy to generate information barriers between taxpayers and the government, which is not conducive to the popularization and promotion of e-invoices. At the same time, current technology does not fully solve the problem of collaboration. Therefore, the electronic invoice cloud platform based on blockchain constructed in this paper can only realize function sharing and collaborative cooperation by integrating many current e-invoice service providers. However, it can be imagined that in the future, a mature invoice system based on the blockchain should be able to integrate all the commodity flow, capital flow, invoice flow, and tax flow into the chain, transform electronic invoices into a digital invoice, solve the problem of information island, realize the comprehensive sharing of information, and greatly improve the level of tax administration. It can even be imagined that when blockchain is integrated with tax, fintech, digital currency, and tax technology will achieve a high degree of integration, and all kinds of tax procedures will be almost transparent, tax period, declaration, deduction, rebates, and other concepts will completely disappear, the system will be completely automatic processing, government tax departments and taxpayers related operations zero burdens.

6.3 Compare the Similarities and Differences in Results at Home and Abroad

In a word, the research, exploration, and application of blockchain begin almost at the same time at home and abroad, and focus on the BFT consensus algorithm, atom cross-chain, sub-chain, and other bottom key technologies. The international giant will take the blockchain as the core strategy to carry on the layout, unceasingly providing the human resources and the material resources, gathering the global resources to create the open-source community, exporting the original technology and the open-source product, affecting and leading the industry development direction and the path. At home, it focuses on the key technologies in the middle layer, such as hash locking, distributed private key control, and authorized access of private data, and the key technologies in the application layer, such as distributed application and intelligent contract.

However, there is a lack of motivation and investment in blockchain innovation in China, and it is highly dependent on foreign open-source software products. The various key technologies involved in blockchain rely heavily on foreign open-source software projects. Although the domestic reference and innovation, but cannot affect its technical route, did not form an autonomous controllable algorithm and technology, and performance efficiency, security, and stability are far worse than foreign counterparts, there is a greater security risk. So, Block technology should be improved further.

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