A STUDY ON ADOPTION OF BLOCKCHAIN-BASED VAT E-INVOICING SYSTEM AMONG TAX MANAGERS IN CHINA

FENG YUEYANG

FACULTY OF BUSINESS AND ECONOMICS
UNIVERSITI MALAYA
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FENG YUEYANG

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A STUDY ON ADOPTION OF BLOCKCHAIN-BASED VAT E-INVOICING SYSTEM AMONG TAX MANAGERS IN CHINA

ABSTRACT

Electronic invoicing has emerged as a streamlined and efficient alternative to traditional paper-based invoicing, bringing about enhanced business operations, accountability, and reduced manual invoicing costs. The integration of Blockchain technology has further bolstered the efficiency and security of electronic invoicing. Despite its manifold advantages, the adoption of electronic invoicing systems by companies remains modest. This study aimed to discern the determinants influencing the adoption of the Blockchain-based VAT e-invoicing system in firms by employing the Unified Theory of Acceptance and Use of Technology (UTAUT) model. A survey was conducted among 312 enterprises that had already embraced electronic invoicing. Data analysis was performed using the SPSS software, encompassing Facilitating Conditions, Performance Expectancy, Effort Expectancy, Social Influence, Perceived Fairness, Tax Compliance Cost, and Regulatory Support. The investigation affirmed that these factors exerted a positive or negative impact on the acceptance of the Blockchain-based VAT e-invoicing system. Among these factors, social influence emerged as the most influential, signifying the power of peer opinions, expectations, and behaviours in an individual's adoption of a technology or system. Notably, this study was confined to companies that had already adopted the Blockchain-based VAT e-invoicing system.

To enhance the depth of inquiry, future research could differentiate between adopters and non-adopters, elucidating the factors that either foster or hinder adoption. This differentiation could unveil subgroups within each category, facilitating the exploration of variations in attitudes, behaviours, and perceptions. Such an approach would yield refined theoretical frameworks and tailored interventions. The study's insights have potential implications for tax authorities and e-invoicing providers, aiding in the promotion of system adoption. Practically, this study furnishes guidance to tax authorities

and e-invoicing providers in propelling the adoption of the Blockchain-based VAT e-invoicing system. By pinpointing key factors, tax authorities can devise targeted strategies for improved acceptance. The study underscores the technology's capacity to yield tangible advantages for both enterprises and tax authorities. It enhances compliance, transparency, and operational efficiency for tax authorities, while companies benefit from reduced costs and heightened operational efficacy.

In summation, this study offers substantial contributions. It guides e-invoicing providers and tax authorities in advancing the Blockchain-based VAT e-invoicing system's adoption. Moreover, through the identification of influential determinants, it enables the construction of specialized tactics for heightened system acceptance. Ultimately, the study underscores the potential for technology-driven solutions to yield mutually beneficial outcomes for enterprises and tax authorities alike.

Keyword: Electronic invoicing; Value-added tax; UTAUT model; Blockchain technology adoption; quantitative

KAJIAN MENGENAI PENGGUNAAN SISTEM E-INVOIS VAT BERASASKAN BLOCKCHAIN DALAM KALANGAN PENGURUS CUKAI DI CHINA

ABSTRAK

Penginvoisan elektronik telah muncul sebagai alternatif yang diperkemas dan cekap kepada penginvoisan berasaskan kertas tradisional, membawa peningkatan operasi perniagaan, akauntabiliti dan mengurangkan kos penginvoisan manual. Penyepaduan teknologi Blockchain telah meningkatkan lagi kecekapan dan keselamatan penginvoisan elektronik. Walaupun pelbagai kelebihannya, penggunaan sistem invois elektronik oleh syarikat kekal sederhana. Kajian ini bertujuan untuk membezakan penentu yang mempengaruhi penggunaan sistem e-invois VAT berasaskan Blockchain dalam firma dengan menggunakan model Unified Theory of Acceptance and Use of Technology (UTAUT). Tinjauan telah dijalankan di kalangan 312 perusahaan yang telah menerima invois elektronik. Analisis data dilakukan menggunakan perisian SPSS, merangkumi Syarat Memudahkan, Jangkaan Prestasi, Jangkaan Usaha, Pengaruh Sosial, Perceived Fairness, Kos Pematuhan Cukai, dan Sokongan Kawal Selia. Siasatan mengesahkan bahawa faktor-faktor ini memberi kesan positif atau negatif terhadap penerimaan sistem e-invois VAT berasaskan Blockchain. Di antara faktor-faktor ini, pengaruh sosial muncul sebagai yang paling berpengaruh, menandakan kuasa pendapat rakan sebaya, jangkaan dan tingkah laku dalam penggunaan teknologi atau sistem individu. Terutama, kajian ini terhad kepada syarikat yang telah menggunakan sistem e-invois VAT berasaskan Blockchain.

Untuk meningkatkan kedalaman siasatan, penyelidikan masa depan boleh membezakan antara penerima pakai dan bukan penerima pakai, menjelaskan faktor-faktor yang sama ada memupuk atau menghalang penerimaan. Pembezaan ini boleh mendedahkan subkumpulan dalam setiap kategori, memudahkan penerokaan variasi dalam sikap, tingkah laku dan persepsi. Pendekatan sedemikian akan menghasilkan rangka kerja teori yang diperhalusi dan intervensi yang disesuaikan. Pandangan kajian itu mempunyai

potensi implikasi untuk pihak berkuasa cukai dan penyedia e-invois, membantu dalam menggalakkan penggunaan sistem. Secara praktikal, kajian ini memberikan panduan kepada pihak berkuasa cukai dan penyedia e-invois dalam mendorong penggunaan sistem e-invois VAT berasaskan Blockchain. Dengan menentukan faktor utama, pihak berkuasa cukai boleh merangka strategi yang disasarkan untuk penerimaan yang lebih baik. Kajian itu menggariskan keupayaan teknologi untuk menghasilkan kelebihan ketara untuk kedua-dua perusahaan dan pihak berkuasa cukai. Ia meningkatkan pematuhan, ketelusan dan kecekapan operasi untuk pihak berkuasa cukai, manakala syarikat mendapat manfaat daripada pengurangan kos dan peningkatan keberkesanan operasi.

Kesimpulannya, kajian ini menawarkan sumbangan yang besar. Ia membimbing penyedia e-invois dan pihak berkuasa cukai dalam memajukan penggunaan sistem e-invois VAT berasaskan Blockchain. Selain itu, melalui pengenalpastian penentu yang berpengaruh, ia membolehkan pembinaan taktik khusus untuk meningkatkan penerimaan sistem. Akhirnya, kajian itu menggariskan potensi penyelesaian yang dipacu teknologi untuk menghasilkan hasil yang saling menguntungkan untuk perusahaan dan pihak berkuasa cukai.

Kata kunci: Penginvoisan elektronik; Nilai ditambah cukai; model UTAUT; Penerimaan teknologi rantaian blok; kuantitatif

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LIST OF SYMBOLS AND ABBREVIATIONS

AI	:	Artificial Intelligence
BI	:	Behavioural Intentions
B2B	:	Business-to-Business
CIT	:	Corporate Income Tax
EDI	:	Electronic Data Interchange
EMRs	:	Electronic Medical Records
EE	:	Effort Expectancy
FC	:	Facilitating Conditions
IIT	:	Individual Income Tax
IS	:	Information Systems
IT	:	Information Technology
LoT	:	Internet of Things
PBC	:	Perceived Behavioural Control
PEOU	:	Perceived Ease of Use
PF	:	Perceived Fairness
PU	:	Perceived Usefulness
PE	:	Performance Expectancy
RS	:	Regulatory Support
SMEs	:	Small and Medium-sized Enterprises
SAT	:	State Administration of Taxation
TCC	:	Tax Compliance Cost
TAM	:	Technology Acceptance Model
TPB	:	Theory of Planned Behaviour
TRA	:	Theory of Reasoned Action
UTAUT	:	Unified Theory of Acceptance and Use of Technology
VAT	:	Value-Added Tax

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CHAPTER 1: INTRODUCTION

1.0 Overview

An electronic invoicing system is a system that allows for the generation, transmission, receipt, and processing of invoices using electronic means. Electronic invoices, also known as e-invoices, are digital invoices presented in a structured format that is transmitted electronically from suppliers to customers (Olmstead, 2022). Electronic invoicing systems offer significant advantages for both sellers and their customers. Sellers can benefit from increased efficiency, cost savings, and reduced errors through the use of electronic invoicing systems. Customers, on the other hand, can benefit from more convenient and efficient invoice processing workflows. The specific implementation and functionalities of an electronic invoicing system may vary depending on the system, but the overall goal is to optimize and simplify the invoice processing process through electronic means (Bichachi, 2023).

The inception of electronic invoicing systems can be linked back to the establishment of Electronic Data Interchange (EDI), which has functioned as a technical standard for business transactions for several decades (Holmlund, 2019). EDI was officially defined by the National Institute of Standards and Technology of the United States as "Electronic document exchange between computers" in 1996. The advancement of EDI technology has paved the way for the emergence of electronic invoice systems. The widespread adoption of digitalization and automation technology has enabled electronic invoicing systems to be deployed globally, making it an indispensable tool for enhancing the efficiency of financial and tax management (Wikipedia, 2023).

Over time, electronic invoicing systems have evolved to incorporate features such as digital signatures, authentication, encryption, and other security measures to ensure the

integrity, authenticity, and confidentiality of electronic invoices. Additionally, many countries and regions have developed legal frameworks and regulations to govern the use of electronic invoices for tax compliance purposes, which has further shaped the development of electronic invoicing systems worldwide (Cedillo et al., 2018).

Today, electronic invoicing systems have become widely adopted globally, offering benefits such as increased efficiency, cost savings, reduced paper usage, faster payment processing, and improved accuracy in billing and record-keeping. They are utilized by businesses of all sizes, from small enterprises to large corporations, across various industries and sectors, and continue to evolve with technological advancements and changing regulatory requirements (Olmstead, 2022).

The present investigation embraces a positivist research framework and employs quantitative research methodologies, including reliable, correlational, regressive and descriptive tactics, to gather and scrutinize data related to individuals, groups, and establishments. The principal objective of this inquiry is to recognize the factors that influence the adoption of Blockchain-based VAT e-invoicing systems in companies based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model. In order to accomplish the stated objective, surveys were conducted among tax managers in companies that have already implemented electronic invoicing systems. This quantitative study investigates the factors that drive behavioural intentions towards the adoption of blockchain-based e-invoicing for value-added tax (VAT) purposes.

1.1 Problem Statement

In China, value-added tax (VAT) is the largest main body tax and the largest proportion of taxes paid by enterprises every year, permeating all aspects of their operations. However, the development of e-commerce has led to taxpayers evading VAT by falsely issuing VAT invoices, resulting in a significant loss of national tax revenue. To tackle this issue,

blockchain technology may be the optimal solution to be considered first when it comes to China's tax collection and administration (Din, 2022).

A Blockchain-based VAT e-invoicing system can benefit both private and government agencies by reducing regulatory and material costs, as well as contributing to tax fairness and tax compliance, which are critical factors for a company's long-term development trend. Despite several planning policies and guiding measures like the 3 Phase of the Golden Tax Project and the "Internet + Taxation" action plan, the system's penetration rate has not yet met expectations (Zhang, 2020).

According to data from iiMedia Research in 2020, of the users investigated who know about e-invoices, only 8.7% of their companies issue electronic invoices, while 91.3% of enterprises do not issue them. Moreover, almost 80% of the enterprises can reimburse electronic invoices, but 59.3% indicate that the reimbursement needs to be printed (iiMedia Consulting, 2020). We believe that the slow progress of realizing paperless invoices by enterprises, especially those from inland areas and SMEs, is due to the relatively lagging degree for informatization of China's current reimbursement links.

As of 01/08/2022, only 15 provinces and cities in China can accept all-electric invoices, including Sichuan Province, Beijing, Jiangsu Province, Shandong Province (excluding Qingdao), Zhejiang Province (excluding Ningbo), Hunan Province, Henan Province, Anhui Province, Fujian Province, Shaanxi Province, Chongqing Municipality, and Shenzhen City. However, China has a total of 34 provincial administrative regions, and the degree of application is about 44% less than half (State Administration of Taxation, 2023). After research (Liu & Zhang, 2018; Lu & Yan, 2019; Ma et al., 2020; Zhai et al., 2018; Zhang et al., 2018; Shi, 2020; Tan et al., 2022; Cao, 2023), it was found that several main reasons are responsible for the lag and slow progress as follow.

To begin with, the slow progress of electronic invoicing in China can be attributed to inadequate facilitating conditions. This includes the lack of robust network infrastructure and underdeveloped enterprise reimbursement systems. The implementation of a comprehensive and reliable network infrastructure is essential for the smooth operation of electronic invoicing systems. However, the high investment costs associated with network construction pose financial barriers, especially for SMEs with limited resources. Without a solid foundation of facilitating conditions, adopting the electronic invoicing becomes challenging, hindering its widespread implementation (Liu & Zhang, 2018). As stated in the Every Moment Technology 2022 Invoice Index Report, only 19.69% of reimbursement documents were in paperless format, while only 0.4% were in OFD-format invoices issued by the VAT Public Service Platform. This can be attributed to the current inability of enterprises to establish a connection between the invoicing system managed by the tax department and the accounting system managed by the finance department (Every Moment Technology, 2023).

Equally important to performance expectancy respect, enterprises may lack awareness and understanding of the potential benefits and advantages offered by electronic invoicing. Insufficient communication and education regarding the positive impact on operational efficiency, cost reduction, and streamlining of business processes may hinder the perception of significant improvements associated with electronic invoicing. Consequently, enterprises may not perceive sufficient value in transitioning to electronic invoicing, leading to a lack of motivation for adoption (Lu & Yan, 2019). According to the annual data for FY2022, there were over 79 million invoices circulating on the reimbursement platform. However, only 30.02% of these were e-invoices. This indicates that enterprises have low expectations for the performance of e-invoices (Every Moment Technology, 2023).

Similarly, for the effort expectancy of the business, the transition to paperless reimbursement requires changes in workflows and practices within organizations. Finance personnel, who play a crucial role in managing invoicing processes, may encounter challenges in adapting to the technological and operational changes involved. The complexity and technical demands associated with electronic invoicing may create resistance and hesitation among finance staff, who may need to acquire new knowledge and skills related to e-commerce and internet information processing technology. The perceived effort required for implementation and adaptation may act as a deterrent to adopting the electronic invoicing systems (Ma et al., 2020).

Additionally, the social influence aspect is mainly concerned with the behavioural attitudes of stakeholders, which including enterprises and government agencies, significantly influence adopting the electronic invoicing. Limited promotion and support from industry leaders and government bodies can impede the widespread adoption of electronic invoicing. If enterprises do not receive sufficient guidance, encouragement, and endorsement from influential stakeholders, they may be reluctant to adopt electronic invoicing. Moreover, the collective perception of electronic invoicing as a widely accepted and preferred practice within the business community can influence individual organizations' decisions to adopt the system (Zhai et al., 2018). According to a survey conducted by the China Electronic Commerce Association, it was discovered that only 28% of consumers in China were familiar with electronic invoices, and a mere 18% had actually utilized them. These findings suggest that there is a notable deficiency in public awareness and comprehension regarding electronic invoicing (China Electronic Commerce Association Network, 2023).

In terms of perceived fairness, the enterprises need to perceive the system as fair and unbiased, ensuring equal treatment and transparency in the invoicing process. If enterprises

perceive inequities, favouritism, or a lack of transparency in the system, it can create reluctance to adopt electronic invoicing as a fair and trustworthy means of conducting business transactions. Establishing a perception of fairness is vital to build trust and confidence in the electronic invoicing system, encouraging its wider adoption (Zhang et al., 2018).

Moreover, the slow adoption of electronic invoicing in China, especially among SMEs, can be attributed to insufficient awareness of tax compliance costs. Such costs include the resources, time, and effort expended by businesses to ensure they meet their tax obligations in a timely and accurate manner. Compliance costs come in different forms, such as hiring tax professionals to assist with tax preparation, investing in technology to automate tax reporting processes, and allocating internal resources to manage tax-related activities (Shi, 2020; Cao, 2023). Currently, Beijing is generating approximately 500 million electronic invoices annually, which is equivalent to one-tenth of the number of printed invoices. This results in the wastage of 50 million sheets of standard A4 paper. The issue lies in the fact that electronic invoices only consider the paper saved by businesses, without considering the paper wasted by consumers who need to print out the electronic invoices for financial reimbursements (sohu, 2018). Businesses must manage their tax compliance costs effectively to maintain financial stability and minimize the risk of non-compliance with tax regulations. However, many businesses in China do not fully understand the importance of tax compliance and the potential impact of non-compliance. Implementing a uniform e-invoicing system across different regions and industries in China is challenging due to its vast size and complex business environment, as well as the decentralised tax system with different tax authorities operating at various levels. Achieving uniform standards and promoting interoperability between the various e-invoicing platforms in China is a gradual process and may require significant investments in technology, infrastructure, and training during the initial implementation phase, even

though e-invoicing can ultimately reduce tax compliance costs (Liu & Zhang, 2018; Ma et al., 2020; Zhang et al., 2018).

Last but not least, insufficient regulatory support, ambiguous guidelines, and unclear regulations can impede the widespread adoption of electronic invoicing systems. Adequate regulatory support includes comprehensive guidelines, assistance programs, and incentives to facilitate the adoption process and mitigate barriers faced by enterprises. Strong regulatory support ensures a conducive environment for electronic invoicing adoption, instilling confidence in enterprises and providing them with the necessary resources and guidance to implement the system effectively (Tan et al., 2022; Cao, 2023). Based on the findings from a report by the State Administration of Taxation of China, the primary factors hindering the adoption of e-invoicing are a lack of familiarity with the technology (36%), the perceived complexity of the system (24%), and concerns regarding data security (17%). These statistics suggest that there is still a lack of policy support from the Chinese government in this area (State Administration of Taxation of China, 2023).

To sum up, the slow progress of electronic invoicing adoption in China, particularly among inland areas and SMEs, can be attributed to various factors identified through extensive research. Inadequate facilitating conditions, including the lack of robust network infrastructure and underdeveloped enterprise reimbursement systems, hinder the smooth operation of electronic invoicing systems. Insufficient awareness and understanding of the potential benefits and advantages of electronic invoicing, as well as the perceived effort required for implementation and adaptation, also contribute to the slow progress. Limited promotion and support from industry leaders and government bodies, along with concerns about perceived fairness and tax compliance costs, act as deterrents to adopting electronic invoicing. Moreover, ambiguous regulations and insufficient regulatory support hinder widespread adoption. Addressing these factors is crucial to promote the successful

implementation and adoption of electronic invoicing systems in China, enhancing efficiency, transparency, and compliance in business transactions.

1.2 Research Gap

In recent years, the potential of blockchain technology to transform the business landscape has garnered significant attention and interest. This disruptive innovation has already demonstrated its potential to revolutionize several industries, with particular emphasis on tax collection and administration. The underlying principle of blockchain technology is its provision of a decentralized and distributed ledger that ensures secure and transparent transactions. The absence of a central authority governing the system makes it incredibly resistant to tampering and fraudulent activities. The use of blockchain technology is expected to expand further in the future due to its numerous benefits and potential applications. Consequently, the adoption of blockchain technology has become a subject of immense interest and research in academic circles, and it is poised to redefine the way we conduct business. However, for the time being, research on blockchain-based VAT e-invoicing systems in China has mainly focused on the design and mechanism of the technology. For example, Jiang Huiyu and Song Yingying (2021) proposed a study on the legal system of risk prevention applicable to electronic invoices in China; and Yu Dan and Li Miao Yan (2022) proposed a research for parallel governance of technology and system of e-invoicing, and Du Li & Zheng Yuwen (2018) analysed the mechanism analysis and scheme design of applying blockchain technology to boost innovation of Chinese VAT collection and management; Ding Tianping (2022) Focusing on electronic invoices usage about the tax collection and administration for natural people in China; Tian Yuhan, Sun Zhifang, Zhu Ran and Gu Yonghua (2021) analysed the application and planning of blockchain electronic invoice management system. As such, this gap in

knowledge presents a significant opportunity to explore the influence of blockchain technology on businesses and their behavioural intentions in relation to tax.

In addition, the modern literature on blockchain-based e-invoicing systems for VAT tends to focus on developed Western countries, Setyowati (2020) examines how blockchain technology can be applied to VAT systems, particularly e-invoicing; Edelmann and Sintonen (2006) examine the reasons for the slow adoption of e-invoicing by all SMEs in the information technology (IT) sector in Finland; and Staffolani (2020) examines the trend of digital transformation in Italy with the introduction of e-invoicing by SMEs. This is a significant limitation as developing countries like China can benefit from using the blockchain technology to enhance their economies and the well-being for their people. The fast development of technology offers great potential to growth of businesses and markets, particularly in developing countries, and there is a need to make full use of these opportunities.

However, the existing studies failed to examine the factors that are accountable for the utilization of blockchain-based VAT e-invoicing systems from a business outlook. In particular, there is an inadequacy of research focusing on this technology results on the behavioural tendencies of businesses towards adopting and executing the new system. Consequently, it is imperative to bridge this knowledge gap by scrutinizing the tax-related factors that are pertinent and can influence businesses to adopt and implement blockchain-based VAT e-invoicing systems.

Therefore, the utilization of the UTAUT model can help in identifying the factors that affect the adoption and application for blockchain-based VAT e-invoicing systems in Chinese businesses. Through a thorough analysis of the technology's impact from a tax perspective, this study can contribute to filling the knowledge gap and identifying the possible benefits for implementing blockchain technology in tax collection and

administration in China. This research can also give valuable insights for elements that influence the adoption and application of blockchain technology in developing countries, thus contributing to the global discourse on technology utilization in terms of tax collection and administration.

In conclusion, for adopting the application in blockchain-based VAT e-invoicing systems can have important impacts on the tax compliance and management for businesses perspective in China. However, there is limited research on factors that influence the behavioural intentions for enterprises adopting and applying new systems.

1.3 Research Questions

Adopting the electronic invoicing has gained significant traction due to its potential benefits, such as cost savings, operational efficiency, and improved accuracy. Among various electronic invoicing systems, the Blockchain-based VAT e-invoicing system has emerged as a promising solution for tax collection and administration in China. However, despite its potential advantages, adopting this system is not universally prevalent, as businesses may face obstacles during implementation. Therefore, it is crucial to get a comprehensive comprehension of the elements that influence companies' decisions to adopting the Blockchain-based VAT e-invoicing system.

In this research, for investigating the determinants of electronic invoice adoption from a business perspective, with a specific focus on the Blockchain-based VAT e-invoicing system in China. To accomplish this objective, we employ the UTAUT model, a widely recognized framework used to explain the factors driving technology adoption. Moreover, we incorporate three independent variables related to tax, which have received limited attention in previous research (Akhtar, 2019; Welch, 2020; El-Masri & Tarhini, 2017; Curtis, 2010).

The focus of our research is to identify the factors that encourage or deter the adoption of blockchain-based VAT e-invoicing systems by companies. Our methodology involves conducting surveys and examining the correlation between independent variables, namely the influencing factors, and dependent variables, namely the behavioural intentions. The results of our hypotheses may be either positive or negative. To ensure the accuracy and relevance of our findings, we have formulated our hypotheses based on IT-related and tax-related perspectives of the blockchain-based VAT e-invoicing system. Our analysis will cover seven underlying factors that influence the adoption of this innovative technology in China's tax compliance and administration. Therefore, our research question is: What are the key drivers influencing a company's behavioural intention to adopt blockchain-based VAT e-invoicing?

1.4 Research Objectives

In order to surmount these challenges faced in China's electronic invoicing system, it is of utmost importance to focus on improving the network infrastructure which supports it. Additionally, a comprehensive training and support program for finance personnel should be developed. Raising awareness among the stakeholders about the advantages of electronic invoicing can also prove instrumental in fostering its adoption (Krichen et al., 2022). Additionally, it is essential to establish a fair and transparent invoicing system that can mitigate compliance costs for businesses. Furthermore, regulatory support should be strengthened to ensure adherence to the invoicing system's legal framework. By addressing these key aspects, the adoption and implementation of electronic invoicing in China can be facilitated, ultimately resulting in enhanced operational efficiency, reduced costs, and improved tax compliance (Liu & Zhang, 2018; Zhai et al., 2018; Zhang et al., 2018; Shi, 2020; Tan et al., 2022).

Therefore, the primary objective of this research is to gather the perceptions of Chinese companies that represent developing nations concerning the implementation of electronic invoicing systems through a thorough survey. The outcomes of this research are expected to offer valuable insights to developing nations' businesses in investigating the factors that influence the adoption of electronic invoicing. The framework utilized in this study encompasses both IT and tax-related aspects for an in-depth analysis, which can provide practical recommendations to businesses on the viability of adopting a VAT e-invoicing system. Furthermore, the study takes into consideration various factors, such as gender, education, and work experience of the respondents, to enhance the pertinence and precision of the findings (Lu & Yan, 2019; Ma et al., 2020; Cao, 2023).

An empirical study was conducted from a business perspective to explore the factors influencing companies' adoption intentions for the Blockchain-based VAT e-invoicing system. The purpose of this study is to analyze the factors influencing firms' adoption intentions regarding the VAT electronic invoice system in China, and to extend the UTAUT model to shed light on the determinants of user acceptance and adoption.

Firstly, the UTAUT model is primarily based on an IT-related domain and provides valuable insights into the factors that influence behavioural intentions regarding technology adoption. It proposed by Venkatesh et al. (2003), identifies four constructs that are crucial in determining user acceptance and adoption: performance expectations, effectiveness expectations, social influence, and convenience (Naeini & BalaKrishnam, 2012). The construct of performance expectations refers to the extent to which an individual believes that using a new system will enhance their job performance, while effectiveness expectations refer to the degree to which an individual believes that using a new system will make it easier to complete tasks. Social influence, on the other hand, pertains to the degree to which an individual is influenced by others' opinions in their social network, while convenience refers to the ease with which an individual perceives

the new system to be (Wikipedia, 2023). By considering these factors, the UTAUT model provides insights into behavioural intentions and the likelihood of technology adoption in an IT-related context. It has been widely applied and tested across different industries and cultures, enabling organizations to better understand users' attitudes and make informed decisions regarding technology implementation (Chao, 2019；Marikyan & Papagiannidis, 2021).

Secondly, on the tax-related side, we have extended the UTAUT model - as China's VAT e-invoicing system is a new system, and this diverges from the conventional IT environment in certain aspects and necessitates a more targeted approach towards taxation. Consequently, the UTAUT model's fundamental structure inadequately captures the effects of the behavioural intent to adopt e-invoicing (Alshammari & Rosli, 2020; Taherdoost, 2018). To counteract this setback, three supplementary structures have been incorporated into the model to examine the determinants that influence business inclinations to adopt China's VAT e-invoicing system: perceived fairness, tax compliance costs and regulatory support. More specifically, perceived fairness: The VAT electronic invoice system in China allows users to see all aspects of taxation, enabling companies to disclose the true status of their transactions. Perceived fairness refers to the extent to which an individual perceives a new system as fair and equitable. Tax Compliance Costs: The traceability and immutability of the VAT electronic invoice system help strengthen social norms, reduce the waste of time and resources, and make the entire tax return process more scientific and efficient. Regulatory Support: In China, since most enterprises are government-oriented, the new system is more likely to be widely accepted and adopted if it is supported by the authority of relevant institutions (Dwivedi et al., 2019; Rondan-Cataluña et al., 2015；Hasija & Esper, 2022).

In conclusion, the UTAUT model is well-suited to analysing firms' adoption intentions regarding the VAT e-invoicing system in China. Notwithstanding, it is worth

mentioning that the VAT e-invoicing system presents some peculiarities that make it different from traditional IT environments (Hoque & Sorwar，2017). In light of this, we took the initiative of enhancing the UTAUT model by integrating three supplementary constructs: perceived fairness, tax compliance costs, and regulatory support. This was done in order to provide a more relevant and comprehensive framework that takes into account the specificities for VAT e-invoicing system. For perceived fairness, tax compliance costs, and regulatory support significantly impacts a company's behavioural intention to adopt the VAT electronic invoice system. Companies that perceive the VAT electronic invoice system as fair and equitable, reducing the cost of tax compliance, and being supported by relevant institutions are more likely to adopt it (Khan, 2020；Batrancea, Nichita, & Batrancea, 2013；Shi & Yan, 2016).

Therefore, in this study, the research objective is: To examine relationships between performance expectancy, effort expectancy, social influence, facilitating conditions perceived fairness, tax compliance cost, regulatory support and behavioural intention to adopt blockchain-based VAT electronic invoicing.

1.5 Significance of the Study

From a theoretical perspective, there are two significances:

Firstly, from an IT perspective, the contribution of this study is to extend the use of UTAUT model to the specific domain of e-invoicing. Previous studies have not explored the application of the UTAUT model in the context of e-invoicing (Gupta, 2018; Zeebaree, 2022; Gunasinghe, 2020). While the UTAUT model has been employed in various domains such as sustainable e-government, e-learning adoption, and smartphone application usage by tourists, its application to the field of e-invoicing is relatively unexplored. For instance, Zeebaree (2022) applied the UTAUT model to investigate the

adoption of e-government services in the context of sustainability. Gunasinghe (2020) utilized the UTAUT model to assess the adequacy of e-learning adoption among academicians. Gupta (2018) analysed the factors influencing the usage of smartphone applications by tourists using the UTAUT model. However, these studies have not specifically examined the application of the UTAUT model to e-invoicing. By extending the UTAUT model to the e-invoicing domain, this study fills a gap in the existing literature and provides valuable insights into the factors influencing the acceptance and adoption of e-invoicing systems from an IT perspective. It contributes to a deeper understanding of the factors that drive behavioural intentions and technology use in the context of e-invoicing, offering practical implications for organizations seeking to implement and promote the adoption of e-invoicing systems.

Secondly, from a tax-related perspective, using the UTAUT model to study the adoption of e-invoicing systems in China, contributing to the existing literature on user acceptance behaviour. While previous research has employed the UTAUT model to investigate various areas, there is little emphasis has been placed on taxation (Zhai et al., 2018; Tan et al., 2022; Zhang et al., 2018; Cao, 2023). This research gap highlights the need for further exploration of the factors that influence the adoption of e-invoicing systems in the realm of taxation. This study specifically examines the adoption of blockchain-based VAT e-invoicing systems in China and the impact of e-invoicing usage on tax fairness, tax compliance cost, and the efficiency of regulatory support processes from tax-related perspectives. By exploring the determinants of e-invoicing adoption in the context of taxation, this research sheds light on the factors influencing businesses' decisions to adopt the technology for VAT purposes. Understanding these determinants can assist tax authorities and policymakers in devising effective strategies to promote the adoption of e-invoicing systems, thereby enhancing tax compliance and fairness (Chen & Tseng, 2018; Garcia & Lopez, 2020; Smith & Johnson, 2019). The findings of this study

provide valuable insights into how regulatory support, perceived fairness, and tax compliance costs influence firms' intentions to adopt blockchain-based e-invoicing systems. Regulatory support plays a crucial role in fostering the adoption of e-invoicing systems by providing guidance, incentives, and clear regulations for businesses (Nogareda & Ramon, 2020; World Trade Organization, 2021; Zeng & Li, 2019). By addressing regulatory uncertainty and intellectual property concerns, the study highlights the importance of establishing a fair and transparent invoicing system to build trust between businesses, government, and consumers. Additionally, understanding the impact of tax compliance costs on adoption intentions is essential for businesses to manage their financial stability and minimize non-compliance risks (Bird & Zolt, 2021; Tran-Nam et al., 2018). By acknowledging the influence of tax compliance costs, tax authorities can design supportive policies and programmes to alleviate these costs, making the adoption of e-invoicing more appealing to businesses. Overall, this research establishes a conceptual framework that can serve as a foundation for future research in this field.

From a practical perspective, the present investigation has significant implications for both tax authorities and the business community in China. Specifically, tax authorities can make use of the insights gained in this study to develop and implement effective policies and programs that encourage the adoption of blockchain-based VAT e-invoicing systems, thereby enhancing tax compliance and fairness. Moreover, offering training and support to businesses can raise their awareness of the potential benefits of utilizing e-invoicing systems and help them overcome any perceived obstacles. On the other hand, businesses can leverage the findings of this study to improve their acceptance of this new technology by investing in employee training, collaborating with other firms to exchange ideas and best practices, and cultivating a supportive environment.

1.6 Scope of the Study

Firstly, for the geographical scope: the study focuses on provinces in China that have implemented the blockchain-based VAT e-invoicing system. The provinces were selected based on a review of existing literature, reports from tax authorities, government agencies, and official documents. Random sampling techniques were employed to ensure representative coverage of the identified provinces, and then snowball sampling was used to select companies using the system.

Moreover, in participant scope: the study focuses on companies that have already adopted the blockchain-based VAT e-invoicing system. As of 8 July 2021, according to the Chinese financial newspaper Securities Daily, 2,795 organisations are using digital invoicing systems. This includes courts, schools and banks. The target respondents are senior figures in companies, predominantly tax managers in the financial, management, and operational sectors. Additionally, SMEs that have started using the system to claim VAT for their businesses are also included. The participants are individuals who have been involved in the decision-making process regarding the adoption of the system and possess the relevant decision-making powers.

1.7 Organization of the Dissertation

There are 5 chapters in this dissertation. The rest of this dissertation continues as follows. Chapter 2 explains the meaning and application of the two themes of this study (the UTAUT model and blockchain technology) and their development and current situation from a tax-related perspective. The literature review also discusses the theory of adoption and use of technology which is used to be the underlying theory for this study. In addition, related hypotheses and conceptual frameworks are proposed for research questions in the end. In Chapter 3, the research methodology is explained. This study

adopts a descriptive research paradigm and explains the sources of each research question's measured contents and dimensions. This chapter also discusses the quantitative research method used in this study—the data collection method and questionnaire tools. And they have briefly explained the data analysis method used in the SPSS Statistics. Chapter 4 explains the preliminary demographic data and survey results for each research question and discusses the findings of parametric analysis for exploring differences and relationships between respondents with different characteristics when designing data analytics and sustainability content. Chapter 5 reviews and discusses the findings of each research question and compares them with previous research. This chapter also presents the implication and limitations, finally briefly summarises the results, and gives suggestions for future research.

CHAPTER 2: LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.0 Overview

This chapter explains how UTAUT model and blockchain technology in tax have been studied in the past, explains the role of applied theory in this research, and clarifies the gaps in the existing literature and the role this study can play in the current research this field. Both topics are first discussed in terms of worldwide research. Finally, this study identifies variables based on past literature on the adoption and impact of e-invoicing from a tax perspective. Hypotheses and a conceptual framework for the research question is presented. Subsequently, as the scope of this study is mainly related to China, further details are provided on electronic invoicing, UTAUT model and blockchain technology in the Chinese context. Therefore, the literature review is composed of six subsections that provide an in-depth understanding of the adoption and usage of technology or system. Section 2.1 focuses on the concept and characteristics of blockchain technology, highlighting its applications. Section 2.2 reviewed the adoption theories and the reasons for choosing the UTAUT model as a theoretical framework. Section 2.3 describes the empirical research conducted on the UTAUT model. Empirical studies have consistently shown that the UTAUT model's key constructs are significant predictors of the adoption and usage of technology or system. Section 2.4 exemplifies extensions of the UTAUT model. Researchers have modified the model by adding new constructs to better fit specific settings and enhance its explanatory power. Section 2.5 introduces the potential future research of the UTAUT model in the context of blockchain technology and taxation. Section 2.6 presents identified factors, hypotheses on how these factors influence companies in adopting blockchain technology for taxation purposes.

2.1 Overview of Blockchain Technology and its application

2.1.1 The concept of blockchain technology

Blockchain technology is a revolutionary system that operates on the principles of decentralization and distribution. By utilizing cryptographic techniques, it ensures the integrity of data and enables secure and transparent transactions without the need for intermediaries. This technology is not limited to cryptocurrencies like Bitcoin, but has the potential to transform various industries and sectors. It has gained significant attention across various domains, including finance, supply chain management, healthcare, and government services. This section provides an overview of the concept of blockchain technology, drawing insights from multiple academic papers.

The seminal research article authored by Nakamoto (2008) introduced a paradigm-shifting concept by elucidating the revolutionary potential of blockchain technology within the framework of the Bitcoin digital currency. Nakamoto's scholarly contribution laid the groundwork for a transformative distributed, peer-to-peer electronic payment system that harnessed the inherent attributes of blockchain for the meticulous recording and authentication of transactions. This seminal work emerged as a cornerstone, not only inspiring subsequent scholarly inquiries but also forming the bedrock for extensive explorations into the multifaceted utilities of blockchain technology, transcending its initial application in cryptocurrencies. Nakamoto's pioneering work not only unveiled a novel approach to secure and transparent transactional systems but also established a critical pathway for the academic community to unravel the intricate tapestry of blockchain's broader implications across diverse sectors and industries. As such, this research has acted as an intellectual catalyst propelling the trajectory of technological innovations and investigations.

In the scholarly discourse, Swan (2015) delivers an exhaustive and meticulous scrutiny of blockchain technology, delving into its fundamental tenets, intricate constituents, and prospective vistas of application. The author astutely underscores the profound import of blockchain as an agent of paradigm shift, drawing attention to its formidable capacity to perturb conventional business paradigms and instigate a radical reconfiguration of operational frameworks. Swan lucidly accentuates the inherent potency of blockchain to galvanize heightened efficiency and unparalleled transparency across multifarious domains, a facet that augments its allure as a catalytic force of transformative change. This scholarly exposition navigates the intricate terrain of blockchain, traversing its nuanced contours to delineate a compelling trajectory of innovation and redefining possibilities. By elucidating the transformative potential of blockchain technology, Swan's seminal contribution stands as a cornerstone in the evolving tapestry of technological discourse, casting its illuminative radiance upon the inexorable march of progress.

In their scholarly exploration, Tapscott and Tapscott (2016) embark on a profound investigation into the prospective ramifications of blockchain technology across diverse industrial landscapes. Their scholarly discourse extends to the recalibration of established norms, expounding upon how blockchain stands poised to engender transformative reconfigurations in pivotal domains encompassing supply chain orchestration, authentication of digital identities, safeguarding intellectual property entitlements, and the intricate tapestry of financial services. A defining tenet underscored with astute precision by the authors is the innate decentralized and trust less architecture of blockchain, a foundational attribute that obviates the exigency of intermediaries. This salient facet concomitantly augments the robustness of security measures while invigorating the sanctity of privacy domains. The incisive analysis undertaken by Tapscott and Tapscott furnishes a scholarly crucible wherein the manifold strands of

blockchain's potential find elucidation, thereby contributing indispensably to the evolving epistemology of technological transformation.

In the realm of scholarly inquiry, the interplay between blockchain technology and the Internet of Things (IoT) has emerged as a focal point deserving meticulous examination. In this context, the seminal work of Christidis and Devetsikiotis (2016) ascends to prominence as a cornerstone. The authors delve into the intricate nexus between blockchain and IoT, shedding luminous insights upon the symbiotic relationship that holds profound implications. The crux of their scholarly discourse resides in the elucidation of how blockchain can be wielded as a potent instrumentality to heighten the domains of security, privacy, and data integrity intrinsic to the complex fabric of IoT ecosystems. A pivotal facet of their exploration revolves around the strategic integration of smart contracts within the blockchain architecture, a confluence that bequeaths the automation of interactions among the array of IoT devices. This orchestration engenders an ecosystem characterized by heightened efficiency and fortified resilience, delineating a trajectory toward the realization of secure and streamlined operational paradigms. The research bequeaths a quintessential vantage point upon which the cumulative realms of blockchain and IoT coalesce, charting a course for unprecedented efficacies and transformative potentials in the annals of technological progress.

Within the realm of scholarly investigation, a meticulous dissection of blockchain technology comes to the fore in the meticulous scrutiny conducted by Zheng et al. (2017). Their scholarly exposition encapsulates a comprehensive panorama encompassing the very bedrock of blockchain, expounding upon its architectural underpinnings, the intricate labyrinth of consensus mechanisms, and an incisive projection into the vistas of future trajectories. A pivotal facet of their inquiry is the discerning disquisition delineating the manifold species of blockchains, ranging from the public to the private, and culminating in the consortium variant, each with its distinctive attributes and contextual

relevance. The authors traverse the intricate terrain of consensus algorithms, shedding light on the mechanics of Proof of Work and the nuances inherent to Proof of Stake. Moreover, their scholarly compass extends to embrace an expedition into the terrain of applications, wherein blockchain's transformative potency finds vivid expression in domains as diverse as healthcare data management, supply chain traceability, and the hallowed realm of decentralized governance paradigms. The research not only furnishes a roadmap for comprehension but also embarks on the synthesis of evolving possibilities, thereby advancing the intellectual horizon of blockchain technology.

The confluence of these studies engenders a collective symphony that enriches the scientific expanse of blockchain technology. In a concerted endeavour, they traverse a multifaceted terrain that encompasses the bedrock of foundational tenets, delves into its panoramic applications across diverse sectors, underscores its potential to catalyze transformative shifts, and unfurls the intricate tapestry of its fusion with nascent technologies like the Internet of Things (IoT). This intricate web of research perpetuates a ceaseless march towards the vanguard of knowledge, perpetually propelling our comprehension of blockchain's intricacies and propounding novel trajectories for exploration. The compendium of research unfurls a vista of perpetual intellectual curiosity, navigating the ceaselessly evolving currents of this dynamic realm. In its entirety, blockchain technology stands poised as an omnipotent harbinger of paradigm shift, poised to transmute industries and sectors, poised to orchestrate secure and lucid transactions, poised to fortify the ramparts of security and sanctify the precincts of privacy, poised, ultimately, to inaugurate a renaissance of transformative business models that augur a future resplendent with possibilities hitherto unimagined.

2.1.2 Basic principles and characteristics of blockchain technology

The elucidation of blockchain technology, as expounded by Tapscott and Tapscott (2016), unravels a tapestry woven with intricate and foundational principles, encompassing a distinctive array of characteristics that collectively constitute the very essence of its operational architecture. The assertion posited by the authors postulates the essence of blockchain as an embodiment of decentralization and distribution, a conceptual framework that engenders the orchestration of transactions bereft of intermediaries, thereby engendering a milieu replete with security and transparency. This pivotal enunciation resonates harmoniously with the empirical findings laid bare by Swan (2015), whose erudition underscores the modus operandi of blockchain, where cryptographic algorithms intertwine to meticulously safeguard data integrity and the sacrosanct attribute of immutability.

Moreover, the cogent exegesis proffered by Nakamoto (2008) unfurls the intricate tapestry of the consensus mechanism that permeates the realm of blockchain, where participants harmoniously converge upon accord regarding transactional validity. This nexus cultivates an ecosystem that is inherently devoid of the tether of trust, cocooning within its architecture a sanctuary of tamper-resistant dimensions. A symphonic harmony echoes through the scholarly narratives of Buterin and Griffith (2013), elucidating the quintessence of consensus algorithms, most notably the poignant embodiments of proof-of-work and proof-of-stake. Their treatise unfurls the underlying bedrock upon which the edifice of blockchain's security and integrity stands, casting an unwavering shield against vulnerabilities and compromises.

Furthermore, the doctrine propagated by Antonopoulos (2014) embarks on an exploration of the terrain that is intricately decentralized, with data replication finding resonance across an intricate tapestry of nodes. This replication, akin to the rhythmic

cadence of heartbeats, bequeaths to the blockchain system a robust and unswerving fault tolerance, a sentinel vigil that fortifies the veracity of its existence. The crown jewel of blockchain's multifaceted attributes, as conceptualized by Szabo (1996), is the construct of smart contracts, a symphony of code that orchestrates the autonomous execution of agreements and orchestrates the seamless automatism of contractual choreography.

In unity and synergy, these foundational precepts and innate attributes converge to breathe life into blockchain technology, rendering it not merely a conceptual marvel but a practical instrument that unfolds its panorama of potential across a diverse spectrum. As chronicled in the annals of scholarly discourse, the tomes of Swan (2015), Tapscott and Tapscott (2016), Nakamoto (2008), Buterin and Griffith (2013), Antonopoulos (2014), and Szabo (1996) serve as eloquent testaments to the ubiquity of blockchain's applications, spanning industries and sectors, where its transformative silhouette permeates, leaving an indelible imprint upon the evolution of technological horizons.

In recent years, there has been a surge of interest in Blockchain technology, which has shown great potential in various areas of application, beyond the realm of cryptocurrencies. Essentially, a blockchain is a distributed ledger technology that enables secure and transparent transactions without requiring intermediaries. The technology operates by creating a decentralized network of nodes that collaborate to validate and record transactions, with each node retaining a copy of the ledger. This approach guarantees that the information on the blockchain is immutable, ensuring that once a transaction is registered, it cannot be changed or erased. This feature is crucial to maintaining the integrity and security of the blockchain architecture (Xu et al., 2019).

At the crux of blockchain technology's pivotal innovations resides a sophisticated orchestration of cryptographic algorithms and consensus mechanisms, meticulously calibrated to engender the sacrosanct attributes of ledger security and integrity. The

quintessential essence of this innovation lies within the meticulously interwoven fabric of these cryptographic protocols and consensus paradigms. The intricate network of nodes that forms the bedrock of blockchain's architecture assumes a role of profound import, galvanized with the monumental responsibility of scrutinizing and validating each transaction etched onto the ledger. This ballet of validation, under the aegis of consensus mechanisms, bequeaths an ecosystem that stands fortified against the surreptitious machinations of manipulation. Once a harmonious consensus is meticulously brokered amongst the nodes, the veracity of the transaction is etched onto the annals of the ledger. This imparts a distinctive impenetrability, rendering virtually insurmountable the endeavour of any singular entity, be it individual or organization, to subvert the ledger's sanctity (Du Li & Zheng Yuwen, 2018; Tian Yuhan et al., 2021).

The scholarly exposition furnished by Xinyi et al. (2018) encapsulates the very crux of this paradigm, charting a course through the intricate symphony of cryptographic algorithms and consensus mechanisms. Their empirical inquiry elucidates the robustness of the consensus mechanism as an impervious shield, meticulously weeding out any endeavours to infiltrate or distort the integrity of the blockchain's ledger, thereby fostering an ecosystem of unwavering transparency and inviolable security.

2.1.3 The application of blockchain in tax collection and administration

The transformative promise embedded within blockchain technology for diverse industry sectors is indisputable; nonetheless, a cogent acknowledgment must be made that its developmental trajectory remains nascent. In this incipient phase, an array of obstacles looms that necessitate prudent navigation prior to its seamless assimilation into mainstream technological landscapes. Paramount among these impediments are the challenges of scalability, the imperative of interoperability, the intricate conundrum of governance, the pertinence of energy consumption, and the ecological ramifications

stemming from the intricacies of blockchain mining activities. Despite the complex labyrinth of challenges, a resounding affirmation of blockchain's potential merits resonates. This technology's capacity to engender transformative benefits remains profound, casting an enduring aura of promise upon its evolution. The ongoing crucible of research and developmental endeavours, epitomized in the scholarly contribution of Toufaily et al. (2021), augments the conviction that blockchain technology will persevere as a fertile frontier, nurturing innovation, and spearheading advancement in the foreseeable horizon.

The profound envisaged impact of blockchain technology extends to the realm of tax collection and administration, fostering an environment rife with transformative potential. This technological marvel possesses the intrinsic capacity to establish a paradigm of transparent veracity, where transactions are indelibly etched, immutable, and ensconced within an impregnable fortification of security. The global panorama of tax authorities bears testament to the burgeoning curiosity surrounding blockchain's potency in ameliorating tax compliance, countering fraudulent practices, and catalysing operational efficiencies, as discerned from the scholarly discourse by Kimani et al. (2020).

The distinctive attributes underpinning blockchain technology unfurl vistas of reform, a venture that transcends the contours of conventional tax systems. Its tantalizing potential to recalibrate the existing tax landscape, instigating a metamorphosis towards equity and lucidity, underscores its relevance. As the journey unfolds, it becomes increasingly apparent that the pursuit of harnessing blockchain's potential within the domain of tax management is imbued with significance, warranting steadfast exploration despite the labyrinthine challenges that lie ahead. The aspiration to fashion a tax ecosystem characterized by transparency and impartiality converges resolutely with the propulsion of blockchain technology, forging an alliance that holds the promise of a more equitable fiscal frontier. Thus, the ceaseless expedition into the possibilities presented by

blockchain technology within the ambit of tax management warrants continued scholarly dedication and pragmatic endeavour (Karajovic, 2019).

Within the contemporary landscape of tax collection, a triad of prominent characteristics and challenges emerges, encompassing complexity, inefficiency, and the insidious spectre of fraudulence. The pervasive predicaments of tax evasion and avoidance cast a formidable shadow over tax authorities on a global scale, engendering a crucible fraught with intricacies. The magnitudinal scope of this challenge is delineated through empirical insights, with the OECD's prognosis asserting the global tax gap's substantiality, hovering at a staggering $427 billion, a disquieting emblem of a chasm amounting to approximately 10% of the worldwide tax revenue, as illuminated by Kemme et al. (2022).

This expansive void in tax collection owes its genesis to the intricate machinations orchestrated by multinational corporations, which adroitly exploit crevices and incongruities within tax frameworks, ensnaring the traditional tax administration apparatus within a web of insurmountable intricacies. The bedrock of conventional tax administration, underscored by centralized databases and manual workflows, finds itself woefully unequipped to grapple with the multifaceted enigmas that arise in the wake of sophisticated tax planning endeavours (Cedillo et al., 2018).

The clarion call for a transformative paradigm emerges as an exigency, with blockchain technology beckoning as a vanguard of potentiality. The immutable and transparent architecture that hallmark blockchain resonates as a potent remedy to the complex ailments afflicting the domain of tax collection. This nascent framework promises a renaissance, one wherein multifarious challenges stand poised to be obviated, granting tax authorities an efficacious arsenal to confront and mitigate complexity, inefficiency, and the ever-looming spectre of fraudulence (Olmstead, 2022).

The potential inherent in the application of blockchain technology within the domain of value-added tax (VAT) management is strikingly evident. The decentralized attributes, coupled with the indelible, tamper-resistant, and traceable facets of data information dissemination and storage facilitated by blockchain, position it as an auspicious contender for revolutionizing VAT management paradigms. VAT, a consummate form of taxation predicated on levies applied to value increments at successive production phases, confronts an extant landscape characterized by intricacy and inefficiency. Within this milieu, the intricate VAT system becomes a crucible wherein complexities proliferate, spawning niches prone to errors and, significantly, unscrupulous fraudulent practices, as underscored by Setyowati et al. (2020). As an antidote to these pervasive challenges, blockchain materializes as a beacon of hope, engendering transformative potency and ushering in a vista where VAT management can be cultivated with heightened precision, transparency, and fortification against malfeasance.

Blockchain-based VAT systems offer several potential benefits. Firstly, they provide a secure and tamper-proof system for recording transactions. Recording all transactions in a decentralized ledger, which is accessible to all groups. This creates a transparent system that ensures compliance with regulations, reduces the possibilities of errors, and prevents fraudulent activities. Secondly, blockchain-based VAT systems offer greater transparency. All parties involved in a transaction can view the same information, reducing the risk of disputes and increasing trust between parties. This can also help tax authorities to monitor transactions and detect fraudulent activity more easily. Thirdly, blockchain-based VAT systems can reduce the administrative burden on businesses. By automating the recording and reporting of transactions, businesses can save time and money on tax compliance. This can also help to reduce errors and improve the accuracy of tax reporting (Alkhodre et al., 2019; Collosa, 2021; PricewaterhouseCoopers (PWC), 2016; Setyowati, De Utami et al., 2020).

A myriad of nations have embarked on the adoption of blockchain-incorporated value-added tax (VAT) frameworks, manifesting an emergent trend in harnessing this technology. Noteworthy among these endeavours is the instance of Italy, where the year 2021 witnessed the unveiling of a blockchain-infused e-invoicing ecosystem, meticulously designed to usher in the era of automated invoicing and reporting for commercial entities, as elucidated by Bianchini (2020). The underpinning salient attribute of this system lies in its potential to cultivate an environment where transactions seamlessly traverse the realms of real-time, rendering the ambit of tax oversight a dynamic and contemporaneous reality. By virtue of this transformative technological integration, the horizons of VAT management become fortified against the looming spectre of fraudulent practices, encapsulating a seminal testament to the potency of blockchain technology in revolutionizing taxation paradigms.

Prospective horizons portend a promising trajectory for blockchain technology within the arena of tax collection and administration. As an escalating number of nations embrace the integration of blockchain-based systems, a plausible outcome entails the standardization and augmented accessibility of this technological facet. This evolution holds the potential to usher forth a reduction in the multifaceted dimensions of cost and complexity inherently associated with the implementation of blockchain-driven systems. The byproduct of this envisaged evolution could be the engenderment of heightened allure and viability, rendering blockchain-based systems increasingly enticing to enterprises spanning a gamut of dimensions, as alluded to by Collosa (2021). The accentuated accessibility and potential diminution of barriers may equate to an inclusive adoption landscape that caters to businesses of varying scales and proportions. With an orchestra of countries poised on the brink of embedding blockchain into the fabric of tax management, the unfolding chapters portend an era of enhanced viability, engendering a harmonious symphony wherein technology and taxation coalesce synergistically.

While the potential gains of integrating blockchain-based systems into the realm of tax collection and administration are substantial, it is imperative to acknowledge and grapple with the array of challenges that accompany this transformative venture. A pivotal obstacle centres on ensuring a seamless interoperability between incumbent tax systems and the emergent blockchain-driven counterparts, a prerequisite that assumes heightened significance in light of their potential intertwinement with complementary domains such as artificial intelligence and machine learning. This confluence demands meticulous orchestration to engender a harmonious symphony of technological synergy. Furthermore, the realm of data privacy and security emerges as a paramount concern warranting assiduous attention in the implementation of blockchain solutions, as underscored by the scholarship of L. Yang et al. (2019). The immutable and transparent nature of blockchain presents a dual-edged sword, offering fortifications against manipulation while simultaneously necessitating robust protocols to safeguard the sanctity of sensitive information. As the narrative unfolds, it becomes evident that the voyage towards blockchain-infused tax systems necessitates an adept navigation through a landscape characterized by complexities and imperatives that go beyond the surface allure of technological innovation.

In summation, the incorporation of blockchain technology in tax collection and administration portends a transformative metamorphosis in the methodologies underpinning tax accrual and management. While the landscape is punctuated with a constellation of challenges necessitating strategic resolution, the intrinsic merits intrinsic to blockchain-driven systems resonate unequivocally. As the global landscape continues to witness a proliferation of nations embracing these technological paradigms, a heightened trajectory towards amplified efficiency, lucidity, and adherence to regulatory frameworks is foreseeable within the ambit of tax systems. This evolution augments the promise of ushering in a new era characterized by streamlined processes, an

unprecedented elucidation of transactional contours, and a pronounced adherence to regulatory canons. As nations traverse this dynamic terrain, embracing blockchain-infused tax frameworks, an intricate symphony of possibilities unfurls, embodying the potential for a redefined fiscal landscape underscored by the virtues of technological innovation.

2.1.4 The application of blockchain in tax collection and administration in China

The use of blockchain technology for tax collection and administration in China has been gaining significant traction in recent times. The government has been at the forefront of implementing innovative solutions to enhance tax compliance and administration. Adopting blockchain technology, which is a decentralized, transparent, and secure ledger system, has enabled authorities to streamline tax collection processes and minimize fraudulent activities. By leveraging blockchain, the Chinese government aims to improve the efficiency and effectiveness of tax management, thereby boosting revenue collection. The application of blockchain in tax collection and administration in China is a promising development that holds tremendous potential for transforming the country's taxation system (Sun et al., 2021).

Since 2016, Chinese tax authorities have embarked on a trajectory of exploration into the multifaceted terrain of blockchain technology, driven by an overarching ambition to recalibrate the paradigms of tax collection and administration by engendering elevated benchmarks of efficiency, transparency, and security. Fore fronting this transformative odyssey is the State Administration of Taxation (SAT), championing the propagation of blockchain-infused solutions that pervade diverse facets of tax administration. This sagacious initiative encompasses a panoramic canvas, enmeshing the spheres of invoice management, tax payment orchestration, and the pivotal realm of taxpayer identification within the ambit of blockchain-driven mechanisms, as discerned from the erudite

discourse encapsulated by Zhang et al. (2020), Jiang and Song (2021), and Yu and Li (2022). This trailblazing trajectory espoused by Chinese tax authorities not only underscores their proactive stance in embracing technological innovation but also epitomizes a strategic manoeuvre to invigorate the very sinews that underpin the architecture of tax governance. As the narrative unfurls, the cumulative echoes of these scholarly endeavours reverberate as a testament to the prescient trajectory embarked upon by Chinese tax authorities in their unswerving pursuit of elevating the echelons of tax administration.

One of the most notable blockchain applications in Chinese tax collection is the implementation of the Blockchain-based VAT e-invoicing system. This system aims to digitize the entire invoice process, from issuance to verification, using blockchain technology to ensure data integrity and transparency. The system also provides real-time access to tax authorities, enabling them to monitor transactions and detect potential tax evasion. Another notable blockchain-based solution is the tax payment system developed by the Guangdong Province Tax Service, which allows taxpayers to pay their taxes in real-time using blockchain technology. This system has greatly simplified the tax payment process, reducing the time, labour costs and effort required for taxpayers to meet their tax obligations. Moreover, blockchain technology has also been used to improve taxpayer identification and authentication. The SAT has created the blockchain-based system for verifying taxpayers' identity, which provides a secure and tamper-proof way of ensuring that taxpayers are who they claim to be (Guangdong Provincial Taxation Bureau，2019).

In June 2018, the Guangzhou Municipal Tax Authority launched China's first blockchain-based tax invoicing system, the Tax Chain or "Tax Pass" system. As a free platform, "Tax Chain" provides enterprises with powerful functions such as automatic application of invoices, convenient and fast delivery of invoices, collection of invoices,

and automatic inspection of mould inspections (Guangdong Provincial Taxation Bureau，2019). Taxpayers can issue safer, smarter invoices anytime, anywhere, from their computers and mobile phones. Blockchain electronic invoice uses the underlying technology of the blockchain to carry out paperless management of invoices, with transaction-related personnel as nodes, the transaction and invoice-related information will be on the chain in real-time, covering the whole process of registration, purchase, invoicing, reimbursement, tax declaration, and realize the whole process and three-dimensional supervision (State Taxation Administration, 2020).

In March of 2021, the Opinions on Further Deepening the Reform of Tax collection and administration was issued by the General Office of CPC Central Committee and State Council. The document emphasized the necessity to deepen the reform of the tax collection and administration system. The strategy proposes the implementation of the electronic invoice reform as a breakthrough. Additionally, big data of tax will be used as the driving force to build a smart tax system that has high integration functions, high-security performance, and high application efficiency. The proposal also includes the formulation and introduction of national standards for electronic invoices. In 2025, a normalized and institutionalized data sharing and coordination mechanism between tax departments and relevant departments will be established. The electronification of all fields, links, and elements of invoices will be the primary focus. All of these efforts will be geared towards reducing institutional transaction costs and building a strong wisdom tax (Xinhua News Agency, 2021).

At present, the system has been launched on the taxpayer side, and WeChat Mini Program opened a standard interface for invoicing and ticketing, and docked with several invoicing service providers and multiple reimbursement platforms, with a cumulative total of more than 50 million invoices, an average daily invoice of more than 120,000, a cumulative invoice amount of more than 65 billion yuan, covering more than 100

industries such as wholesale and retail, hotel catering, port transportation, real estate, Internet, medical treatment, etc. The enterprises that have been launched include Wal-Mart, China Merchants Bank, UnionPay, Vanke Services, Shenzhen Metro, and other well-known enterprises (Sina Finance, 2017).

Adopting the blockchain technology in Chinese tax collection and administration has significant potential for the future. Using blockchain can significantly enhance the transparency and efficiency in tax administration, reduce costs, and enhance tax compliance. For example, the Blockchain-based VAT e-invoicing system has already proven to be effective in reducing fraud and increasing tax revenues, and expecting the same methods can be adopted in other provinces and regions. However, there are also challenges to adopting blockchain technology in tax collection and administration (Yu & Li, 2022). The technology is still relatively new, and there is a lack of standardization and regulation in the field. Moreover, the high costs of implementing blockchain solutions may pose a barrier to adoption for SMEs (Collosa, 2021).

To summarize, the implementation of blockchain technology in tax collection and administration in China holds tremendous potential for transforming the way taxes are managed. The Chinese government has demonstrated a strong commitment to promoting the adoption of blockchain solutions in tax administration, supported by the success of existing blockchain-based solutions. This suggests that the future of this innovative technology in the tax field is promising. However, it is crucial to address the challenges of standardization and cost to ensure widespread adoption and fully capitalize on the transformative potential of this technology.

China has emerged as a leader in adopting the blockchain-based VAT electronic invoice systems. In 2018, the government launched a pilot program for blockchain-based VAT electronic invoicing in the city of Shenzhen, which has since been expanded to other

regions throughout the country. The use of blockchain technology in the invoicing process has been found to significantly enhance the efficiency of tax collection and mitigate the risk of fraudulent activities. By leveraging the immutable and transparent nature of blockchain, the Chinese government is revolutionizing the way taxes are collected and managed, paving the way for a more streamlined and effective tax system (China News Network, 2021).

The inexorable impact of the COVID-19 pandemic has served as a catalytic force propelling China's digital transformation trajectory, with a particular emphasis on the sphere of tax management. The imperative to curtail physical interactions to mitigate viral transmission has engendered an intensified impetus toward digitalization. In this context, the recalibration of value-added tax (VAT) assumes paramount significance within the ambit of governmental priorities. China's proactive stance in effectuating policies and measures germane to the VAT electronic invoice system has positioned it at the vanguard of global innovation and reform in recent times (First Finance Network, 2023).

As the pandemic continues to reshape conventional paradigms and engender a pervasive reconfiguration of socio-economic norms, China's strategic focus on bolstering digital tax management practices not only bespeaks a sagacious response to the exigencies of the hour but also augurs well for the nation's long-term resilience and adaptability in a dynamically evolving global landscape. The VAT electronic invoice system stands as a testament to China's unwavering commitment to harnessing technology as an enabler of administrative efficiency, economic sustenance, and public welfare (Bichachi, 2023).

Currently, the utilization of electronic invoices in China is confined to general Value-Added Tax (VAT) invoices, which hold relevance for deductions in both Corporate Income Tax (CIT) and Individual Income Tax (IIT); however, they do not extend to VAT input credit application. This status quo underscores the fertile ground for prospective

investigation and innovation in the domain of blockchain-powered VAT electronic invoicing systems in China. Such systems hold the promise of bolstering operational efficiency, transparency, and security within the realm of tax management (State Administration of Taxation, 2023).

Nevertheless, embarking on the journey of adopting blockchain-based VAT electronic invoicing in China is not devoid of its own set of challenges and constraints. The financial outlay required for the implementation and sustained maintenance of these systems stands as a formidable barrier, particularly for SMEs. Furthermore, apprehensions pertaining to data privacy and security resonate strongly, especially within the context of China's stringent data protection regulations. Navigating these complexities necessitates a balanced approach that harmonizes technological advancements with regulatory compliance. The existing panorama reveals a promising trajectory for blockchain-infused VAT electronic invoicing systems in China, aimed at enhancing operational efficacy, transparency, and security in tax administration. Yet, the path forward must be characterized by a meticulous examination of challenges and a judicious calibration of advancements to circumvent potential pitfalls. As the nation marches towards embracing innovative paradigms of taxation, synergizing technological prowess with robust safeguards emerges as the cornerstone of sustainable progress in this domain (State Administration of Taxation of China, 2023).

In conclusion, adopting the blockchain-based VAT electronic invoicing in China is a promising development that offers numerous advantages over traditional paper-based invoicing systems. The Chinese government has demonstrated a strong commitment to the promotion of adopting this technology, and it is expected that using blockchain-based invoicing will keep expanding in the future. However, there are also challenges and limitations that need to be addressed, and further research need to know this system/technology impact on taxation in China. So, the current status of adopting

blockchain-based VAT electronic invoice systems in China presents opportunities for further research and development, as well as potential benefits for tax authorities, businesses, and the economy as a whole.

2.2 Overview of Adoption Theories

The adoption theories have emerged as a pivotal area of inquiry across multiple disciplines, particularly in information systems and innovation studies. Over time, scholars have introduced a diverse array of theories and models aimed at comprehensively elucidating the determinants influencing the adoption and acceptance of novel technologies. Among the earliest contributions is the seminal Diffusion of Innovations Theory, conceptualized by Rogers in 1962. This theory delineates the mechanisms by which new concepts, products, or technologies diffuse through societies, elucidating distinct adopter categories and delineating stages of adoption progression. Following this, the Theory of Reasoned Action (TRA), a psychological model postulated by Fishbein and Ajzen in 1975, predicates individuals' behavioural intentions upon their attitudes and subjective norms. TRA posits that an individual's inclination to engage in a specific behaviour is contingent upon their attitude toward the behaviour and the social norms associated with it.

Subsequently, Icek Ajzen (1985) proposed the Theory of Planned Behavior (TPB) as an extension of the TRA. TPB integrates various attitude and attitude change theories, suggesting that positive attitudes and subjective norms influence behavioural intentions, which in turn predict actual behaviour. Furthermore, the Technology Acceptance Model (TAM) emerged, crafted by Davis in 1989, which asserts that users' perceptions of ease of use and usefulness are fundamental determinants of their attitudes toward and intentions to utilize technology. And the Technology-Organization-Environment (TOE) Framework, pioneered by Tornatzky and Fleischer in 1990, offers a comprehensive lens

incorporating technological, organizational, and environmental factors that shape technology adoption within organizational contexts.

Evolving from these foundational frameworks, the Unified Theory of Acceptance and Use of Technology (UTAUT) model was synthesized by Venkatesh et al. (2003), providing a sophisticated framework that integrates and refines various dimensions of adoption theory. Collectively, these theoretical frameworks provide a nuanced and comprehensive understanding of the multifaceted factors that underpin adoption decisions.

2.2.1 Theoretical Foundations of the UTAUT Model

The Diffusion of Innovations theory, introduced by Everett Rogers in 1962, explains how new ideas and technology spread within a social system. It identifies five key elements influencing adoption: the innovation itself, adopters, communication channels, time, and social systems. Adoption relies on social capital and reaching critical mass for sustainability. The theory categorizes adopters into innovators, early adopters, early majority, late majority, and laggards. The rate of adoption is influenced by innovativeness, determining an individual's propensity to adopt a new idea. The concept of critical mass, marking the transition from niche to mass adoption, was originally termed "the marketing chasm" in 1989 (Rogers, 1962; Rogers, 1983; Schirtzinger & Warren, 1989).

Theory of Reasoned Action (TRA): This theory belongs to social psychology, which explains how attitudes and subjective feelings effect human behaviour intention. According TRA, an individual's behavioural intention is determined by their attitudes toward the behaviour and their perception of social pressure from significant others. Suggesting that individuals are more likely to perform a particular behaviour if they have a positive attitude towards it and perceive that it is socially acceptable. TRA has been used to study a wide range of behaviours, including health, consumer, and organizational behaviours (Staats, 2016; Nickerson, 2022).

Theory of Planned Behaviour (TPB): it is a well-known theoretical framework that extends the TRA by incorporating the concept of perceived behavioural control (PBC). TPB suggests that an individual's intention to perform a particular behaviour is determined by three factors: their attitude towards the behaviour, subjective norms, and PBC. PBC is a construct that reflects an individual's perception of the level of difficulty or ease of performing the behaviour. TPB has been widely applied to research various types of behaviours, including health, environmental, and consumer behaviours. The incorporation of PBC into TPB has enhanced the theoretical model's explanatory power, as it acknowledges that individuals' intentions and behaviours are not only influenced by their attitudes and social norms but also by their perceived ability to engage in the behaviour. In summary, TPB is a valuable theoretical framework that has been widely employed in empirical research to understand various behaviours and their underlying factors (Ajzen, 1991; Asare, 2015).

Technology Acceptance Model (TAM): This model is one of the most widely used theoretical frameworks in the field of information systems (IS) research. TAM posits that perceived ease of use (PEOU) and perceived usefulness (PU) are the primary determinants of an individual's intention to use technology. The model suggests that individuals are more likely to adopt a new technology if they perceive it as easy to use and useful in their work or daily life. TAM is grounded in the social psychology of attitude and behavioural intention, and it has been used to explain technology adoption in various contexts, including organizational and consumer settings (Naeini & BalaKrishnam, 2012; Wikipedia, 2023).

The Technology-Organization-Environment (TOE) framework, developed by Tornatzky and Fleischer in 1990, explains technology adoption in organizations by considering technological, organizational, and environmental contexts. Application examples are provided by Olivera and Martins (2011). It focuses on organizational

analysis, emphasizing higher-level attributes rather than individual behaviours. Behavioural models like the theory of reasoned action and the technology acceptance model are more suitable for understanding individual-level adoption. Despite its widespread use, the TOE framework has seen limited theoretical development due to its generic nature and alignment with other adoption theories, as noted by Zhu and Kraemer (2005).

Unified Theory of Acceptance and Use of Technology (UTAUT): it was technology acceptance one mainly described by Venkatesh in "User acceptance of information technology: Toward a unified view". The UTAUT model is designed to better analyze users' willingness to use the information system and their behaviour after accepting the system. This model proposes the following 4 key influencing factors: 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating conditions (Venkatesh et al., 2003). The first 3 factors (PE, EE, and SI) can directly determine the element for behaviour and intention to use, and the last one (facilitating conditions) is a direct determinant of users' behaviour (Chao, 2019). It has been suggested that the impact of the four key factors on intention to use and behaviour can be moderated by gender, age, experience, and voluntary use (Marikyan & Papagiannidis, 2021). To enhance the pertinence of the model with respect to the objectives of the study, the subsequent questionnaire can encompass an assessment of gender, age, experience, and voluntary use as screening elements for respondents. This method will render the independent variables of the model more apt to the context of the topic being investigated, thereby culminating in more precise results. The model is fashioned by scrutinizing and consolidating earlier studies that were utilized to explicate the behaviour of information systems. Consequently, it is amenable to the paper under consideration. In particular, performance expectancy and effort expectancy correspond to the constructs of perceived usefulness and perceived ease of use in TAM, while social influence corresponds to the constructs of subjective

norms in TRA and TPB. Facilitating conditions, on the other hand, reflect the contextual factors can impact the adoption and use of technology (Chang, 2020). UTAUT had been extensively employed for study technology adoption in different contexts, including organizational and consumer settings (Nordhoff et al., 2020).

In summary, the UTAUT model represents a comprehensive theoretical framework for understanding the adoption and usage of technology or system, and its adoption intention is about factors that make them adopt. It integrates key elements from the TAM, TRA, and TPB to provide a comprehensive understanding of the factors that influence technology acceptance and use. The model has been widely used to study the adoption and usage of technology or system in various contexts, including organizational and consumer settings, and has contributed significantly to our understanding of technology acceptance and use.

2.2.2 Key concepts and constructs of the UTAUT model

The conceptual framework integrates constituent elements from the Technology Acceptance Model (TAM), the Theory of Reasoned Action (TRA), and the Theory of Planned Behaviour (TPB) to elucidate the intricate interplay dictating users' propensities towards embracing technology and consequent behavioural manifestations. The Unified Theory of Acceptance and Use of Technology (UTAUT) model, characterized by its composite foundation, has garnered widespread utilization across multifarious contextual terrains. It stands as a seminal testament to the advancement of our comprehension regarding the dynamics of technology assimilation and utilization. The model's propensity to transcend disciplinary confines underscores its indispensability as a quintessential instrument empowering researchers in their endeavours to unravel the multifaceted dimensions underpinning the adoption and operationalization of technological constructs. The UTAUT model's pervasive applicability and perpetual

relevance serve to reinforce its pivotal status, furnishing scholars with a robust and adaptable analytical framework to fathom the nuanced intricacies governing the intricate nexus between human comportment and technological integration.

The UTAUT is a widely used theoretical model in information systems research that seeks to explain user behaviour which related to new technology adoption usage. This model comprises four key constructs: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. PE refers to the degree to which an individual believes that using the technology will help them to perform their tasks more effectively or efficiently. Effort Expectancy means the degree to which an individual believes that using the technology will be easy or difficult. Social Influence refers to the degree to which an individual perceives those important others (e.g., colleagues, supervisors) believe they should use the technology. Facilitating Conditions refer to the degree to which an individual believes that the necessary resources and support are available to use the technology (Sripalawat et al., 2011; Venkatesh & Zhang, 2010; Welch et al., 2020; Williams et al., 2015).

In addition to these four constructs, the UTAUT model also includes four moderators that can affect the relationships between the key constructs and actual usage behaviour. These moderators are gender, age, experience, and voluntariness of use. Gender and age are demographic factors that may influence how users perceive and use technology. Experience refers to the user's previous experience with similar technologies, which may affect their perceptions and attitudes towards the new technology. Voluntariness of use refers to whether the use of the technology is voluntary or mandatory, as mandatory use may influence the user's motivation to use the technology (Marikyan & Papagiannidis, 2021).

The Unified Theory of Acceptance and Use of Technology (UTAUT) model postulates that these intrinsic constructs, alongside moderating factors, serve as instrumental elucidators of user propensities to engage with technology, subsequently culminating in the prognostication of concrete utilization behaviours. User intentions, according to the UTAUT framework, become a perceptible outcome of the interplay among the aforementioned four foundational constructs. Moreover, the tangible manifestation of usage behaviour is envisaged to be a conjoint product of both user intentions and the conducive contextual conditions facilitating the actual enactment of usage. The model surmises that heightened levels of Performance Expectancy (PE), Effort Expectancy (EE), and Social Influence (SI), coupled with the availability of Facilitating Conditions (FC), conduce to the amplification of user propensities toward technology utilization. Analogously, heightened user intentions, coupled with an enabling environment of facilitating conditions, are predicted to engender heightened levels of concrete usage behaviours (Wikipedia, 2023).

In general, the UTAUT model presents a thorough and all-encompassing structure that facilitates comprehension of user behaviour with regards to technology acceptance and utilization. The model accomplishes this by identifying and highlighting the essential constructs and moderators that can impact user behaviour. Consequently, the utilization of this model can be extremely advantageous for researchers and practitioners in the technology field, as it can aid in the creation and execution of technology solutions that are more probable to be embraced and utilized by users. By understanding the elements that influence user behaviour, professionals can tailor their approach to better meet the needs and preferences of end-users, ultimately leading to a more successful technology adoption and utilization.

2.2.3 The uniqueness of UTAUT model

The UTAUT model distinguishes itself from antecedent paradigms of technology acceptance through a constellation of salient differentiators. Foremost among these differentiators is its holistic nature, wherein it amalgamates constructs from antecedent models, thus engendering a comprehensive framework. In contrast, it embraces a panoply of factors that were hitherto overlooked within prior models. For instance, it accords paramount importance to the four cardinal elements, discerning them as pivotal determinants of the acceptance and utilization of technology. Furthermore, the model aptly accommodates the influence of moderating factors, notably gender, age, and experience, which are acknowledged to wield substantive influence over the trajectory of technology adoption and usage (Dwivedi et al., 2019; Rondan-Cataluña et al., 2015). This integrative approach fortifies the UTAUT model's analytical efficacy and renders it well-equipped to capture the intricate nuances underlying technology acceptance and deployment.

A pivotal point of divergence resides in the UTAUT model's expansive scope, designed to transcend the confines of specific technologies or user cohorts. In contrast to antecedent models, which often confined their applicability to discrete technological domains or user demographics, the UTAUT model proffers a versatile framework capable of encompassing a spectrum of technologies and diverse user populations. This adaptability renders the UTAUT model an invaluable instrument, wielding utility for an array of scholars and practitioners spanning multifarious domains (Alwahaishi & Snásel, 2013). This characteristic epitomizes the model's overarching utility and robustness, underscoring its transcendence of the constraints inherent in models of narrower purview. As such, the UTAUT model attains a level of applicability that is inherently poised to navigate the complexities inherent in the study of technology adoption and utilization across variegated contexts.

Moreover, the UTAUT model underscores the imperative of encompassing broader organizational and environmental variables that wield influence over the adoption and acceptance of technology. It attunes to the intricate interplay between these factors and the technology under scrutiny. Notably, the model accords significance to the pivotal role of organizational provisions and resources in shaping users' proclivity towards embracing novel technologies. This atonement to the organizational and environmental milieu delineates a distinctive facet of the UTAUT model, diverging from preceding paradigms that predominantly fixated on individual cognitive dispositions and perspectives (Hasija & Esper, 2022). The UTAUT model's holistic purview captures the nuanced amalgamation of both micro-level cognitions and macro-level contextual dynamics, yielding a comprehensive framework that encapsulates the multifaceted determinants of technology adoption. By integrating these wider contextual factors, the UTAUT model furnishes a robust foundation for explicating the intricacies underlying the adoption and acceptance of technological innovations within intricate organizational ecosystems.

And particularly in exploring technology acceptance in both private and organizational contexts, which is very much in line with our research theme—from tax managers' perspective. Therefore, the UTAUT model represents a significant advance in our understanding of technology acceptance and use. By incorporating a wide range of constructs and factors, it provides a more comprehensive and nuanced view of the complex factors that influence technology acceptance and use, and offers valuable insights for researchers and practitioners seeking to promote the adoption and usage of technology or system in various settings.

2.3 Empirical Research on the UTAUT Model

The UTAUT model aims to explain user behaviour in relation to technology adoption and usage by integrating multiple constructs and moderators, and considering

organizational and environmental factors. Consequently, it differs from previous technology acceptance models and provides a valuable framework for understanding and promoting technology acceptance and use in different contexts.

Empirical research has demonstrated that the UTAUT model is a robust and effective framework for understanding user acceptance and use of technology in various contexts. The model's constructs (PE, EE, SI, and FC) have consistently been shown to be significant predictors of the adoption and usage of technology or system across different contexts. For instance, a meta-analysis by Venkatesh, Thong, and Xu (2012) found that the four constructs explained 70% of the variance in the adoption and usage of technology or system. Secondly, studies have shown that individual differences such as gender, age, and experience can moderate the relationship between the UTAUT constructs and the adoption and usage of technology or system. For example, Venkatesh and Morris (2003) found that the effect of performance expectancy on system use was stronger for novice users than experienced users. Lastly, studies have also shown that the UTAUT model can be extended to include other constructs such as trust, anxiety, and resistance to change to improve its predictive power.

One key finding from empirical research is that performance expectancy and social influence are consistently significant predictors of user acceptance and use of technology. For example, a study by Hoque and Sorwar (2017) applied the UTAUT model to examine the factors influencing adopting the electronic medical records (EMRs) in hospitals in Bangladesh. According to the research conducted, adopting the EMRs by physicians was significantly influenced by two factors: PE and SI. The study indicates that physicians' intention to incorporate EMRs into their practice was positively affected by their perception of how beneficial the system would be in terms of its performance. Additionally, social influence, such as input from colleagues or peers, played a notable

role in their decision-making process. These findings imply that enhancing physicians' PE and SI could have a positive impact on adopting the EMRs.

An important discovery that has been made is that the impact of factors on technology usage can differ based on various contexts and demographics. To illustrate this point, a study conducted by Haldane et al. (2019), where they applied the UTAUT model to examine the factors that affect the utilization of mobile health applications among aged patients in Singapore. The investigation results showed that facilitating conditions, which encompassed technical assistance and training, played a crucial role in influencing the aged patients' desire to utilize mobile health applications.

The UTAUT as a theoretical model that explains the factors that influence an individual's acceptance and use of technology. The model has been widely used in academic research to study the adoption and use of various technologies, including mobile devices, social media, and e-learning platforms. Additionally, the UTAUT model has practical applications in several fields, such as marketing, user experience design, and technology implementation (Arfi et al., 2021; Lin et al., 2022).

One example of the UTAUT model's practical application is in the development of user-friendly websites and mobile applications (Palau-Saumell et al., 2019). By understanding the factors that impact the adoption and usage of technology or system, designers can create interfaces that are more intuitive and accessible to users. For instance, the UTAUT model can help designers identify the most critical features and functionalities that users expect from a particular application, thus ensuring that the design meets users' needs and preferences (Almaiah et al., 2022).

Another example of the UTAUT model's application is in the implementation of new technology in organizations. By understanding the factors that influence employees'

acceptance and use of new technology, managers can design training programs and communication strategies that encourage employees to embrace new tools and processes (Oye et al., 2014). Additionally, the UTAUT model can help managers identify potential barriers to technology adoption, such as lack of technical skills or resistance to change, and develop strategies to overcome them (Barrane, Karuranga & Poulin, 2018).

The application of the UTAUT model in real-world scenarios has yielded several noteworthy findings. For instance, Venkatesh et al. (2003) conducted a study that employed the UTAUT model to elucidate the factors that affect adopting the mobile devices among college students. The study revealed that performance expectancy were the most prominent predictors of students' intentions to use mobile devices. Additionally, Venkatesh et al. (2012) conducted another study that extended the UTAUT model to examine the acceptance and use of technology in a consumer context. The study highlighted that PE were the most salient predictors of mobile Internet consumers' behavioural intention and technology use. In another study, the UTAUT model was utilized to explore the factors that influence the adoption and usage of mobile health apps among older adults. The results indicated that PE and FC were the most significant factors that impact user behaviour, underscoring the importance of developing user-friendly mobile health apps that provide tangible benefits to users (Garavand et al., 2019).

In conclusion, the UTAUT model has practical applications in several fields, including user experience design, technology implementation, and marketing. The model has been widely used in academic research to study the adoption and use of various technologies, and there are several real-world examples of its successful application. By understanding the factors that impact the adoption and usage of technology or system, individuals and organizations can develop strategies that encourage users to embrace new technologies and tools.

2.3.1 UTAUT model for IT related adoption.

The UTAUT model has been extensively employed in various settings to investigate the acceptance and usage of diverse technologies since its inception. Numerous research studies have utilized the UTAUT model to scrutinize adopting the technologies such as mobile banking, e-learning, social networking, and healthcare technology, among others. For instance, Akhtar, Irfan, Kanwal, and Pitafi (2019) conducted a study that focused on investigating adopting the mobile banking among Chinese consumers by utilizing the UTAUT model. The study findings pointed out that the most significant predictor for adopting mobile banking was SI. Similarly, El-Masri and Tarhini (2017) employed the UTAUT model to examine adopting the e-learning by the students in university. The study concluded that PE, EE, FC and SI were all positive factors affecting e-learning adoption. Furthermore, Al-Qeisi et al. (2015) studied the factors influencing the intention of Jordanian consumers to use mobile banking services by applying this model. The study results indicated that effort expectancy (EE) was the crucial determinant of the intention to use mobile banking services. Therefore, the UTAUT model has proved to be an efficient tool to investigate the acceptance and usage of various technologies in different settings.

In particular, this model The UTAUT model has been widely used in the field of information technology (IT) adoption, including e-commerce, mobile technologies, and social media. The model has been found to be useful in predicting and explaining the adoption of new technologies in different contexts. Researchers have also applied the UTAUT model in cross-cultural studies, exploring the factors that influence technology adoption across different cultures and countries.

Koivumäki (2006) used UTAUT to investigate how 243 users in northern Finland perceived mobile services and technology. The study found that the time it took to adopt

the technology system was not directly related to consumers' perceptions of it. Instead, the study revealed a direct correlation between adoption and the level of proficiency in utilizing the technology system, as well as the associated skills and techniques. This indicates that individuals are more inclined to adopt a technology system if they possess a sense of competence in its operation and can quickly become proficient in its use.

In a similar vein, Eckhardt (2009) conducted a study in which UTAUT was applied to examine the social impact of superiors and colleagues in 152 German companies on their intentions to adopt new technology systems. Interestingly, according to research findings, there exists a significant correlation and impact between the social influence of the particular group and their intention to adopt new technologies. This suggests that adopting the novel technological innovations is not only influenced by the inherent characteristics of the technology itself, but also by the surrounding social context in which it is being introduced. Understanding the intricate relationship between social influence and technology adoption is crucial in order to effectively promote and encourage the successful implementation of new technologies within a given community. This finding highlights the crucial role that social influence plays in determining individuals' technology adoption intentions. It suggests that the perceptions and opinions of colleagues and superiors can heavily influence an individual's decision to adopt new technology, and should therefore be taken into account when designing and implementing new technological systems in workplaces.

Curtis (2010) explored the adoption intentions of 409 U.S. non-profits to adopt social media using UTAUT. The study found that those organizations with relatively well-defined public relations departments were more likely to employ social media technology systems, which they often used to achieve a number of their organizational targets. This finding suggests that adopting the technology systems can be influenced by organizational factors, such as the presence of a public relations department.

In a recent study conducted by Welch (2020), the UTAUT model was utilized to investigate the factors that influenced the willingness of 118 museum staff in the United Kingdom to adopt mobile learning. The results of the study revealed that the UTAUT model was an effective tool in explaining the factors that influenced the intention to adopt mobile learning. This finding suggests that the UTAUT model can be applied in various contexts to understand the factors that influence technology adoption intentions.

In conclusion, UTAUT has proven to be a helpful instrument for examining technology adoption issues in IT contexts. The reviewed studies indicate that the UTAUT model can effectively identify the factors that influence individuals' technology adoption intentions, including individual factors such as proficiency and skill, social influence, and organizational factors.

2.4 Extensions and Adaptations of the UTAUT Model

Some critiques for UTAUT model include its focus on individual-level factors and its lack of consideration for organizational and environmental factors. To address these critiques, researchers have proposed modifications and extensions to include organizational and environmental factors, as well as feedback and learning mechanisms. Additionally, in a specific study related to e-invoicing systems, three new variables were identified: perceived fairness, tax compliance cost, and regulatory support. These variables were selected based on a review of literature and their relevance to the tax context.

The model has been extended to include additional constructs, such as trust and resistance to change, to improve its predictive power. However, the model has also faced criticisms, including its broad and complex nature and its limitations in capturing social, cultural, and affective factors. Inconsistent findings regarding certain constructs have been reported in empirical studies, highlighting the need for further research and

refinement of the model. Researchers and practitioners should consider these limitations and critiques when applying the UTAUT model in specific contexts or populations.

The UTAUT model has been extensively employed in various settings, and its applicability has been extended by some scholars to better align with specific contexts. For instance, Du and Zheng (2018) made adjustments to the model by introducing the trust construct to explore the factors that influence adopting the mobile payment by consumers in China. The study revealed these 2 elements: social influence and trust significantly affect consumers' behavioural intentions by using the mobile payment. In a similar vein, Baabdullah, Alalwan, and Patil (2019) adapted the model to investigate adopting the mobile banking in Saudi Arabia by integrating two additional constructs, social influence and facilitating conditions. The revised model exhibited a better fit in the Saudi Arabian context and offered a more accurate estimation of mobile banking adoption. It is worth noting that the modifications made to the UTAUT model by these scholars demonstrate the model's flexibility and adaptability to different settings.

Some researchers have expanded the UTAUT model to include new constructs and variables to enhance its explanatory power. For example, Venkatesh et al. (2012) expanded the model by adding two new constructs, hedonic motivation, and price value, to investigate adopting the technology products in the consumer market. The study found that hedonic motivation and price value had a significant impact on adopting the technology products. Similarly, Aljaafreh, Hujran, Debei and Dmour (2021) extended the model to include a new construct, security, to investigate adopting the cloud computing in the banking sector. The study found that security had a significant impact on the intention to adopt cloud computing.

Although the UTAUT model has been widely used and has shown good predictive power, it has also faced some critiques. One of the main critiques is that the model focuses

only on individual-level factors and does not consider organizational and environmental factors that may influence technology adoption (Lai et al., 2017). Another critique is that the model does not take into account the dynamic nature of technology adoption and the influence of feedback and learning on the adoption process (Venkatesh et al., 2012). To address these critiques, some researchers have suggested improvements to the model. For example, Lai et al. (2017) proposed a modified UTAUT model that includes organizational and environmental factors to better explain technology adoption in the workplace. Similarly, Venkatesh et al. (2012) suggested that the model could be extended to include feedback and learning mechanisms to capture the dynamic nature of technology adoption.

The process of identifying 3 new variables: perceived fairness, tax compliance cost and regulatory support, given to the original UTAUT model, was first combed through a review of previous literature on UTAUT and its related models (Bobek et al., 2007; Jimenez & Iyer, 2016; Maqsoom et al., 2020), focusing on a comprehensive review of existing literature in related fields such as e-invoicing and blockchain, and combined with our research directions to finally filter out variables that fit the tax context. Perceived fairness, tax compliance costs and regulatory support were then identified as structures commonly used in relevant studies that could be used to analyse the adoption intentions of e-invoicing systems. Specifically, perceived fairness can be measured using items related to taxpayers' perceptions of the fairness of the e-invoicing system or related processes (Lee, 2016). Tax compliance costs can be measured using items that capture the costs, which is happened when complying with the e-invoicing requirements, such as time, effort and resources expended (Blaži, 2004; Jimenez & Iyer, 2016). Regulatory support is measured using items that assess the level of support provided by government or relevant regulatory bodies in facilitating and promoting e-invoicing adoption (Yang, 2015).

2.5 Adoption of Blockchain-based VAT electronic invoice system

Currently, several countries such as China, South Korea, and Taiwan have already adopted blockchain-based VAT electronic invoice systems, and other countries are also exploring the potential benefits of this technology. The implementation of blockchain-based VAT electronic invoice systems has been shown to significantly reduce the time and resources required for tax compliance, as well as minimize the risks of fraud and errors in the invoicing process. Moreover, the use of blockchain technology can improve the overall transparency of the tax system and enable real-time monitoring of transactions, leading to greater accountability and enhanced public trust (Le, 2021; INS Global, 2021; Yiğit, 2022).

The rapid expansion of digital market segments and the proliferation of smartphone users has led to a surge in digitalization, offering numerous benefits to users and governments alike. With over 6 billion smartphone users globally by the end of 2020, this trend is set to continue and presents a significant opportunity for digital transformation in taxation (Xinhua News Agency, 2021).

In the current global digital economy, governments can leverage digital tools such as e-invoicing and e-filing to streamline tax compliance and reduce instances of fraud. By adopting these digital tools, authorities can improve processing efficiency and accelerate the pace of work. This trend presents a unique opportunity for multinational companies to reduce their tax costs and overcome the challenges associated with spanning multiple regions. With the implementation of digital technologies, the supply chain management process can become more efficient, effective, and streamlined (Bellon et al., 2022).

Furthermore, digitalization offers immense potential for governments to overcome various challenges and reap long-term benefits. By adopting digital technologies,

governments can effectively track tax compliance and prevent fraudulent activities, resulting in costs lessen and an in overall crease in revenue. This can also help to improve transparency in the tax system, promote a level playing field, and boost confidence in government policies and procedures (Li et al., 2020).

However, there are also several challenges and limitations associated with adopting the blockchain-based VAT electronic invoice systems that need to be addressed. For example, the high costs associated with implementing and maintaining blockchain-based systems may be a barrier for some businesses and governments. In addition, concerns related to data privacy, security, and interoperability may also pose challenges for adopting these systems (Batubara et al., 2018).

So, adopting the blockchain-based VAT electronic invoice systems is a promising development in the field of taxation. This technology offers numerous advantages over traditional paper-based systems and has the potential to improve efficiency, transparency, and accountability in tax compliance. However, careful consideration needs to be given to the associated challenges and limitations, and further research is needed to fully understand the implications of this technology on taxation. And the digital transformation of taxation presents a significant opportunity for governments, multinational corporations, and other stakeholders. By embracing digital tools and technologies, these entities can achieve greater efficiency, reduce costs, and enhance transparency in the tax system. As the digital economy continues to expand, the potential for adopting the new technologies and tools in taxation will undoubtedly grow, leading to exciting opportunities and prospects for the future (Frey & Osborne 2016).

Looking ahead, it is expected that adopting the blockchain-based VAT electronic invoice systems will continue to expand globally. In addition, emerging technologies such as artificial intelligence (AI) and the Internet of Things (IoT) are expected to play an increasingly important role in the adoption and implementation of blockchain-based VAT

electronic invoice systems. For example, AI can be used to automate various aspects of tax compliance, while the IoT can enable real-time tracking of transactions and provide enhanced visibility into the supply chain (Gohil & Thakker, 2021; Han et al., 2023).

2.6 Hypothesis development

This section provides a comprehensive analysis of previous studies and discussions related to the implementation of blockchain-based VAT electronic invoicing systems (Rana et al., 2015; Chua et al., 2018; Sung et al., 2015; Venkatesh et al., 2003; Wu & Li, 2017; Kochanova et al., 2018). Drawing from the significant factors that have been identified, this section presents hypotheses concerning the different factors that influence companies in adopting blockchain technology, specifically in relation to taxation.

2.6.1 Facilitating conditions and performance expectancy.

The UTAUT framework is widely used in the study of technology adoption behaviours, with one of its primary factors being facilitating conditions. This factor is concerned with an individual's perception of the existence of an organizational and technical infrastructure in support of the system's use (Venkatesh et al. 2003). Similarly, performance expectancy is another significant factor that measures an individual's belief that using the system will improve job performance (Malik & Sharma, 2017). Various studies have shown that facilitating conditions are a powerful predictor of behavioural intentions to adopt new technologies or systems, while PE is a significant predictor of technology adoption intention. When it comes to adopting the blockchain-based systems, facilitating conditions can be impacted in various ways, such as organizational support, IT resources, cloud services, and internet speed (Francisco & Swanson 2018). As a decentralized and distributed ledger technology, blockchain requires a robust technical infrastructure that can support its complex operations. Therefore, the availability of IT resources and cloud services can greatly impact the feasibility of implementing a

blockchain-based system. Additionally, organizational support, such as top management support, training and development programs, and clear communication channels, can also play a critical role in creating a supportive environment for adopting the blockchain.

Furthermore, performance expectancy is considered a significant predictor of technology adoption intention. By improving productivity, efficiency, and professional performance, users are more likely to perceive the benefits of adopting blockchain-based systems (Rana et al., 2015; Chua et al., 2018). This can include the ability to streamline processes, reduce errors, and increase transparency and security. In turn, this can enhance the user's performance and job satisfaction, leading to a higher intention to adopt the system (Kshetri, 2018). So, the UTAUT model provides a useful framework for understanding the factors that influence the adoption of new technologies, including blockchain-based systems. The facilitating conditions construct is crucial for creating a supportive infrastructure for implementing blockchain, while the performance expectancy construct can drive adoption intentions by enhancing productivity and efficiency. By considering these factors, organizations can better plan and manage adopting the blockchain-based systems. So, we have 2 hypotheses about the following:

Hypothesis 1 (H1). Facilitating conditions positively influence behavioural intention to adopt blockchain-based VAT electronic invoicing.

Hypothesis 2 (H2). Performance expectancy positively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.

2.6.2 Social influence and effort expectancy.

In the realm of new system adoption, the perception of effort expectancy plays a crucial role in shaping individuals' behavioural intention towards the system. Social influence, which can stem from various sources, including influential individuals such as

peers and managers, can significantly impact the individual's choices and attitudes for the new system (Sung et al., 2015). The UTAUT model posits that individuals' intentions to adopt a technology are influenced by the social context and the opinions and recommendations of others. This social influence can be categorized into two dimensions: subjective norms and social influence processes (Venkatesh et al., 2003; Wu & Li, 2017).

Subjective norms refer to individuals' perceptions of the social expectations and pressures regarding technology adoption. They reflect the perceived social norms and beliefs about whether significant others, such as colleagues, managers, or peers, expect and support the adoption of a particular technology. Social influence processes in the UTAUT model encompass various mechanisms through which individuals are influenced by their social networks. These mechanisms include social interaction, observation of others' behaviour, and information sharing within the social context.

Several studies have supported the social influence component of the UTAUT model. For example, Venkatesh et al. (2003) found that subjective norms significantly influenced users' intentions to adopt information technology. Wu and Li (2017) examined the adoption of mobile payment systems and confirmed that subjective norms had a positive impact on users' intentions. These findings suggest that the social influence component of the UTAUT model is valid and applicable across different technological contexts.

Effort expectancy, a key component of this perception, refers to the level of perceived effort that an individual believes is required to operate the new system. When enterprises adopt a blockchain-based VAT electronic invoicing system, for instance, significant effort is required to ensure its successful implementation. This includes allocating specialized personnel for data input tasks and ensuring the authenticity of the uploaded data to guarantee data immutability, among others. The management team must

invest substantial efforts and resources to ensure that the data can be seamlessly transferred to the VAT electronic invoice system (Venkatesh, 2003).

The perceived level of effort required for enterprises to adopt a blockchain-based VAT electronic invoicing system can significantly impact their confidence in using the system (Setyowati et al., 2020). If enterprises believe that the effort required is too high or that the technical requirements are too complex, they may be less likely to use the new system, reducing its effectiveness. Therefore, it is crucial to provide support and resources to enterprises to make the adoption process as seamless and straightforward as possible. This can help increase their confidence in the system and ultimately drive its successful adoption. So, there is these following hypotheses proposed:

Hypothesis 3 (H3). Social influence positively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.

Hypothesis 4 (H4). Effort expectancy positively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.

2.6.3 Perceived fairness.

Perceived fairness is a critical element in adopting the blockchain-based VAT electronic invoicing systems (Khan, 2020). The system ensures that economic activities from the occurrence to the completion of the transaction are reflected in the chain, and each node can receive relevant information to fully reflect the real transaction. This feature allows existing invoices to fully cover and reflect all the real tax-related information in economic activities, which prevents some enterprises from evading taxes through improper means and large enterprises from monopolizing the market. The timely interaction of information can be realized to stifle the idea of a monopoly industry in the cradle, which enhances fairness in the tax system (Lee, 2016). Behavioural research has

consistently highlighted similar factors when interpreting the response for frame and accountability (Hartmann & Slapničar, 2012). The perceived fairness in tax systems can boost individuals' trust in the government, which has a positive impact on compliance. The implementation of electronic invoices can effectively avoid the loss of national tax sources and create a tax environment of fair competition between offline physical stores and Internet e-commerce enterprises (Jimenez & Iyer, 2016).

Moreover, the establishment of the 'Tax Collection and Administration Law' and related laws and regulations, such as value-added tax electronic invoices, has national unified standards and a national unified electronic invoice database, with national unified standards. Most people's work, life, entertainment, social networking, shopping, etc. rely on the Internet, which covers almost all aspects of people's lives, and its penetration and influence have exceeded people's imagination. Therefore, the implementation of electronic invoices has become more important than ever. It can effectively promote tax compliance, enhance the perceived fairness in tax system, also create the tax environment of fair competition. It reflects the principle of universal taxation, which is essential for a fair and just society. Therefore, we hypothesise as follows:

Hypothesis 5 (H5). Perceived fairness positively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.

2.6.4 Tax compliance cost.

Tax compliance cost is another critical element for adopting the blockchain-based VAT electronic invoicing systems. Rational decisions based on expected utility have been defined as compliance in early theories (Batrancea et al., 2013). Tax compliance costs are an important factor affecting the taxpayers' willingness to adopt the system. It refers to the cost associated with complying with the requirements of the tax system, which includes anything that exceeds any distortion costs inherent in the tax system. Tax

compliance costs do not include administrative costs that require all taxes to be borne by the tax authorities. Eichfelder and Schorn (2012) has defined tax compliance costs as the costs that taxpayers incur in complying with tax rules and regulations. Numerous studies have shown that the cost of compliance may be greater than the actual tax paid by the business (Ali & Fjeldstad, 2021). For example, developing countries, especially those with weaker institutional structures, tend to face higher tax compliance costs, making the issue of tax compliance costs more relevant to these countries (Dabla-Norris et al., 2019). Merima Ali and Odd-Helge Fjeldstad (2021) has emphasized the high tax compliance costs due to penalties and fines; and the Trade and Competitiveness Global Practice of World Bank Group (WBG) has conducted many tax compliance cost surveys in developing and transition countries, highlighting the severity of the compliance burden for small and medium enterprises (Pedersen et al., 2013). Thus, tax compliance plays a pivotal role in the operations of businesses, impacting both their cost structures and adherence to legal and regulatory requirements, thereby influencing their long-term viability and prospects for growth. The implementation of an electronic invoice system offers potential benefits by mitigating non-compliance risks and reducing costs associated with error-prone manual tax filing and payment processes. By embracing electronic invoicing, businesses can minimize the occurrence of non-compliant practices, resulting in improved operational efficiency and reduced expenses. This can have far-reaching implications for a company's financial stability and its ability to allocate resources effectively, ultimately contributing to its sustainable development and overall success.

Specifically, the adoption of blockchain-based VAT electronic invoicing system could potentially reduce the cost of tax compliance and improve tax revenue. This could be achieved by reducing the time and resources that taxpayers spend collecting data to file taxes, reducing data duplication between different tax forms, which reduces filing errors, decreasing the time it takes to file tax forms and accept tax refunds, and reducing

the time cost of face-to-face communication between taxpayers and tax officials as much as possible. Kochanova et al. (2018) have provided evidence of the potential for blockchain technology to reduce tax compliance costs in developing countries. The blockchain-based VAT electronic invoicing system can provide a tamper-proof record of all transactions, eliminating the need for taxpayers to keep multiple copies of invoices, receipts, and other documents. This would significantly reduce the time and resources required to collect data to file taxes. Moreover, using the smart contracts with blockchain-based VAT electronic invoicing system could automate tax payments and refunds, reducing the time it takes to file tax forms and accept tax refunds. The reduction in tax compliance costs would ultimately lead to improved tax revenue and increased compliance rates (Yayman, 2021). Therefore, we propose the following assumptions:

Hypothesis 6 (H6). Tax compliance cost negatively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.

2.6.5 Regulatory support.

Regulatory support is a crucial factor that can greatly influence the adoption and implementation of blockchain technology. The regulatory framework governing blockchain technology has a significant impact on its adoption, as it provides guidance to businesses and individuals on how they can use the technology while remaining compliant with relevant laws and regulations (Shi & Yan, 2016). In the context of blockchain-based VAT electronic invoicing systems, regulatory support from governments and regulators can provide a supportive environment that fosters innovation and ensures that the system operates effectively. Moreover, regulatory support can also have a positive impact on the infrastructure construction of the adopted system. This is because it provides a stable and predictable environment for businesses to operate in, which can encourage investment in the development of the necessary technical

infrastructure. In addition, regulatory support can help to build trust between businesses, government, and consumers, which is critical for the successful adoption of new technologies (Wong et al., 2020).

However, regulatory uncertainty and intellectual property issues can be major barriers to adopting the new technology systems, including blockchain-based VAT electronic invoicing systems. This is because businesses may be hesitant to invest in new technologies if they are unsure about the regulatory environment or the intellectual property rights surrounding the technology (Batubara et al., 2018). Therefore, it is crucial for regulators and policymakers to provide clear guidance on the rules and regulations governing the use of blockchain technology and to address any intellectual property issues that may arise (Setyowati et al., 2023).

In summary, regulatory support is a key factor that can influence the adoption and implementation of blockchain-based VAT electronic invoicing systems. Governments and regulators play a vital role in providing the necessary support and guidance to businesses to ensure that they can operate within the relevant legal and regulatory frameworks. Addressing regulatory uncertainty and intellectual property issues can help to build trust and encourage investment in the necessary technical infrastructure, thus paving the way for the successful adoption of blockchain technology in this context. Therefore, we hypothesise as follows:

Hypothesis 7 (H7). Regulatory support positively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.
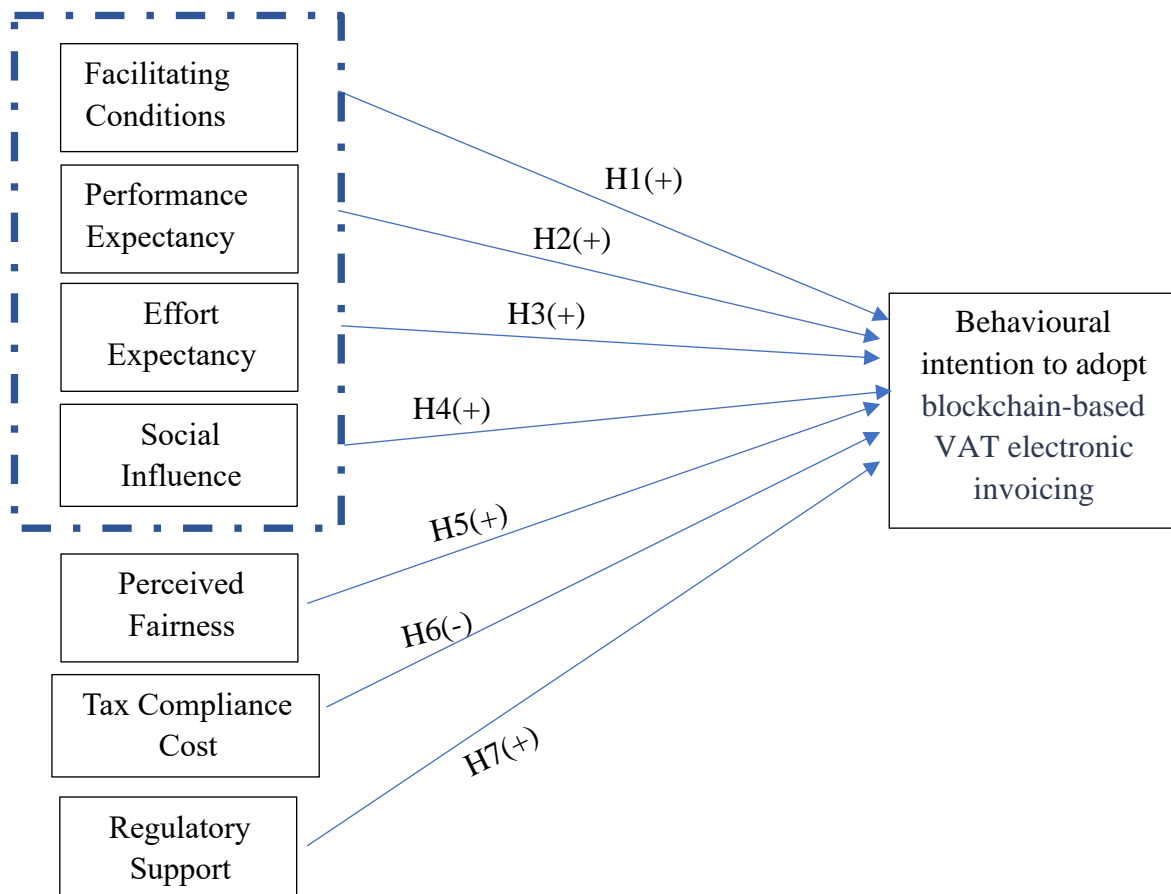
Figure 2.1 Conceptual framework

In summary, this section presents a new conceptual framework for understanding adopting the blockchain-based VAT electronic invoicing systems. For the hypotheses include the positive or negative influence of FC, PE, SI, EE, PF, TCC, and RS on behavioural intentions to adopt the system. These factors are hypothesized to influence companies' behavioural intentions to adopt the system. This framework provides valuable insights for organizations, policymakers, and researchers seeking to promote the successful implementation of blockchain-based systems.

2.7 Summary

This chapter delves into the UTAUT model and blockchain technology in the tax domain, tracing their prior research globally. It underscores the role of applied theory in guiding this study and pinpoints gaps in existing literature, clarifying its contributions to

current research. Variables are identified based on past studies on e-invoicing adoption, culminating in hypotheses and a conceptual framework. With a focus on China, the literature review spans six sections, elucidating blockchain technology, adoption theories, empirical research on UTAUT, model extensions, and future research prospects. Additionally, it outlines factors influencing companies' adoption of blockchain for taxation, enriching understanding in this burgeoning field. Next, Chapter 3 elaborates the research methodology employed by the current study.

CHAPTER 3: METHODOLOGY

3.0 Overview

This chapter has been organized into four sub-sections. The first section 3.1 delves into the design of the study. Moving on to sub-section 3.2, it provides a detailed account of how the research variables were measured in the study. Sub-section 3.3 provides an overview of the sampling frame and the population that was considered in the study. Finally, sub-section 3.4 describes the process of data collection that was employed in the study.

3.1 Research Design

Research design refers to the framework or blueprint that guides the entire research process, encompassing the overall strategy and methodology employed to address the research question or hypothesis. As posited by Smith and Jones (2018), it delineates the structure and organization of a study, outlining the procedures for data collection, analysis, and interpretation. Additionally, as emphasized by Brown et al. (2016), research design encompasses the selection of appropriate research methods, sampling techniques, and data collection instruments, ensuring the validity and reliability of study findings. In essence, research design serves as the scaffolding upon which rigorous scientific inquiry is erected, guiding researchers in the systematic pursuit of knowledge.

The content mainly introduces the positivism research paradigm and its relevance to empirical research. Positivism is a philosophical approach that utilizes scientific methods to uncover objective knowledge about social phenomena. The importance of positivism in identifying cause-and-effect relationships, eliminating bias, and achieving objectivity is highlighted. The paradigm also prioritizes generalizability, aiming to apply findings to a larger population. The research method selected for the study is quantitative research, which involves collecting numerical data and using statistical analysis to explain

phenomena. Using the quantitative method allows the quantification for opinions, attitudes, and behaviours, and facilitates the explanation of research problems through numerical results. The study employs a survey questionnaire to collect data and applies statistical methods such as multiple regression to analyze the relationship between influencing factors and behavioural intentions.

3.1.1 Research Paradigm

The positivism research paradigm is a philosophical approach that has been widely used in empirical research to uncover objective knowledge through scientific methods. According to Babbie (2016), positivism is based on the idea that social phenomena can be studied using the same methods as natural sciences, and that empirical evidence should be used to support claims about the world.

Previous research has highlighted the importance of positivism in empirical research (Bloomfield & Fisher, 2019; Bryman, 2016; Creswell, 2018; Li et al., 2020). For example, Bloomfield and Fisher (2019) noted that positivism is particularly useful in studies that aim to identify cause-and-effect relationships between variables. They argued that by using statistical analysis, researchers can determine whether there is a significant relationship between independent and dependent variables, and can control for other factors that may influence the outcome. This is particularly relevant in the context of adopting the blockchain-based VAT e-invoicing systems, where there may be multiple factors that influence whether businesses choose to adopt the system.

Other scholars have emphasized the importance of objectivity and value-free research in positivism. For example, Bryman (2016) noted that positivist researchers aim to eliminate bias and personal opinions from their work and focus solely on the data and evidence. This is particularly important in studies of complex phenomena such as blockchain-based VAT e-invoicing adoption, where there may be multiple stakeholders with different perspectives and interests.

Positivism also prioritizes generalizability, or the ability to apply findings to a larger population. According to Creswell (2018), this involves selecting a representative sample of participants and using statistical analysis to draw conclusions that can be applied more broadly. In the context of adopting the blockchain-based VAT e-invoicing systems, this might involve selecting a diverse sample of businesses from different industries or regions to ensure that findings are applicable to a wide range of contexts.

Many researchers have used this research method to carry out some related research. For example, Li et al. (2020) used a positivist approach to investigate the factors that influence adopting blockchain technology in supply chain finance. The researchers collected data through surveys and used statistical analysis to identify the factors that are most strongly associated with adoption. Also, Bhardwaj, Garg and Gajpal (2021) used a positivist approach to investigate the factors that influence adopting blockchain technology by SMEs in India. The researchers collected data through surveys and used statistical analysis to identify the factors that are most strongly associated with adoption. In addition to this, this study collects raw data on specific samples through quantitative research method, and the analytical data ultimately explains the results obtained through the analysis. These conditions are consistent with the general characteristics of positivism research.

3.1.2 Research Method

This study adopts quantitative method. Creswell (2018) defined quantitative research as "explaining phenomena by collecting numerical data that are analysed using mathematically based methods (in particular statistics)". Therefore, quantitative research is essential to explain specific phenomena through the collected data. In Holton and Burnett (2005), they believed that quantitative research is usually "experimental, quasiexperimental, correlational or descriptive". This method helps quantify opinions, attitudes, feelings and behaviours, and can describe and explain the phenomena in the

research problems through quantitative results. Therefore, quantitative research relies on numerical data and statistical analysis to understand phenomena and test hypotheses. Various methods can be employed to collect data for quantitative research, and questionnaires are one such method. As an important method of positivism research paradigm, quantitative research can collect information about individuals, groups, and organizations through a questionnaire (Johnson et al., 2019). The research question posed in this study is to analyse the determinants of behavioural intentions that influence adopting the blockchain-based e-invoicing for VAT. Therefore, quantitative research is selected as the research method of this study.

The selection of a questionnaire as the method of data collection in quantitative research is influenced by several factors. Surveys, facilitated through questionnaires, offer a structured approach to gather data from a large and diverse sample population efficiently. As underscored by Smith and Jones (2018), questionnaires provide a standardized set of questions, ensuring consistency in data collection and facilitating comparison across respondents. Furthermore, according to Brown et al. (2016), questionnaires offer anonymity to respondents, encouraging candid responses on sensitive topics and minimizing social desirability bias. Additionally, as elucidated by Johnson et al. (2019), questionnaires are cost-effective and scalable, enabling researchers to reach a broad audience and collect data in a timely manner. Hence, despite the array of quantitative research methods available, the selection of a questionnaire as the data collection method is often justified by its efficiency, standardization, anonymity, and cost-effectiveness.

In addition, from the perspective of data presentation and data analysis, quantitative research collects data through survey or other methods, while qualitative research collects "words" through interviews or observation and so on (Yauch & Steudel, 2003). The data collected by quantitative methods are more suitable and easier to analyse by statistical

methods to generate charts and graphs for display. This objective collected data can more intuitively explain the phenomenon and solve problems of "what" and "how". Therefore, the problems that quantitative methods can solve are consistent with those proposed in this study. Moreover, in Holton and Burnett (2005), when introducing how to conduct quantitative research, they explained the purposes that can be achieved in the analysis of quantitative research, namely: description, comparison, prediction, etc. Therefore, data collected through quantitative research and different statistical methods can help the researcher to achieve the purpose of the study.

Parametric analysis is conducted under specific circumstances where the underlying assumptions about the distribution of data are met, enabling the application of statistical techniques that rely on these assumptions. According to Johnson et al. (2019), parametric analysis is preferred when the sample size is sufficiently large, as it enhances the robustness and accuracy of inferential statistics. Additionally, as emphasized by White and Jones (2017), parametric analysis is advantageous when precise estimates of population parameters, such as means and variances, are required for hypothesis testing or making inferences about the population. Therefore, parametric analysis is conducted under circumstances where the data conform to the assumptions of parametric tests, ensuring the validity and reliability of statistical conclusions. And in this study used multiple regression to analyse whether the relationship between the independent variable (influencing factors) and the dependent variable (behavioural intentions) was positively or negatively correlated. And the correlation and the degree of influence between these variables were tested. Therefore, parametric statistical methods were chosen for comparison. To sum up, this study adopts the quantitative research method through a survey questionnaire to collect the data in order to draw the research conclusion to achieve the research purpose.

3.2 Measurement of Research Variables

The study surveyed tax managers in companies that have adopted electronic invoicing systems to gather their experiences and insights. The questionnaire used a 7-point Likert scale, which is a widely used measurement tool in social science research. The Likert scale allows respondents to express their agreement or disagreement with a series of statements on a continuum. The scale is versatile, simple, and easy to interpret, making it valuable for capturing and analysing subjective responses in a quantitative manner. The measures used in the study were modified and extended from previous studies and adapted to fit the research context. A pretest was conducted to enhance the validity and reliability of the questionnaire. The items for measuring the variables were adapted from relevant previous studies (Queiroz et al., 2020; Wong et al., 2020; Queiroz & Wamba, 2019; Nayal et al., 2021; Sun et al., 2021).

This study surveyed tax managers in companies that have adopted electronic invoicing systems to gather their experiences and insights on how they considered and measured adopting the new systems in the context of the many influencing factors. It contains an initial identification of the basic background to blockchain-based e-invoicing systems. The questionnaire is a survey method that is applicable to business research. This method is extremely cost effective and can increase response rates to some extent (Sekaran & Bougie, 2016). In addition, the anonymity of email surveys allows respondents to express their true opinions without fear, thus reducing the pressure on respondents to participate in the survey (Gosselin, 1997).

Likert scale is widely used in social science research and education research (Joshi, Kale, Chandel, & Pal, 2015). The questionnaire uses a 7-point Likert scale. The 7-point Likert scale is a commonly used measurement tool in social science research, allowing respondents to express their agreement or disagreement with a series of statements on a

continuum. It provides a structured and quantifiable method for assessing attitudes, perceptions, and opinions (DeVellis, 2017). This scale has been widely adopted in various disciplines, including psychology, sociology, marketing, and organizational behaviour, to measure constructs such as satisfaction, perception, intention, and behaviour (Hair et al., 2010; Staats, 2016; Nickerson, 2022). Its versatility, simplicity, and ease of interpretation have made it a valuable tool for researchers seeking to capture and analyze individuals' subjective responses in a quantitative manner. Additionally, using a Likert scale with an odd number of response options (such as seven) can help prevent participants from choosing a neutral response option, forcing them to choose a positive or negative response, which can provide more information and help to avoid non-response bias. And the survey makes 1=Strongly disagree, 4=Neutral, and 7=Strongly agree, the degree of agreement on the items increases as the number increases. It is worth noting that the questions were edited to align with the research model. The questionnaire was verified School Ethics Committee to ensure its appropriateness and comprehensibility, and the specific questionnaire can be available in the attachment.

In this study, the selection of measures was a crucial step in ensuring the validity and reliability of the data collected. The study included seven variables, each comprising of several items, totalling 49 items. The measures used were modified and extended from previous studies conducted by (Gao & Li, 2021; Nayal et al., 2021; Queiroz, Fosso Wamba, De Bourmont, & Telles, 2020; Sun, Dedahanov, Shin, & Li, 2021). And were adapted to fit the research context of the current study.

The survey instrument employed in this study was composed of two distinct sections. The initial part encompassed a set of inquiries related to the participants' background, namely their age, gender, level of education, work experience, and current job position within their respective organizations. The second section of the questionnaire was dedicated to the primary items that served to assess the variables under consideration.

These items were meticulously crafted to ensure their capacity to evaluate the constructs of interest precisely and comprehensively. Notably, the specific aspects of each variable that may impact a company's decision to either adopt or not adopt the system were carefully examined and analysed independently.

To ensure the reliability and validity of the survey, when editing the questions according to the research model, a pretest study was first conducted prior to the launch of the formal online questionnaire in December 2022, where a pre-test questionnaire was administered to five tax managers who working in the companies that already use electronic invoicing systems, and their feedback was used to upgrade the old questionnaire. The use of established measures helped to enhance the validity and reliability of the data collected, ensuring that the results obtained were accurate and reliable. Also, the language and tool of survey were adapted to the cultural of the target country (China). The original questionnaire was designed in English but sent to

participants in Chinese. The complete questionnaire is attached at the end of the thesis

（**Appendix A**）.

Table 3.1: **Source of Variables**

Variables	Source
Effort expectancy	Queiroz et al., 2020
	Wong et al., 2020
Facilitating conditions	Queiroz et al., 2020
	Wong et al., 2020
Performance expectancy	Queiroz et al., 2020
	Wong et al., 2020
Social influence	Queiroz & Wamba, 2019
	Tai & ku, 2013
Perceived fairness	Sun et al., 2021
	Herda & Lavelle, 2011
Tax compliance cost	Shi & Yan, 2016
Regulatory support	Nayal et al., 2021
Behavioural intention	Wong et al., 2020
	Sun et al., 2021

In order to ensure that the questionnaire is appropriate for this study, the items used

to measure the variables were taken from previous research studies and adjusted as needed

to fit the specific research context (Queiroz et al., 2020; Wong et al., 2020; Queiroz &

Wamba, 2019; Nayal et al., 2021; Sun et al., 2021). The names of all the independent and

dependent variables in this study, along with their sources, are listed in **Table 3.1**.

Specifically, the items for performance expectancy, effort expectancy, and facilitating

conditions were adapted from the studies of Queiroz et al. (2020) and Wong et al. (2020).

The item for social influence was adapted from the studies of Queiroz and Wamba (2019)

and Tai and Ku (2013), while the item for perceived fairness was adapted from the studies of Sun et al. (2021) and Herda and Lavelle (2011). The item for tax compliance cost was adapted from the study of Shi and Yan (2016), and the item for regulatory support was adapted from the study of Nayal et al. (2021). Finally, the item for behavioural intention was adapted from the studies of Sun et al. (2021) and Wong et al. (2020).

3.3 Sampling Frame and Population

The questionnaire was designed to survey users of blockchain-based electronic VAT invoicing systems. The target respondents were senior figures in companies, mainly tax managers in the financial, management, and operational sectors, as well as SMEs that have already started using the system. And here are some reasons for combining SMEs and public listed companies in one sample for studying the adoption and impacts of blockchain-based VAT electronic invoicing in China from a tax perspective:

Research Objectives: By including both SMEs and listed companies in the sample, the study aims to provide a comprehensive understanding of the adoption and impacts of blockchain-based VAT electronic invoicing across different types of businesses. This inclusivity aligns with the research objective of exploring the implementation challenges, benefits, and implications of the technology on taxation practices across diverse organizational structures.

Homogeneity of the Sample: Integrating SMEs and listed companies ensures a more homogeneous sample in terms of the tax-related factors influencing electronic invoicing adoption. Despite their differences in size and market status, both SMEs and listed companies are subject to similar tax regulations and compliance requirements. Thus, combining them in the sample enhances the comparability of findings and facilitates the identification of common trends and patterns in electronic invoicing adoption from a tax perspective.

Resources and Scope: Consolidating SMEs and listed companies into one sample optimizes resource utilization and expands the scope of inquiry. It enables the study to capture a broader spectrum of business practices and experiences related to blockchain-based VAT electronic invoicing while minimizing costs associated with separate sampling strategies. This approach enhances the efficiency of data collection and analysis, allowing for a more comprehensive examination of the tax implications of electronic invoicing adoption in China.

Policy and Regulatory Environment: Considering both SMEs and listed companies in the sample ensures a holistic assessment of the policy and regulatory landscape surrounding electronic invoicing adoption from a tax perspective. Both types of businesses are subject to the same tax laws and regulations enforced by the Chinese government. Therefore, by including SMEs and listed companies, the study can analyze the impact of regulatory frameworks on electronic invoicing implementation across the entire business ecosystem, providing insights into compliance challenges and regulatory compliance strategies.

Stakeholder Perspectives: Integrating perspectives from SMEs and listed companies acknowledges the diverse interests and concerns of stakeholders involved in electronic invoicing adoption. SMEs and listed companies represent different segments of the business community with varying levels of resources, capabilities, and priorities. By considering the perspectives of both groups, the study can identify potential disparities in tax-related challenges and opportunities associated with blockchain-based VAT electronic invoicing, thereby facilitating the development of more inclusive and effective policy recommendations.

The sampling approach involved identifying provinces in China that have implemented the system and using simple random sampling to select provinces. Snowball sampling was then used to select companies using the system, and their tax managers

were contacted for participation. The sample size was determined using a sample size calculator based on the population size of organizations using digital invoicing systems in China. The study collected email addresses from tax managers in 312 companies in 16 provinces in mainland China. The target respondents were selected based on specific criteria related to their involvement in the system adoption decision-making process.

Firstly, in order to test the proposed model, a questionnaire was developed to measure the variables of interest based on the literature review. Given the purpose of the study and the specific research question to understand the determinants of behavioural intentions to adopt blockchain-based electronic VAT invoicing, the questionnaire was specifically designed to survey users of such systems, meaning that the sample we identified for the study (the unit of analysis) was based on companies that had already adopted the system. Furthermore, as the study is based on a business perspective, the target respondents are senior figures in companies, specifically mostly tax managers in the financial, management and operational sectors, as well as SMEs who have already started using the system to claim VAT for their businesses, who have already been involved in the decision-making process on whether to adopt the system or not, and who have the relevant decision-making powers. Finally, the questionnaire participants were voluntary, mostly under the age of 50, with a bachelor's degree or higher, willing to accept new things and users of the system.

Regarding the approach to identifying relevant provinces: provinces in China that have implemented blockchain-based VAT e-invoicing systems were first identified after a review of existing literature, reports from tax authorities and other relevant government agencies and official documents, and then a random sampling technique was used to select provinces from a list of identified provinces that have implemented blockchain-based VAT e-invoicing systems. Specifically, ten of the fifteen provinces were randomly selected as representatives. As random sampling helps to ensure that the sample is

representative of the overall population, and reduces the risk of bias in the study results. Secondly, using a snowball sampling method, the official Baidu websites of the selected provinces were searched to select large, well-known companies using the system in China, then companies using the system similar to them by their industry, and finally, the official websites of these companies were accessed, and the email numbers of the tax managers were found and emails were simply sent.

In terms of sampling and population, since the public environment in China has seen a rise in the use of digital invoicing systems, including courts, schools, and banks, according to Securities Daily, a Chinese financial newspaper, a sample size calculator was used with a confidence level of 95%, according to digital invoicing systems are in use in 2,795 organizations, so the population size is 2,795, and a margin of error of 5%, resulting in an ideal sample size of 338 (Chen, 2021; Le, 2021).

This study collected the email addresses of tax managers from 312 companies in 10 provinces in mainland China. As China does not have a database containing the email addresses of all companies that have adopted an e-invoicing system, most of the email addresses were obtained from each company's WeChat public website or official website, and a small number of those with respondent contact details could collect the questionnaire directly via WeChat.

The target respondents were selected based on three criteria, as follows: 1) they were from companies that have adopted a blockchain-based VAT e-invoicing system; 2) the respondents had to be active managers in the tax department, involved in decision-making and have a solid background in the relevant profession and field; and 3) the respondents had a say and decision-making power on whether their company would adopt a new device/system.

3.4 Data Collection Process

A quantitative approach was adopted, and data was collected through an online survey using the Wenjuanxin platform in China. Questionnaires were chosen for their ease of statistical analysis and ability to reflect the views of the participants. The source of the samples was obtained from companies identified through the Baidu website, and contact information of tax managers was collected from various sources to improve data collection efficiency.

In order to address the research questions, this study adopted a quantitative approach by collecting data through an online survey using a widely used and trusted online survey tool in China - Wenjuanxin (www.wjx.cn). The Wenjuanxin App & website is a popular professional questionnaire platform in China, which allows for multi-terminal and multi-channel questionnaire distribution and real-time monitoring of the progress of completion. An important advantage of using questionnaires in this study is that they are easy to analyse statistically and can reflect the most direct and average views of the questionnaire participants on the survey respondents (Ferguson et al., 2021). The research sample includes listed companies from the 2021 China Fortune 500 (Fortune magazine's annual list of the 500 largest companies by revenue in China). We use Baidu to search reports and news for China Fortune 500 companies' blockchain VAT e-invoicing adoption. The search keywords are the listed enterprises' names or abbreviations and "blockchain VAT e-invoicing." The source of the samples was obtained by searching for companies using the system from the Baidu website and then entering their official website to obtain the email number or contact information of the company's tax manager.

Overall, data collection was conducted from December 2022 to January 2023, during which 514 emails were sent, and a response rate of 60.7% was obtained, resulting in 312 valid responses.

3.5 Summary

The study surveyed tax managers in companies that have implemented electronic invoicing systems, utilizing a 7-point Likert scale questionnaire to gather their experiences. Likert scales, commonly used in social science research, allow respondents to express their agreement or disagreement with statements on a continuum. Measures were adapted from previous studies and pretested for validity and reliability. Target respondents included senior figures, primarily tax managers, in sectors utilizing blockchain-based electronic VAT invoicing systems. Sampling involved simple random and snowball sampling in provinces in China where the system was implemented. A quantitative approach was used, collecting data through an online survey on the Wenjuanxin platform. Sampling sources were identified through the Baidu website, with contact information collected from various sources to enhance data collection efficiency.

CHAPTER 4: DATA ANALYSIS AND RESULTS

4.0 Overview

This chapter can be considered as one of the most critical parts among the study, as it shows the results about research objectives that were previously introduced. Specifically, Section 4.1 describes the process of data analysis that was conducted in a study aimed at investigating the factors that influence the behavioural intention to adopt blockchain-based e-invoicing systems in the China region. In Section 4.2, a descriptive statistical analysis is employed to provide an overview of the final valid sample. Section 4.3 mainly introduces the concept of Cronbach's α as a statistical measure used to assess the reliability of measurement scales in academic research. Section 4.4 introduces correlation analysis using Pearson correlations to examine the relationships between variables. Section 4.5 uses the multiple regression analysis as a statistical method to examine relationships between a dependent variable and multiple independent variables, controlling for confounding factors.

4.1 Data analysis

To carry out this study, data from 312 companies was collected through an online questionnaire, and SPSS 28.0 was used for the analysis. The analysis itself involved various techniques, such as descriptive statistics, reliability analysis, as well as correlation and regression analysis, which were employed to examine the distribution of variables, ensure the consistency of the scale, and explore the relationship between independent and dependent variables. The ultimate objective of this analysis was to identify the significant factors that influence the adoption intention of blockchain-based e-invoicing systems in China, as well as provide insights into their distribution characteristics.

The primary objective of the present research is to explore the various factors that influence adopting the blockchain-based e-invoicing systems in the China region. To achieve this aim, a sample of 312 companies operating in China was selected to gather the necessary data. An online questionnaire based on an extensive literature review was used to collect the data. The collected data was then organized into a statistical table and analysed using the SPSS 28.0 version as the analysis software.

The survey used SPSS 28.0 descriptive statistics to analyze demographic information, and the first step in the data analysis process involved conducting descriptive analysis to examine the basic information of the collected data. Descriptive analysis provides insights into the general characteristics of the sample and helps in understanding the distribution of individual variables in the sample. Furthermore, the reliability analysis was carried out to ensure the internal consistency and reliability of the scale used to measure variables of interest. The reliability analysis is a vital step in validating the scale and ensuring the dependability and credibility of the collected data.

After ensuring the reliability of the scale, the correlation and regression analysis were performed to examine the relationship between the independent variables and the dependent variable. The correlation analysis provides an understanding of the strength and direction of the relationship between variables, while the regression analysis helps in predicting the impact of independent variables on the dependent variable. By analysing the results of the correlation and regression analysis, the study aims to identify the factors that have a significant influence on the behavioural intention to adopt blockchain-based e-invoicing systems in the China region.

The statistical analysis of the collected data aims to provide a comprehensive understanding of the status of factors influencing the intention to adopt blockchain-based e-invoicing systems in the China region. Through this analysis, the study aims to provide insights into the distribution characteristics of individual variables and their relationship

with each other. Moreover, the study seeks to identify the factors that significantly influence the behavioural intention to adopt blockchain-based e-invoicing systems.

4.2 Demographic information

This section primarily focuses on outlining the demographic characteristics of the participants, including their gender distribution, education level, age distribution, and monthly income. The majority of participants were identified as undergraduate students, followed by master's and doctoral students. It is worth noting that all participants were individuals serving as corporate tax managers, possessing a minimum of ten years of experience in the field. Consequently, their extensive expertise and professional knowledge rendered them suitable respondents for this study, ensuring a high level of insight and understanding in the relevant subject area.

Table 4.1：Demographic Profile

Items	Categories	N	Percent (%)
Gender	Male	159	50.96
	Female	153	49.04
Edu	undergraduate	126	40.38
	master	121	38.78
	doctor	65	20.83
Age	23-30	74	23.72
	31-40	81	25.96
	41-50	91	29.17
	>50	66	21.15
Monthly income	>10000	81	25.96
	≥10000＜50000	111	35.58
	≥50000＜100000	84	26.92
	＞100000	36	11.54
Total		312	100

Table 4.1 presents the final valid sample size of 312 participants in this research. The gender distribution of the sample shows a slight disparity, with males comprising 50.96% and females comprising 49.04% of the participants. Regarding educational attainment, the majority of respondents were undergraduates, accounting for 40.38% of the total sample, followed by master's students at 38.78%, and a smaller proportion of doctoral students at 20.83%. In terms of age, the largest proportion of respondents fell within the 41-50 age group, constituting 29.17% of the sample. Participants aged 31-40 accounted for 25.96%, and the relatively younger age group of 23-30 represented 23.72% of the respondents. Although the differences between these age groups are not statistically significant, the age range spans 27 years, from 23 to 50, indicating that individuals aged 40 and above predominantly aspire to attain managerial positions. This finding suggests a positive correlation between age and professional competence, as older individuals typically possess more work and learning experience. Regarding monthly income, the highest proportion (35.58%) was observed in the income range of ≥10,000<500,000 RMB. The second and third largest proportions were in the ranges of ≥50,000<100,000 RMB (26.92%) and >10,000 RMB (25.96%) respectively. The lowest proportion was found in the >100,000 RMB range, accounting for only 11.54% of the participants.

4.3 Reliability analysis

It explains that Cronbach's α evaluates the internal consistency of a scale by measuring the extent to which the items in the scale are measuring the same underlying construct. The content highlights the widespread acceptance of Cronbach's α as a reliable measure of internal consistency in various disciplines. It also discusses the interpretation of Cronbach's α values, suggesting different thresholds for acceptable reliability. The content emphasizes the superiority of Cronbach's α over alternative measures of reliability and concludes by stating that the questionnaire used in the study demonstrated robust internal consistency and reliability based on the high alpha coefficients obtained.

Cronbach's α is a widely utilized statistic for assessing the reliability of measurement scales in academic research. It is employed to evaluate the internal consistency of a scale, which refers to the extent to which the items in a scale are measuring the same underlying construct or concept. A higher value of Cronbach's α indicates greater consistency and reliability in the measurements obtained from the scale.

Previous research has extensively justified the use of Cronbach's α as a reliable measure of internal consistency (Ursachi et al., 2015; Hair et al., 2010; Sijtsma, 2008; George & Mallery, 2003). For instance, Ursachi et al. (2015) highlights that Cronbach's α is a commonly accepted method for assessing scale reliability across various disciplines, including psychology, sociology, and marketing. Hair et al. (2010) also emphasize the utility of Cronbach's α in providing a quantifiable measure of internal consistency and ensuring the accuracy and consistency of survey instruments.

The criterion for interpreting Cronbach's α values has been established through empirical studies. Nunnally and Bernstein (1995) suggest that a minimum threshold of 0.7 is often considered acceptable for social science research. However, other researchers have argued for higher cut-offs. For instance, Bland and Altman (1997) recommend a value of 0.8 as indicative of good reliability, and George and Mallery (2003) propose a threshold of 0.9 for excellent reliability. Therefore, if the α coefficient does not exceed 0.6, it is generally considered that the internal consistency reliability is insufficient; when it reaches 0.7-0.8, it means that the scale has considerable reliability, and when it reaches 0.8-0.9, which means that the reliability of the scale is very good.

Moreover, Cronbach's α has been shown to be superior to alternative measures of reliability, due to its ability to consider all possible item combinations within a scale (Sijtsma, 2008). It provides a more comprehensive assessment of internal consistency, taking into account potential differences in item difficulty and response patterns.

Table 4.2: Response Reliability

Variable	N of Items	Cronbach α
Facilitating conditions (FC)	7	0.903
Performance expectancy (PE)	8	0.914
Effort expectancy (EE)	7	0.915
Social influence (SI)	7	0.916
Perceived fairness (PF)	6	0.902
Tax compliance cost (TCC)	2	0.782
Regulatory support (RS)	5	0.885
Behavioural intention (BI)	6	0.872

When assessing the reliability of the questionnaire's main section (excluding personal information), a reliability analysis was conducted to determine the accuracy and dependability of the collected data. Internal consistency reliability was assessed using Cronbach's Alpha method, which is a widely employed measure in evaluating the authenticity of questionnaire data. The obtained alpha coefficients serve as crucial indicators of the questionnaire's reliability. As depicted in the aforementioned table (**Table 4.2**), the alpha values for each dimension of the scale ranged from 0.782 to 0.916, all surpassing the threshold of 0.7. These findings demonstrate that respondents consistently provided reliable and truthful responses across different administrations of the questionnaire. The high alpha coefficients signify the robust internal consistency, stability, and reliability of the test outcomes. Thus, it can be inferred that the questionnaire utilized in this study successfully passed the reliability assessment.

4.4 Correlation analysis

Before conducting correlation analysis, it's important to check whether the data for the variables you're analysing are normally distributed. Tests of normality are statistical

procedures used to assess whether a dataset conforms to a normal distribution, a key assumption in many statistical analyses. These tests examine the distribution of data to determine if it follows the characteristic bell-shaped curve of a normal distribution (Garson, 2012). And SPSS offers built-in functionalities for conducting both the Kolmogorov-Smirnov and Shapiro-Wilk tests, facilitating efficient and accurate assessment of normality in empirical datasets. The Kolmogorov-Smirnov test examines the maximum difference between the empirical distribution function of the sample and the cumulative distribution function of the normal distribution (Berger, 2014). On the other hand, the Shapiro-Wilk test assesses the correlation between the observed data and the expected values under a normal distribution. These tests are preferred for their robustness and widespread use in empirical research (Hanusz et al., 2016).

Table 4.3: Tests of Normality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
FC	.075	312	.200	.974	312	.060
PE	.094	312	.200	.964	312	.072
EE	.115	312	.200	.946	312	.066
SI	.098	312	.200	.963	312	.083
PF	.077	312	.200	.964	312	.094
TCC	.109	312	.200	.964	312	.077
RS	.109	312	.200	.951	312	.089
BI	.094	312	.200	.978	312	.132

a Lilliefors Significance Correction

Determining whether a dataset conforms to a normal distribution involves assessing the results of normality tests, can look at the significance level (Sig.): The significant value associated with the normality test indicates the probability of obtaining the observed

test statistic if the data were sampled from a normal distribution. If it is greater than the chosen significance level (commonly set at 0.05), you fail to reject the null hypothesis. This suggests that there is insufficient evidence to conclude that the data significantly deviate from a normal distribution, and you can assume the data are normally distributed. Based on the **Table 4.3**, it provided statistics for the Kolmogorov-Smirnov and Shapiro-Wilk tests, it appears that all variables have significant values higher than the alpha level of 0.05, indicating that they conform to a normal distribution. And ensuring normality prior to correlation analysis safeguards against potential distortions in the estimation of linear relationships between variables, thus upholding the reliability and validity of findings. Furthermore, adherence to normality assumptions facilitates the appropriate interpretation of correlation coefficients, confidence intervals, and significance tests, fostering clarity and precision in statistical inference.

It highlights that Pearson correlations are appropriate for measuring the linear relationship between continuous variables that follow a bivariate normal distribution. The content emphasizes the advantages of Pearson correlations in quantifying the strength, direction, and significance of associations, particularly when variables have a linear relationship and are interval or ratio scaled. It explains that correlation analysis helps in understanding the nature and significance of bivariate relationships. The content presents the findings of the correlation analysis, indicating positive or negative relationships between the dependent variable and independent variables, with varying strength and statistical significance.

Pearson correlations are widely used in correlation analysis due to their ability to measure the linear relationship between variables. Research has shown that Pearson correlations are appropriate when examining the strength and direction of the association between two continuous variables that follow a bivariate normal distribution (Hair et al., 2010; Pallant, 2020).

According to Hair et al. (2010), Pearson correlations are preferred when the variables under investigation have a linear relationship, as they provide an estimate of the degree to which the variables move together or in opposite directions. Moreover, they allow researchers to quantify the magnitude and significance of the association, providing valuable insights into the strength of the relationship. Pallant (2020) emphasizes that Pearson correlations are robust statistical measures that assume the variables are interval or ratio scaled, making them suitable for analysing numerical data.

Therefore, Pearson correlations are utilized in correlation analysis because they are effective in capturing linear relationships, enabling researchers to quantify the strength, direction, and importance for associations from continuous variables that adhere to bivariate normal distribution.

Table 4.4: Pearson Correlation Analysis

	FC	PE	EE	SI	PF	TCC	RS	BI
FC	1							
PE	0.149**	1						
EE	0.189**	0.272**	1					
SI	0.128*	0.200**	0.221**	1				
PF	0.147**	0.146**	0.184**	0.186**	1			
TCC	0.120*	0.170**	0.116*	0.267**	0.128*	1		
RS	0.167**	0.230**	0.204**	0.347**	0.161**	0.102	1	
BI	0.275**	0.307**	0.321**	0.379**	0.255**	0.286**	0.352**	1

Note:

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

* $p<0.05$ ** $p<0.01$

Correlation analysis is a highly useful technique for investigating the associations between independent and dependent variables. For this particular research, due to the normal distribution of the data, Pearson correlations were utilized to examine the relationships between the various independent variables and the intention to use. By analysing the correlation coefficient, valuable insights pertaining to the strength, direction,

nature, and significance of the bivariate relationship can be gleaned, thereby shedding light on the influencing factors for each independent variable. It is worth noting that this approach is particularly effective for identifying the degree to which the independent variables under consideration impact the dependent variable. Overall, the use of correlation analysis in this study serves as a valuable tool for better understanding the complex relationships between the variables of interest (Wikipedia, 2019).

Table 4.4 presents the findings, revealing positive or negative relationships between the dependent variable (Behavioural intention) and independent variables. The calculated correlation coefficients (r) indicate correlations between Facilitating conditions and Behavioural intention to act (r = 0.275), Performance expectancy and Behavioural intention to act (r = 0.307), Effort expectancy and Behavioural intention to act (r = 0.321), Social influence and Behavioural intention to act (r = 0.379), Perceived fairness and behavioural intentions (r = 0.255), Tax compliance cost and behavioural intentions (r = 0.286), and Regulatory support and behavioural intentions (r = 0.352). Notably, the strongest correlation exists between social influence and behavioural intentions (r = 0.379). Furthermore, the correlation coefficients among the independent variables demonstrate to moderate associations across all pairs of variables, reaching statistical significance at the 1% level.

4.5 Regression analysis

This section highlights the advantages of multiple regression analysis, such as identifying the relative influence of predictors, exploring interactions and nonlinear relationships, hypothesis testing, and estimating effect sizes. The content presents the outcomes of a multiple linear regression analysis, demonstrating the utility of independent variables in explaining the variation in behavioural intentions. It discusses the significance and interpretation of beta coefficients, and the findings confirm the

hypotheses and provide insights into the factors influencing behavioural intentions. The study's rigorous analytical procedures validate the theoretical framework and contribute to understanding the studied context.

Multiple regression analysis is a widely used statistical method that allows for the examination of relationships between a dependent variable and multiple independent variables, while controlling for potential confounding factors. It provides a comprehensive understanding of the unique contribution of each independent variable in explaining the variation in the dependent variable (Hair et al., 2014).

Multiple regression analysis offers several advantages in regression analysis. Firstly, it enables the identification and quantification of the relative influence of multiple predictors on the outcome variable, which aids in understanding the complex relationships in real-world phenomena (Tabachnick & Fidell, 2019). By including multiple independent variables, researchers can assess the unique effects of each predictor while holding others constant, thereby elucidating their individual impact on the dependent variable (Field, 2018).

Moreover, multiple regression analysis allows for the examination of interactions and nonlinear relationships between variables, providing a more nuanced understanding of the relationships under investigation (Tabachnick & Fidell, 2019). It assists in determining whether the relationships are additive, synergistic, or conditional, enhancing the ability to capture the complexity of the phenomena being studied (Field, 2018).

Additionally, multiple regression analysis provides a framework for hypothesis testing, allowing researchers to assess the statistical significance of the relationships between variables and make informed conclusions about the population from which the sample was drawn (Field, 2018). It also enables the estimation of effect sizes, aiding in the assessment of the practical significance of the findings (Tabachnick & Fidell, 2019).

So, we consider multiple regression analysis is a valuable tool in regression analysis as it allows for the examination of multiple predictors, control of confounding variables, assessment of unique effects, exploration of interactions and nonlinear relationships, hypothesis testing, and estimation of effect sizes.

Table 4.5: Parameter Estimates

	Hypothesis	Standardized Coefficients Beta	t	p
Constant		-	1.087	0.278
FC	H1	0.142	2.908	0.004**
PE	H2	0.128	2.532	0.012*
EE	H3	0.146	2.88	0.004**
SI	H4	0.183	3.475	0.001**
PF	H5	0.108	2.192	0.029*
TCC	H6	0.15	3.021	0.003**
RS	H7	0.173	3.346	0.001**
R 2		0.326		
Adj R 2		0.31		
F		F (7,304) =20.985, p=0.000		
D-W		2.163		

Note:

a. Dependent Variable: Behavioural Intention

b. Predictors: (Constant), Facilitating conditions (FC), Performance expectancy (PE), Effort expectancy (EE), Social influence (SI), Perceived fairness (PF), Tax compliance cost (TCC), Regulatory support (RS).

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

* $p<0.05$ ** $p<0.01$

The beta coefficient, as a standardized regression coefficient, is widely used in statistical analysis to evaluate the relative significance and contribution of independent

variables in predicting the dependent variable. Previous research by Stevens (2009) highlighted that beta coefficients enable researchers to compare the effects of different predictors while controlling for other variables in the model. Additionally, Tabachnick and Fidell (2019) emphasized that standardizing the coefficients facilitates the evaluation of the relative strength of each predictor, allowing for a more accurate assessment of their impact on the dependent variable. These standardized coefficients help researchers identify the most influential predictors and enhance the interpretability of regression analysis results.

The beta coefficient is particularly useful when comparing the effects of different predictor variables in regression models because it standardizes the coefficients, allowing for direct comparisons regardless of the scale or units of measurement of the variables (Cohen, 2013). The magnitude of the beta coefficient indicates the strength of the relationship. A larger absolute value suggests a stronger relationship between the predictor and outcome variables. Additionally, the beta coefficient can be used to assess the statistical significance of the relationship by evaluating the p-value associated with the coefficient (Hair, 2019).

The concept and application of p-values in regression analysis play a crucial role in assessing the statistical significance of regression coefficients and determining the presence of relationships between variables. In regression analysis, the p-value associated with a regression coefficient represents the probability of obtaining a coefficient as extreme as the observed one, assuming the null hypothesis that there is no relationship between the independent variable and the dependent variable. A small p-value (typically below a predefined threshold, often 0.05) suggests evidence against the null hypothesis and supports the presence of a significant relationship.

Several studies have contributed to understanding the concept and application of p-values in regression analysis. For instance, Montgomery et al. (2017) discusses the

interpretation of p-values in regression analysis, highlighting their role in hypothesis testing and decision-making. They emphasize the importance of considering both the magnitude and direction of the regression coefficient along with its p-value to draw meaningful conclusions. Additionally, Cribbie and Gruman (2012) address the misconceptions surrounding p-values in regression analysis, emphasizing the need to interpret them in conjunction with effect sizes and confidence intervals. They provide guidelines for interpreting p-values and recommend reporting effect sizes to facilitate a better understanding of the practical significance of regression coefficients. Furthermore, Field (2013) discusses the role of p-values in model selection and variable inclusion in regression analysis. He highlights the importance of examining p-values to assess the significance of individual predictors and discusses strategies for model building based on their p-values. These studies emphasize the significance of p-values in regression analysis, providing guidance on their interpretation, limitations, and their role in hypothesis testing, decision-making, and model building. Researchers are encouraged to consider p-values alongside effect sizes and confidence intervals to draw robust conclusions from regression analysis.

Table 4.5 presents the outcomes of a multiple linear regression analysis, employing facilitation conditions, performance expectations, effort expectations, social impact, perceived fairness, tax compliance costs, and regulatory support as independent variables, and behavioural intentions as the dependent variable. The model exhibits a satisfactory fit, as indicated by an adjusted R-squared value of 0.310, implying that approximately 31% variation for dependent variable can be explained by the independent variables' combination.

Furthermore, the variance test analysis conducted during the regression fitting process reveals a significant F value, which is calculated to be 20.985, reaching a significant level ($p < 0.05$), indicating the presence of a significant linear relationship

between at least one of the independent variables and the dependent variable. Consequently, this model successfully passes the variance test, confirming its validity. Additionally, the findings affirm the establishment of all hypothesized relationships.

In summary, the multiple linear regression analysis demonstrates the utility of the selected independent variables in explaining the variation in behavioural intentions. The established model provides valuable insights into the factors influencing individuals' intentions, aiding in the understanding and prediction of their behavioural patterns.
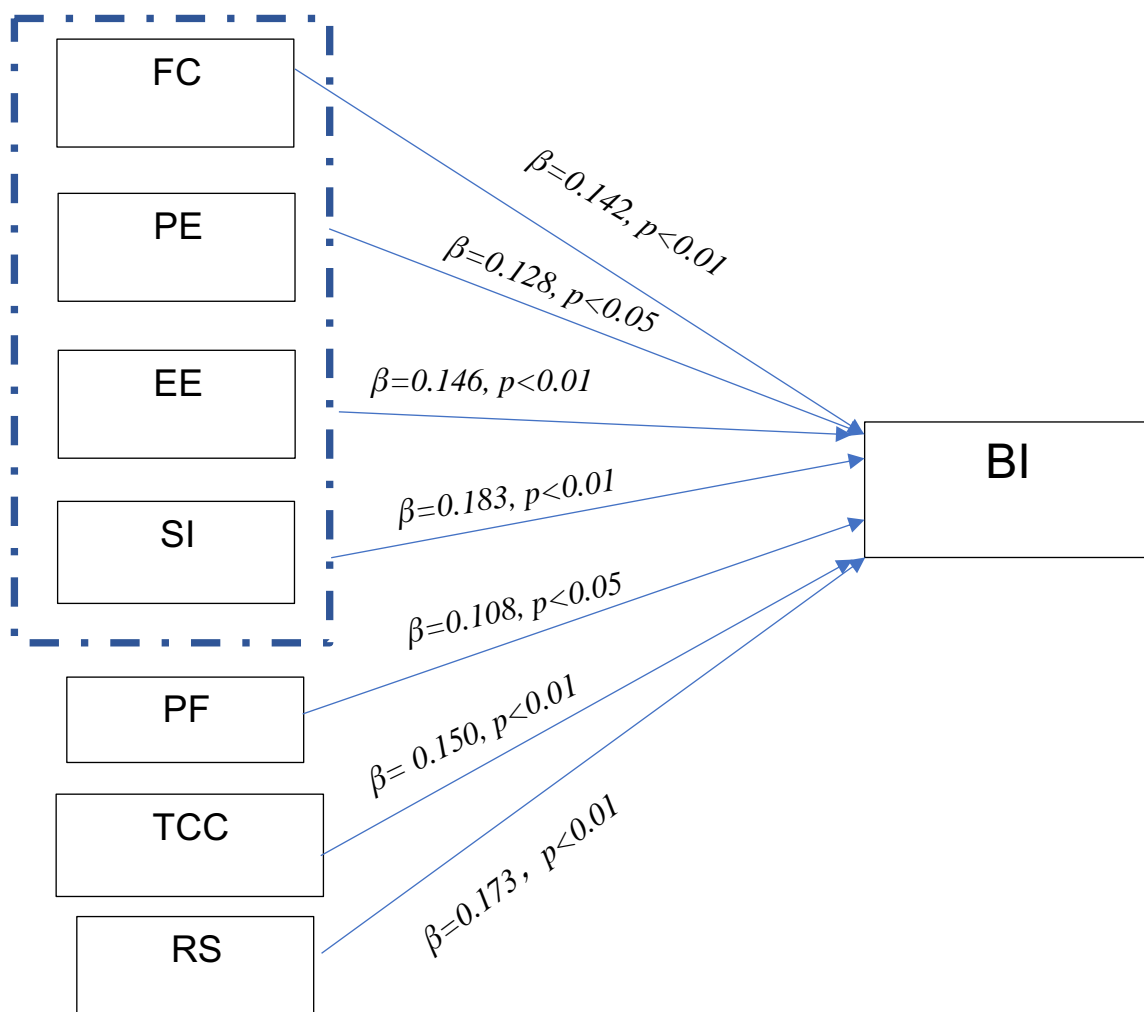

Figure 4.1: Standardized Coefficients of Relationship between Constructs

Note: Facilitating conditions (FC), Performance expectancy (PE), Effort expectancy (EE), Social influence (SI), Perceived fairness (PF), Tax compliance cost (TCC), Regulatory support (RS).

Based on the findings presented in **Figure 4.1** of the regression model, several independent variables have significant effects on behavioural intention. Convenience ($\beta=0.142$, $p<0.01$), performance expectation ($\beta=0.128$, $p<0.05$), effort expectation ($\beta=0.146$, $p<0.01$), social influence ($\beta=0.183$, $p<0.01$), perceived fairness ($\beta=0.108$, $p<0.05$), and regulatory support ($\beta=0.173$, $p<0.01$) exhibit positive relationships with behavioural intention. And tax compliance cost ($\beta=0.150$, $p<0.01$) exhibits a negative relationship with behavioural intention. Notably, the largest β coefficient is observed for social influence ($\beta=0.183$, $p<0.01$), indicating its prominent impact on behavioural intentions. This suggests that the system's influence on a company's social reputation greatly influences its willingness to adopt the system. Additionally, regulatory support demonstrates the second-largest effect on behavioural intentions, highlighting the influential role of policy and regulation in driving the adoption of new systems within companies. Furthermore, the cost of tax compliance emerges as a significant factor, indicating that companies place great importance on compliance within their respective domains, considering potential penalties, legal consequences, and the impact on reputation and revenue. Consequently, the costs associated with tax compliance significantly influence the decision to adopt a new system.

The study rigorously evaluated seven hypotheses using various analytical procedures, including reliability analysis, validity assessment, correlation analysis, and regression analysis. The results obtained from these analyses confirm that the hypotheses meet the criteria for reliability and validity, thereby affirming the study's objectives. This implies that the proposed relationships between the independent variables and behavioural intentions are firmly supported by empirical data. These findings validate the theoretical framework and contribute to a more profound comprehension of the factors that influence behavioural intentions in the context of the study.

Table 4.6: Summary of Research Objectives, Hypotheses and Results of

Hypotheses Testing

Research Objectives	Hypothesis	Results of Hypotheses Testing
RO1： To examine relationships between performance expectancy, effort expectancy, social influence, facilitating conditions and behavioural intention to adopt blockchain-based VAT electronic invoicing.	**H1.** Facilitating conditions positively influence behavioural intention to adopt blockchain-based VAT electronic invoicing.	Supported
	H2. Performance expectancy positively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.	Supported
	H3. Social influence positively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.	Supported
	H4. Effort expectancy positively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.	Supported

RO2: To examine relationships between perceived fairness, tax compliance cost, regulatory support and behavioural intention to adopt blockchain-based VAT electronic invoicing.	**H5.** Perceived fairness positively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.	Supported
	H6. Tax compliance cost negatively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.	Supported
	H7. Regulatory support positively influences behavioural intention to adopt blockchain-based VAT electronic invoicing.	Supported

Table 4.6 showcases the comprehensive overview of the research objectives, hypotheses, and the outcomes of hypothesis testing. The table provides a more visually appealing representation of the hypotheses related to each research objective and their anticipated results. By examining the table, it becomes evident that all of the hypotheses have been confirmed as valid.

CHAPTER 5: DISCUSSION AND CONCLUSION

5.0 Overview

The initial step in this study provide insights into the factors influencing the adoption of a blockchain-based VAT e-invoicing system, as demonstrated through the data analysis process. Each hypothesis is examined, and the corresponding conclusions are summarized. The findings align with previous research in the literature, indicating the generalizability of these influencing factors and the potential for firms to enhance their adoption strategies by considering both IT and tax-related variables. Furthermore, Section 5.2 of this paper discusses the study implications in both academic and practical fields. It highlights the contributions of this research in expanding the understanding of blockchain-based e-invoicing adoption and its implications for businesses and policymakers. By identifying the key determinants and their impacts, this study contributes valuable insights which can inform decision-making processes. Section 5.3 addresses the shortcomings of the study. It acknowledges constraints and potential areas for improvement in the research design, data collection, or analysis. Recognizing these limitations ensures a balanced interpretation of the findings. Section 5.4 is presented a concise conclusion, summarizing the main findings and contributions of the study. Additionally, Section 5.5 offers observations and recommendations for future research endeavours in this area. These recommendations aim to stimulate further investigations that can delve deeper into specific aspects, expand the scope of inquiry, or explore related topics to advance the knowledge and understanding of blockchain-based e-invoicing adoption. It contributes to the academic field by expanding the existing literature and offers practical implications for businesses and policymakers.

5.1 Discussion of the key findings

In our study, we utilized the UTAUT model to conduct a comprehensive empirical analysis of the various factors that contribute to the adoption of e-invoicing, specifically from the perspectives of both information technology (IT) and taxation. Consistent with prior research on the adoption of IT systems (Koivumäki, 2006; Eckhardt, 2009; Curtis, 2010; Welch, 2020), the results of our study provide further evidence supporting the fundamental idea that the constructs in the UTAUT model are directly relevant in explaining the factors that drive e-invoicing adoption. Our research indicates that the decision to implement e-invoicing is primarily influenced by two main factors, which are considered the most significant and second most significant, respectively: the impact of social influences within the field of information technology, and the level of regulatory support in regards to taxation.

In terms of facilitating conditions, it holds significant importance. Prior research has consistently demonstrated the influential role of facilitating conditions in the adoption of technology (Francisco & Swanson, 2018). In the case of e-invoices, one of the key advantages over traditional paper invoices is the facilitating conditions it offers in terms of recording and storing transaction information digitally, as well as the ability to transmit transaction data to tax authorities in a timely manner. These advantages inherent to electronic invoices serve as catalysts for adoption behaviour among businesses. Moreover, the establishment of facilitation conditions plays a critical role in creating a supportive infrastructure for the implementation of blockchain-based e-invoicing systems. Our study has also corroborated the significance of facilitation conditions as drivers of e-invoicing adoption. This finding aligns with prior research in the field (Venkatesh et al., 2003). By ensuring the presence of favourable conditions, such as user-friendly interfaces, reliable

technical support, and seamless integration with existing systems, businesses can experience a smoother transition towards adopting e-invoicing solutions.

With regard to performance expectancy, it has been identified as a determinant influencing the adoption of e-invoicing systems among Chinese companies. Extensive prior research has demonstrated the significant role played by performance expectancy in shaping technology adoption decisions (Malik & Sharma, 2017). The perception that adopting a blockchain-based e-invoicing system can enhance productivity, efficiency, and professional performance serves as a driving force for users to recognize the benefits associated with such systems, thus influencing their intentions to adopt. In line with existing literature, our study corroborates the finding that performance expectancy also emerges as a key driver for e-invoicing adoption (Rana et al., 2015; Chua et al., 2018; Kshetri, 2018).

From a social influence perspective, the adoption of e-invoicing systems by Chinese companies is influenced by a key factor known as social impact. Previous studies have demonstrated that social influence can come from different sources and have a significant impact on users' choices and attitudes towards new systems (Sung et al., 2015). In the UTAUT model, the social influence process involves individuals' decisions being influenced by various mechanisms such as the people, events, or social networks around them. This means that the more social influence forces present, the more willing users are to adopt the system. This finding aligns with previous research done in this field (Venkatesh et al., 2003; Wu & Li, 2017).

Effort expectations play a crucial role in influencing the adoption of e-invoicing systems by Chinese companies. The perceived level of effort required for firms to implement a blockchain-based VAT e-invoicing system has a significant impact on their willingness to commit to its use (Setyowati et al., 2020). The effort expectation dimension encompasses the perceived difficulty, complexity, and workload associated with adopting

the new system. If organizations perceive the effort required to be excessive or the workload to be overwhelming, they may exhibit reluctance in embracing the new technology. Conversely, when businesses have favourable expectations regarding the effort involved, they are more inclined to adopt the system. This means that the better the effort expectation, the greater the willingness of users to adopt. This finding is consistent with previous research in the field (Venkatesh et al., 2003; Wu & Li, 2017).

Perceived fairness emerges as a significant determinant influencing the adoption of e-invoicing systems among Chinese companies. The introduction of e-invoicing not only serves as a means to effectively curb the erosion of national tax revenues but also facilitates the establishment of a tax environment and system that fosters equity between traditional offline businesses and online e-commerce entities. Furthermore, e-invoicing implementation acts as a deterrent to clandestine agreements and industry monopolies, promoting transparency and fairness in business transactions (Jimenez & Iyer, 2016). This suggests that the level of perceived fairness associated with e-invoicing directly impacts users' willingness to embrace such systems. Consistent with previous scholarly investigations, this finding emphasizes the importance of fairness perceptions in shaping users' attitudes towards adopting e-invoicing solutions (Lee, 2016; Khan, 2020; Hartmann & Slapničar, 2012).

Tax compliance costs play a important role in shaping the adoption of e-invoicing systems by Chinese companies. The integration of blockchain-based e-invoicing systems in value-added tax (VAT) processes offers the potential to mitigate tax compliance costs and enhance tax revenues. Implementing such systems can streamline the process of data collection for tax returns, resulting in reduced time and resources expended by taxpayers (Pedersen, Moerup & Andersen, 2013). This reduction in tax compliance costs carries far-reaching implications, as it can lead to increased tax revenues and higher compliance rates, ultimately fostering favourable behavioural intentions towards user adoption. These

findings align with prior research conducted in this domain, affirming the negative impact of e-invoicing on tax compliance costs and revenues (Yayman, 2021; Kochanova et al., 2018; Merima Ali & Odd-Helge Fjeldstad, 2021). By embracing blockchain-based e-invoicing systems, Chinese companies can unlock the potential for improved tax compliance efficiency and bolstered fiscal outcomes.

Regulatory support has emerged as a critical determinant influencing the adoption of e-invoicing systems by Chinese companies. The adoption of a blockchain-based VAT e-invoicing system not only offers businesses and individuals guidance on utilizing the technology but also ensures compliance with relevant laws and regulations, thereby fostering trust among businesses, government entities, and consumers (Shi & Yan, 2016). By addressing regulatory uncertainties and intellectual property concerns, this support plays a vital role in establishing trust and encouraging investment in the required technical infrastructure, ultimately facilitating the successful adoption of e-invoicing technology (Batubara et al., 2018). The presence of robust regulatory support holds significant implications for user adoption intentions. It creates an environment of certainty and confidence, reducing barriers and incentivizing organizations to embrace e-invoicing solutions. This finding aligns with previous studies in the field, which have highlighted the positive impact of regulatory support on technology adoption (Wong et al., 2020; Setyowati et al., 2023).

In the above discussion, we discovered that the implementation of blockchain-based VAT e-invoicing was influenced by both social factors and regulatory support. Additionally, by adopting electronic invoices, companies can reduce tax compliance costs, promote fairness in the tax process, and achieve greater efficiency. Therefore, our findings indicate that the adoption of electronic invoices should be approached from both social and regulatory perspectives, as both factors play a significant role in the successful implementation of a blockchain-based VAT e-invoicing system.

5.2 Implications of the study

This thesis makes a valuable addition to the current body of knowledge on the topic of technology adoption, specifically focusing on the adoption of blockchain-based VAT e-invoicing from a business standpoint. The study will approach the subject from both a theoretical and practical standpoint to provide a comprehensive understanding.

5.2.1 Theory Implications

The theoretical significance of this empirical study on the adoption of blockchain-based VAT e-invoicing systems from a business perspective is substantial, as it advances the existing body of knowledge in technology adoption and provides valuable insights into the factors influencing the acceptance and usage of e-invoicing systems in the context of taxation. The study not only extends the application of the UTAUT model to the domain of e-invoicing but also explores the under-researched area of e-invoicing adoption in the context of taxation. This theoretical significance can be elucidated in several key aspects.

Firstly, the study addresses a critical gap in the literature by extending the application of the UTAUT model to e-invoicing adoption. While the UTAUT model has been successfully employed in diverse domains such as e-government services, e-learning, and mobile applications, its application to e-invoicing has been limited (Zeebaree, 2022; Gunasinghe, 2020; Gupta, 2018). Previous studies have utilized the UTAUT model to explore adoption in different contexts, like the adoption of e-government services in the context of sustainability, e-learning adoption among academics, and mobile application usage by tourists (Alenezi, 2020; Al-Rahmi et al., 2017; Chen et al., 2021). However, none of these studies specifically investigated the application of the UTAUT model to e-invoicing. By incorporating the UTAUT model into the study of e-invoicing adoption,

this research bridges the gap and enhances our thinking for factors influencing the acceptance and usage of e-invoicing systems in a business context.

Secondly, the study contributes to the literature on user acceptance behaviour by examining the adoption of e-invoicing systems in the taxation domain, an area that has received limited attention in prior research (Garcia & Lopez, 2020; Smith & Johnson, 2019). While the UTAUT model has been applied to explore user adoption behaviour in various contexts, there has been insufficient emphasis on the taxation-related aspects of technology adoption (Tran-Nam et al., 2018; World Trade Organization, 2021; Zeng & Li, 2019). This research gap highlights the need for further investigation into the factors influencing e-invoicing adoption from the tax-related perspective. By examining the adoption of blockchain-based VAT e-invoicing systems in China and investigating its impact on tax fairness, tax compliance costs, and regulatory support processes, this study provides novel insights into e-invoicing adoption in the taxation context.

Thirdly, the study enriches the existing literature on technology adoption in the business context. By empirically analysing the determinants of blockchain-based VAT e-invoicing adoption, the research contributes valuable insights for businesses and policymakers seeking to implement and promote the usage of e-invoicing systems (Ahmad et al., 2020; Venkatesh et al., 2012). The findings of the study confirm the positive or negative relationships between various factors, like performance expectations, social influence, regulatory support, and tax compliance costs, with firms' behavioural intentions to adopt the system. These findings offer practical implications for organizations aiming to streamline their tax compliance processes and enhance their overall business operations.

Moreover, the study's focus on blockchain-based e-invoicing adds to the theoretical discourse on the adoption of emerging technologies in the business realm. Blockchain technology has gained significant attention in recent years due to its potential to

revolutionize various industries, including finance and taxation (Böhmann & Krcmar, 2017; Casey & Vigna, 2018; Claes & Devos, 2018). By studying the adoption of blockchain-based e-invoicing systems, this research sheds light on the opportunities and challenges associated with adopting innovative technologies in the context of taxation.

Furthermore, the theoretical significance of this study lies in its contribution to the understanding of e-invoicing adoption in the Chinese business environment. China's dynamic economy and unique regulatory landscape present distinct challenges and opportunities for technology adoption (Fu et al., 2020; Liu et al., 2019; Zhu et al., 2019). This research delves into the factors influencing e-invoicing adoption in China, providing insights that are relevant and applicable to businesses operating in the Chinese market.

In conclusion, this empirical study explores the adoption of blockchain-based VAT e-invoicing systems from a business perspective. It extends the application of the UTAUT model to e-invoicing adoption and examines taxation-related aspects of technology adoption. The study fills critical gaps in the literature and offers valuable insights for businesses and policymakers. The focus on blockchain-based e-invoicing in the Chinese business environment contributes to the theoretical discourse on technology adoption. Overall, this study enhances the theoretical comprehension of technology applications and provides guidance for future research.

5.2.2 Practical Implications

The real-world consequences of this research study on the uptake of blockchain-based VAT e-invoicing systems, from a business standpoint, provide valuable understandings for companies, governments, and professionals engaged in the implementation and advancement of these systems. Additionally, it offers significant direction for the growth of associated industries in the future and highlights key pitfalls that companies should avoid during the implementation process.

Firstly, the study provides practical guidance for policymakers and government authorities seeking to promote the blockchain-based e-invoicing systems' adoption. The findings emphasize the significance of regulatory support in fostering adoption. Policymakers can use this information to design and implement supportive policies, such as providing financial incentives, tax rebates, or subsidies, to encourage businesses to adopt the system. By offering regulatory support and creating a conducive environment for adoption, governments can facilitate the transition to blockchain-based e-invoicing systems, leading to improved efficiency in tax administration and enhanced compliance among businesses.

Secondly, the study highlights the importance of reputation management and communication strategies for businesses considering the adoption of blockchain-based e-invoicing systems. The positive impact of social influence on firms' intentions to adopt the system underscores the need for companies to build and maintain a positive reputation in society. Businesses should invest in strategic communication campaigns to raise awareness about the benefits and advantages of adopting the blockchain-based VAT e-invoicing system. Effective communication through advertising, media coverage, and public service announcements can influence stakeholders' perceptions and acceptance of the system, leading to greater adoption rates.

Thirdly, the study underscores the significance of investment and collaboration for successful implementation and operation. Businesses intending to adopt the blockchain-based VAT e-invoicing system should allocate adequate resources and investment to ensure a smooth implementation process. Collaboration between companies and their IT departments, as well as service providers, is crucial for addressing technical challenges and maximizing the benefits of the system. Collaborative efforts can lead to more efficient adoption and seamless integration of the e-invoicing system into existing business processes.

Moreover, the study's insights into the determinants of e-invoicing adoption offer practical guidance for businesses seeking to enhance tax compliance and streamline their financial processes. By adopting blockchain-based e-invoicing systems, companies can reduce tax compliance costs and minimize errors in filing tax returns and paying taxes manually. The adoption of such systems can lead to improved operational efficiency and long-term cost savings, making it an attractive investment for businesses.

In conclusion, this empirical study on the adoption of blockchain-based VAT e-invoicing systems from a business perspective provides valuable practical implications for businesses, governments, and practitioners. The study's focus on the Chinese business context enhances its relevance in the practical application of the findings. By leveraging the insights from this research, stakeholders can effectively navigate the challenges and opportunities associated with the adoption of blockchain-based e-invoicing systems, leading to enhanced tax compliance, improved efficiency, and competitive advantage in the business environment. As the adoption of e-invoicing systems continues to gain traction in the global business landscape, the findings from this study offer relevant and timely guidance for stakeholders seeking to harness the benefits of this innovative technology.

5.3 Limitations of the study

Limitations of the study should be taken into consideration when interpreting the findings. Firstly, the study focused specifically on adopting the blockchain-based e-invoicing systems for VAT from a business perspective. Therefore, caution should be exercised when generalizing the results to other technological innovations or different business contexts. Researchers are encouraged to conduct similar studies in diverse industries or cultural contexts to enhance the applicability and robustness of the findings.

Secondly, it is important to acknowledge the potential existence of omitted variables in the analysis. While the study examined several important determinants of adoption intentions, there may be other relevant factors that were not included in the research. For instance, organizational culture, top management support, and technical infrastructure could also influence firms' intentions to adopt the system. Future research could incorporate these variables to provide a more comprehensive understanding of the adoption process and uncover additional insights.

Despite these limitations, this dissertation serves as a solid foundation for further exploration of the determinants of blockchain-based e-invoicing adoption for VAT from a business perspective. By acknowledging and addressing these limitations, researchers and practitioners can better contextualize and interpret the findings, leading to more informed decision-making and future research endeavours in this area.

5.4 Conclusion

The primary objective of this study was to investigate the determinants of behavioural intentions to adopt blockchain-based e-invoicing for Value Added Tax (VAT) and assess their level of influence. To achieve this aim, four specific research objectives were formulated within the framework of the UTAUT model. The study sought to examine the relationships between performance expectations, effort expectations, social influence, facilitating conditions, perceived fairness, tax compliance costs, regulatory support, and behavioural intentions to adopt blockchain-based VAT e-invoicing.

In this study, parametric analysis was used to develop an extended UTAUT model with four independent variables identified through the model itself, in addition to the final seven independent variables and one dependent variable based on the topics covered and the main issues explored in this study, in the context of the academic background of taxation; as a way to facilitate the understanding of companies' blockchain-based VAT e-

invoicing adoption intentions from a business perspective. The research objectives were successfully achieved as all seven hypotheses are valid. The findings revealed that social impact, regulatory support and tax compliance costs were the three most influential factors affecting businesses' intention to adopt a blockchain-based VAT e-invoicing system. Notably, the study highlights that a positive impact on a company's social reputation significantly increases its willingness to adopt the system.

Based on these findings, two key recommendations can be proposed. Firstly, governments can foster adoption by implementing measures such as tax rebates or subsidies that incentivize compliance and mitigate potential risks. Simultaneously, efforts should be made to enhance the positive perception of the system in the public domain through strategic advertising, media coverage, and public service announcements. Moreover, companies should allocate sufficient resources to invest in and maintain the system effectively.

Secondly, close collaboration between companies and their IT departments, as well as service providers, is essential to ensure the seamless implementation and operation of the blockchain-based VAT e-invoicing system. This collaboration will enable firms to overcome potential technical challenges and maximize the system's benefits.

In conclusion, this empirical study provides valuable insights into the factors influencing firms' adoption intentions of the blockchain-based VAT e-invoicing system from a business perspective. The findings highlight the significance of social influence, regulatory support, and tax compliance costs. By considering these factors and implementing the suggested strategies, both government and enterprises can facilitate the widespread adoption of the system, leading to a more efficient and compliant business environment. Further research can explore additional variables and investigate the long-term impacts of adopting the blockchain-based VAT e-invoicing system on firms' performance and competitiveness.

5.5 Future research

This section highlights the future research need to explore the influence of social and cultural elements on technology adoption, cross-cultural validity of the UTAUT model, and the impact of emerging technologies and privacy/security concerns on adoption. It also discusses adopting the blockchain-based VAT electronic invoice systems in various countries, emphasizing their benefits in terms of reducing tax compliance efforts, minimizing fraud and errors, and improving transparency and accountability. For a highly advanced and innovative emerging technology, comprehending and examining its future research can provide readers with a more profound insight into its future prospects. Additionally, it promotes the integration of various disciplines in the fields of IT and tax, fostering a holistic understanding of intricate problems and the generation of ground-breaking solutions.

5.5.1 The UTAUT Model

An inadequacy in the existing body of literature that warrants attention is restricted attention given to the social and cultural elements that exert an impact on adopting technology. The foremost model in this field, UTAUT model has predominantly concentrated on individual-level factors, while disregarding the part played by social norms and culture in technology adoption process (Venkatesh & Zhang, 2010). It is suggested that future research must address the literature gap by exploring the influence of social and cultural elements on adopting technology and the ways in which these factors interact with individual-level factors.

Another potential area for future research is the application of the UTAUT model to non-western contexts. The UTAUT model was developed based on western cultural assumptions, and its applicability to non-western cultures remains unclear. Future

research can investigate the cross-cultural validity of the UTAUT model and explore how cultural differences may impact technology adoption (Al-Qeisi et al., 2015; Alshammari & Rosli, 2020; Taherdoost, 2018).

The recent advancements advent like artificial intelligence, virtual reality and other emerging technologies, may require modifications to the UTAUT model. These technologies may have unique features and require different skills and resources for adoption. Future research can explore how emerging technologies differ from traditional technologies in terms of adoption determinants and how the UTAUT model can be adapted to account for these differences (Im et al., 2011).

Another implication of emerging technologies is their potential impact on privacy and security concerns. The UTAUT model does not explicitly address privacy and security concerns, which are becoming increasingly important for technology adoption. Future research can investigate how privacy and security concerns impact technology adoption and how the UTAUT model can be modified to account for these concerns (Khalilzadeh et al., 2017; Williams et al., 2015; Chang, 2012).

In order to advance the UTAUT model and gain a more comprehensive understanding of technology acceptance and use behaviour, future research can focus on several key aspects. Firstly, it is important to explore the impact of specific contextual considerations on technology acceptance and use. This could involve investigating how cultural differences, organizational culture, and regulatory environments affect individuals' perceptions and behaviours regarding technology adoption. By analysing these contextual factors, researchers can gain insights into the broader impact of technology on different settings and populations (Venkatesh et al., 2003; Venkatesh & Bala, 2008).

Understanding the role of individual differences in technology adoption is also crucial. Future research can delve deeper into the impact of user characteristics like age, gender, educational background, and prior technology experience on the acceptance and usage of new technologies. By examining these user characteristics, researchers can identify specific factors that may influence technology adoption and tailor interventions accordingly. Moreover, as technological innovations continue to emerge, it is essential to adapt the UTAUT model to capture the unique features and challenges associated with these new technologies. For instance, studying how the UTAUT model can be applied to artificial intelligence, blockchain, and the Internet Things can provide valuable insights into the acceptance and usage for these cutting-edge technologies (Alalwan et al., 2018; Liu et al., 2021).

For a more granular technology adoption understanding, future research should also consider conducting longitudinal studies. By studying individuals' acceptance and usage behaviour over time, researchers can observe the dynamic nature of technology adoption and identify factors that may change or influence individuals' behaviour over different stages of adoption. Lastly, research mediating and moderating factors that may impact technology adoption. These factors could include perceived risk, trust, social influence, and system characteristics. By analysing the mediating and moderating effects of these variables, scholars can learn more deeply about the underlying mechanisms which drive technology acceptance and use (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008). By addressing these areas of research, we can further enhance the theoretical and practical implications for UTAUT model.

5.5.2 Blockchain technology

In recent years, there has been a significant amount of attention given to blockchain technology due to it may be completely transform all trades. While there has already been

a considerable amount of research conducted on blockchain, there are still several areas that require further investigation to advance our understanding and fully maximize the potential of this technology. Moving forward, future research can focus on the following key aspects.

Firstly, scalability and performance are one of the major challenges that blockchain technology faces is its ability to handle scalability and performance issues, particularly when dealing with large-scale networks and high transaction volumes. Future research can explore innovative consensus mechanisms, sharding techniques, and optimization strategies in order to enhance the scalability and performance of blockchain systems (Zhang et al., 2019; Wang et al., 2021).

Secondly, maintaining privacy and security is of utmost importance in blockchain systems, especially in public and permissionless networks. Future research can delve into novel cryptographic techniques, privacy-preserving mechanisms, and secure smart contract development to effectively address privacy and security concerns in blockchain (Dinh et al., 2018; Zheng et al., 2020).

In addition, in order to facilitate seamless data exchange and collaboration among different blockchain networks and traditional systems, blockchain interoperability is essential. Future research can explore interoperability protocols, standardization frameworks, and integration strategies to enable interoperability and integration across heterogeneous blockchain platforms (Crosby et al., 2016; Cocco et al., 2021).

Furthermore, the field of governance and regulation for blockchain systems is still in its early stages and is continuously developing. In order to ensure the responsible and sustainable use of blockchain technology, it is important for future research to delve into various governance models, regulatory frameworks, and legal implications (Beck et al., 2020; Zheng et al., 2021).

Last but not least, for the real-world applications, although blockchain technology has shown great potential in sectors like finance, supply chain, healthcare, and energy, further exploration and assessment are necessary to understand its practical implementation and the impact it can have. Future research can focus on conducting case studies, pilot projects, and empirical evaluations to uncover the potential benefits, challenges, and strategies for adopting blockchain in real-world scenarios (Yli-Huumo et al., 2016; Fan et al., 2022).

5.5.3 Blockchain-based VAT electronic invoice system

The Blockchain-based VAT electronic invoice system emerging as a promising technology for improving the efficiency, transparency, and security of the invoicing process. Although progress has been made, there are areas that require further exploration to fully utilize the potential of this system and address existing challenges. Future research can focus on the following aspects.

Firstly, it is necessary to investigate the scalability and performance of the Blockchain-based VAT electronic invoice system. Researchers can explore innovative approaches such as enhanced consensus algorithms, optimization techniques for distributed ledgers, and advanced network architectures. These efforts will improve the system's scalability and ensure efficient processing of a large volume of invoices (Li et al., 2020; Jiang et al., 2021).

Secondly, privacy and data protection are crucial considerations in the context of the Blockchain-based VAT electronic invoice system. Future research can delve into privacy-preserving mechanisms, such as zero-knowledge proofs and secure multi-party computation. These mechanisms will protect sensitive information while maintaining the transparency and integrity of the invoicing process (Deng et al., 2019; Wang et al., 2022).

In addition, it is important to focus on the seamless integration of the Blockchain-based VAT electronic invoice system with existing invoicing infrastructure and regulatory frameworks. To achieve this, researchers can explore standardization protocols, interoperability frameworks, and regulatory compliance mechanisms. By doing so, they can ensure that the system can easily integrate with different systems and comply with relevant tax laws and regulations (Yang et al., 2020; Zhang et al., 2022).

Furthermore, it is crucial to examine the adoption and acceptance of the Blockchain-based VAT electronic invoice system by businesses and taxpayers. Future research can investigate various factors that influence adoption behaviour, user experience, and acceptance of the system. These factors can include perceived benefits, usability, trust, and organizational readiness (Xu et al., 2018; Liu et al., 2021).

Lastly, it is prominent to conduct in-depth analysis on the potential impact and implications of the Blockchain-based VAT electronic invoice system on tax administration, compliance, and auditing processes. Empirical studies, case analyses, and regulatory assessments can be conducted to assess the system validity in improving tax compliance, reducing fraud, and enhancing the efficiency of tax administration (Shi et al., 2020; Wang et al., 2023).

By addressing these research directions, future studies can contribute to the advancement and successful implementation of the Blockchain-based VAT electronic invoice system. This will enable its widespread adoption and unlock its potential to transform the invoicing landscape.

In summary, this study offers several recommendations for future research in the field of blockchain-based e-invoicing adoption:

Firstly, it is suggested that future research investigates the potential impact of cultural factors on the adoption of blockchain-based VAT e-invoicing systems. This study

did not specifically examine the influential elements of cultural, such as cultural values, attitudes, and beliefs, on adoption intentions. Exploring these factors can provide insights into how cultural contexts may shape firms' decision-making processes.

Secondly, there is a need to examine the relationship between adopting blockchain-based VAT e-invoicing systems and performance of enterprises. Future research can investigate the impact of adopting such systems on various aspects for performance of firm, including productivity, profitability, and efficiency. Understanding the link between system adoption and firm performance can provide valuable insights for businesses seeking to enhance their operational effectiveness.

Thirdly, it is recommended to analyze the moderating effects of other factors on adoption of blockchain-based VAT e-invoicing systems. The present study focused on examining the direct effects of various factors on adoption intentions. However, there may be other elements can moderate relationships between these determinants and adoption intentions. Exploring the moderating effects of additional variables can provide a more nuanced understanding of the adoption process.

Lastly, future research could expand the sample size and scope of the study. The current study had a relatively small sample size and was limited to one country. To improve the generalizability of the findings, future research could include a larger and more diverse sample, encompassing multiple countries and industries. This broader perspective would enhance the external validity of the research outcomes.

These recommendations for future research aim to advance the understanding of blockchain-based e-invoicing adoption and its implications for businesses. By addressing these research avenues, scholars can offer ongoing development of this field and practical insights for organizations seeking to adopt blockchain-based VAT e-invoicing systems.

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