Barriers and Drivers of e-Tax System Acceptance: A Quantitative Case Study from Thailand

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Abstract

This quantitative case-study research examines the factors that influenced customer acceptance of the e-Tax invoice by e-mail channel during Company XYZ's 2022 implementation in Thailand. Data from 251 corporate clients in five Sales Areas (SA) were analyzed with multiple regression and one-way ANOVA. Perceived Usefulness (PU) (β = .19, p = .001), Perceived Ease of Use (PEOU) (β = .21, p = .001) and Attitude Toward Using (ATT) (β = .54, p < .001) all showed significant positive effects on Behavioral Intention (BI) and together explained 49 percent of its variance. Tukey post-hoc tests revealed that clients in Bangkok and Vicinity, the Central region and the East scored higher on intention than those in the North and Northeast (p < .001), underscoring a regional digital divide that complicated deployment. The results indicate that seamless system integration, low set-up effort and positive user attitudes were critical success factors, whereas weak infrastructure in the North and Northeast remained a major barrier. Recommendations include bundling digital-signature certificates with onboarding and partnering with regional internet service providers. The findings offer transferable lessons for other Thai SMEs planning similar e-Tax implementations.

Keywords: e-Tax invoice; e-Tax invoice by e-mail; Electronics invoicing; e-Tax invoice system

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อุปสรรคและปัจจัยสนับสนุนต่อการยอมรับระบบภาษีอิเล็กทรอนิกส์ (e-Tax): กรณีศึกษาเชิงปริมาณจากประเทศไทย

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บทคัดย่อ

งานวิจัยเชิงปริมาณแบบกรณีศึกษานี้ ตรวจสอบปัจจัยที่มีอิทธิพลต่อการยอมรับช่องทาง e-Tax Invoice ทางอีเมลของลูกค้าบริษัท XYZ ซึ่งเป็นบริษัทไทยเพียงรายเดียวที่ศึกษา การเก็บข้อมูลจากลูกค้า 251 ราย ใน 5 พื้นที่ขายทั่วประเทศ และการวิเคราะห์ด้วยการถดถอยพหุคูณและ ANOVA ทางเดียว พบว่าการรับรู้ประโยชน์ (β = .19, p = .001 การรับรู้ความง่ายในการใช้ (β = .21, p = .001) และทัศนคติต่อการใช้ (β = .54, p < .001) มีอิทธิพลเชิงบวกต่อความตั้งใจใช้ โดยอธิบายความแปรปรวนได้ 49% การทดสอบ Tukey แสดงว่าลูกค้าในกรุงเทพฯ และปริมณฑล ภาคกลางและตะวันออก คะแนนความตั้งใจใช้สูงกว่าภาคเหนือและภาคตะวันออกเฉียงเหนือ (p < .001) สะท้อนความเหลื่อมล้ำด้านโครงสร้างพื้นฐานดิจิทัล ซึ่งเป็นอุปสรรคของการปรับใช้ ปัจจัยความสำเร็จคือการเชื่อมต่อระบบกับซอฟต์แวร์บัญชีอย่างราบรื่น ขั้นตอนเริ่มต้นที่ไม่ซับซ้อนและทัศนคติเชิงบวกของผู้ใช้ ส่วนโครงสร้างพื้นฐานอินเทอร์เน็ตที่อ่อนในภาคเหนือและภาคตะวันออกเฉียงเหนือยังเป็นความท้าทาย ข้อเสนอแนะ ได้แก่ การจัดแพ็กเกจใบรับรองดิจิทัลพร้อมการเริ่มใช้งาน และความร่วมมือกับผู้ให้บริการอินเทอร์เน็ตในภูมิภาค ผลลัพธ์ให้บทเรียนที่ขยายผลได้สำหรับ SME ไทยที่วางแผนปรับใช้ e-Tax ในลักษณะเดียวกัน

คำสำคัญ: ใบกำกับภาษีอิเล็กทรอนิกส์; ใบกำกับภาษีอิเล็กทรอนิกส์ผ่านอีเมล; การออกใบกำกับภาษีด้วยระบบอิเล็กทรอนิกส์; ระบบใบกำกับภาษีอิเล็กทรอนิกส์

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Introduction

According to Yutthana (2021), the Thailand 4.0 policy is an economic transformation initiative introduced by the Thai government to promote the digital transformation of various sectors. This policy aims to address economic challenges resulting from previous development models, Thailand 1.0, which focused on agriculture; Thailand 2.0, which emphasized light industry; and Thailand 3.0, which concentrated on heavy industry. In contrast, Thailand 4.0 emphasizes building an innovation and value-based industrial sector by encouraging the production of innovative products, investment in research and development, and the adoption of advanced and green technologies (Yutthana, 2021).

This initiative marked the beginning of Thailand's transformation into a "Digital Economy," which seeks to leverage digital technology across all socio-economic activities. Its objectives include the development of digital infrastructure, innovation, data systems, human capital, and other digital assets essential for long-term sustainable development (Chakpitak et al., 2018; Vu & Nguyen, 2024). In line with this vision, the Thai government introduced a payment infrastructure development plan aimed at creating a cashless society accessible to all business sectors (Phonthanukitithaworn et al., 2016). The National e-Payment Master Plan, launched in 2017, promotes the adoption of electronic payment tools such as Prompt Pay, Electronic Data Capture (EDC), and Quick Response (QR) codes. Under the framework of the National e-Payment policy, the Revenue Department implemented an integrated electronic tax and transaction document system known as the "e-Tax Invoice & e-Receipt System." This system replaces paper-based tax documents with digital formats and facilitates online data submission through the Revenue Department's electronic platform (Teerapunyachai & Bawornkitchaikul, 2024).

The implementation timeline was as follows: from January 1, 2018, all large enterprises, public organizations, and government agencies were required to comply; from January 1, 2020, small enterprises were included; and finally, from January 1, 2022, micro enterprises were also required to participate (Teerapunyachai & Bawornkitchaikul, 2024). XYZ Company, a pseudonym used for confidentiality in this case study, is a medium-sized firm operating in Thailand's lubrication industry. Established in the mid-2000s as a subsidiary of a larger international corporation, XYZ Company recognized several potential benefits of adopting the e-Tax invoice system. These benefits included reduced operational costs through the elimination of paper documentation, enhanced environmental sustainability, improved user experience, and stronger data security. Amid the COVID-19 pandemic in mid-2021, the company initiated the implementation of the e-Tax system as part of its operational processes. The primary motivations were: (1) to minimize or eliminate issues in the order-to-cash process that often resulted in lost tax documents during delivery and billing, thereby delaying payments; (2) to reduce physical contact and thereby lower the risk of COVID-19 transmission; (3) to contribute to environmental goals by cutting CO_2 emissions related to paper usage; and (4) to improve data security and user experience. According to Matsson et al.,

(2015), traditional paper invoices require physical materials and transportation, which are environmentally unsustainable. Reducing paper and printing directly benefits the environment. Each invoice generates approximately 0.029 kg of CO_2 emissions (Matsson et al., 2015). In addition, digital invoicing systems help safeguard sensitive financial data from competitors. In the company's ideal process, e-Tax invoices and e-Delivery Orders are sent to customers via email. Customers then make online payments through digital payment gateways. Upon confirmation of payment, the finance department issues and sends e-Receipts electronically (Morshed et al., 2024).

XYZ Company adopted the e-Tax Invoice by e-mail channel in January 2022 as part of its ISO 27001 digital-transformation roadmap. Under this channel, each invoice is automatically generated in two formats: (1) a PDF/A-3 file digitally signed with an ETDA-approved certificate, and (2) an XML file that follows the Revenue Department's "ขมธอ.3-2560" schema. The system sends a digitallysigned PDF/A3 and the Revenue Department XML schema to customers by e-mail and copies the RD inbox the same day. System used, SAP Business One add-on; invoices and XML are archived for seven years and a monthly XML batch is uploaded via Pagero, meeting Thai SME compliance rules (< THB 30 million turnover). XYZ chose e-mail because 94% of its clients fall below the THB 30 million threshold.

However, to XYZ Company's surprise at that time, the e-Tax invoice system was not well received by its business partners. The system, initially intended to improve operations, led to confusion and inconvenience from the buyer's perspective. Most business partners requested a return to the traditional paper-based invoicing system and declined to adopt the new electronic format. This low acceptance rate and apparent lack of popularity posed significant barriers to the company's efforts to successfully integrate the e-Tax system into its workflow. To maintain service quality and ensure smooth operations, XYZ Company currently issues both e-Tax invoices and traditional paper invoices. This hybrid approach is intended to prevent the rejection of goods at customer sites due to document-related issues during delivery. Therefore, this case study aims to explore the root causes behind the low acceptance of the e-Tax invoice system at this time and to identify actionable strategies that XYZ Company could have adopted to improve implementation success. The findings of this research are expected to offer practical value not only to XYZ Company but also to other businesses in Thailand and the broader ASEAN region facing similar challenges with e-Tax system adoption in the future.

Research Objective

Research Aim and Questions

This study seeks to identify the factors that influence customer acceptance of the e-Tax invoice system via e-mail as implemented by XYZ Company. The research questions and objectives are as follows:

RQ1: What are the factors that have affected customers to accept e-Tax invoice system by e-mail when purchasing products from XYZ Company?

RO1.1: To find out customers limitations accepting e-Tax invoice by e-mail.

RO1.2: To explore the problems when customers adopt using e-Tax invoice by e-mail to their supply chain process.

RQ2: Does customer Market Segmentation (MSeg), and Sales Area (SA) affect customer acceptance on using e-Tax invoice by e-mail?

RO2.1: To understand whether the customer MSeg affects customer acceptance on using e-Tax invoice by e-mail or not.

RO2.2: To investigate whether SA affects customer acceptance on using e-Tax invoice by e-mail or not.

Theory Background, Literature Review and development of Conceptual Framework

Principle of Taxation

According to Adam Smith 1776, (Smith, 2024) a rational system of taxation should be governed by a set of fundamental principles. These principles, which aim to ensure fairness and effectiveness in tax policy, are commonly summarized into seven core guidelines:

Equality: Individuals should contribute to the government in proportion to their ability to pay. In practice, this means that those with higher incomes should bear a larger share of the tax burden compared to those with lower incomes.

Certainty: The details of taxation, such as the time, manner, and amount of payment, should be clear and well-defined for the taxpayer. Transparency in these aspects ensures that all contributors, and others in the system, are fully informed.

Convenience: The tax system should be structured in a way that makes payment convenient for taxpayers, considering both timing and method of payment.

Economy: The cost of tax collection should be minimized. If the administrative expenses of collecting taxes exceed the revenue generated, the system becomes inefficient and counterproductive.

Flexibility: The tax system should be adaptable to changes in economic conditions or government objectives. This ensures the system remains relevant and effective over time.

Efficiency: Taxes should enhance, or at the very least, not significantly hinder, the efficiency of markets. The objective is to maintain or improve economic performance through well-designed tax policies.

Simplicity: Tax assessment and compliance procedures should be straightforward and easily understood by the average taxpayer, thereby reducing confusion and the potential for errors.

These principles remain a foundational reference for tax policy design and are frequently cited in modern tax discourse (Khamta & Wattanakulchai, 2018).

E-Invoicing Worldwide

A commercial invoice is one of the most important documents exchanged between trading partners. Beyond its commercial function, it also serves as a formal accounting record and carries legal implications, particularly as the basis for calculating value-added tax (VAT). In contrast, electronic invoicing (e-invoicing) represents the digital counterpart to traditional paper invoices, offering several added advantages in terms of efficiency and cost. The demand for invoices is expected to grow by 2-3% annually, driven by increasing population numbers, household formation, and business activity. In many cases, producers do not extend credit to customers; instead, they send an invoice along with the delivery of goods. Within the European Union, it is mandated that invoices must be issued within 15 to 30 days after the customer receives the product (Koch, 2017).

E-invoices are cost-effective to transmit, making them particularly appealing for businesses and widely adopted across various sectors. According to Koch (2017), Finland was one of the pioneering countries in the adoption of e-invoicing, initiating its implementation in 1999. By 2005, Finland had transmitted approximately 8.82 million e-invoices, accounting for roughly 2% of all invoices issued that year. E-invoicing has proven especially effective in the business-to-business (B2B) sector, where it has led to significant reductions in manual processing and operational costs. In this context, e-invoices are not limited to billing for services or wholesale transactions; they are also commonly used in standard e-commerce operations (Koch, 2017).

Koch (2017) further outlines that Finnish companies can purchase online products with automatically generated e-invoices, eliminating the need for the vendor to issue separate billing statements. Service providers such as Enterpay and Maksuturva are notable examples facilitating such transactions. In addition to conventional e-invoices, electronic data interchange (EDI) messages are another widely used format for transmitting invoice data. In Finland, 23 e-invoicing service providers operate with diverse models. Some brokers convert invoices between different electronic formats while maintaining the integrity of the message content. Others require client systems to comply with standardized formats to ensure seamless processing (Koch, 2017).

E-Invoicing Model

According to Koch (2019), the e-invoicing landscape can be broadly categorized into four main models, each differing in implementation strategy, technological integration, and stakeholder interaction:

Supplier Direct Model (In-House): In this model, the supplier independently implements an e-invoicing system within their own infrastructure. Customers access a dedicated supplier portal to view or download invoices. This model is commonly adopted by large-scale invoice issuers, such as telecommunication companies, that manage high invoice volumes.

Buyer Direct Model (In-House): Here, the buyer establishes and maintains the e-invoicing system within their internal environment to receive electronic invoices through various channels. This model is typically utilized by large buyers that work with a limited number of suppliers, offering greater control over invoice processing.

Network Model: Both buyer and supplier connect to an e-invoicing service provider, creating a shared interface. The service provider (or operator) manages the translation of invoice data between different formats to ensure compatibility with the recipient's systems. Additional services often include data validation, quality assurance, and digital archiving.

Clearance Model: This model involves real-time or near-real-time validation of invoices by tax authorities, either directly or through certified e-invoicing operators. It is commonly used in jurisdictions with stringent VAT compliance requirements. The clearance model has been implemented in various regions, including several European, Latin American, and Asian countries (Koch, 2019).

Principle of e-Taxation in Thailand

e-Tax system and electronic transaction plan under National e-Payment is a strategy of Thai Government to motivate tax systems toward Thailand 4.0 and digital economy.

This e-Tax system comprises as follows:

1) E-Withholding Tax is where a bank acts as an agent in deducting withholding tax and submitting the withholding taxes to the Revenue Department.

2) e-Tax Invoice is the exchange of the invoice document between a supplier and a buyer in an integrated electronic format. It needs to have Digital Signature or Time Stamp before sending the invoice to both supplier and customer. There are 2 types of e-Tax invoice as explanation below.

Type 1: e-Tax Invoice & e-Receipt Systems

The electronic documents will be exchanged in a number of ways including PDF, PDF/A3, and XML File together with digital signature to both supplier and customer submitting the electronic format in XML file to the Revenue Department within the 15th of the following month.

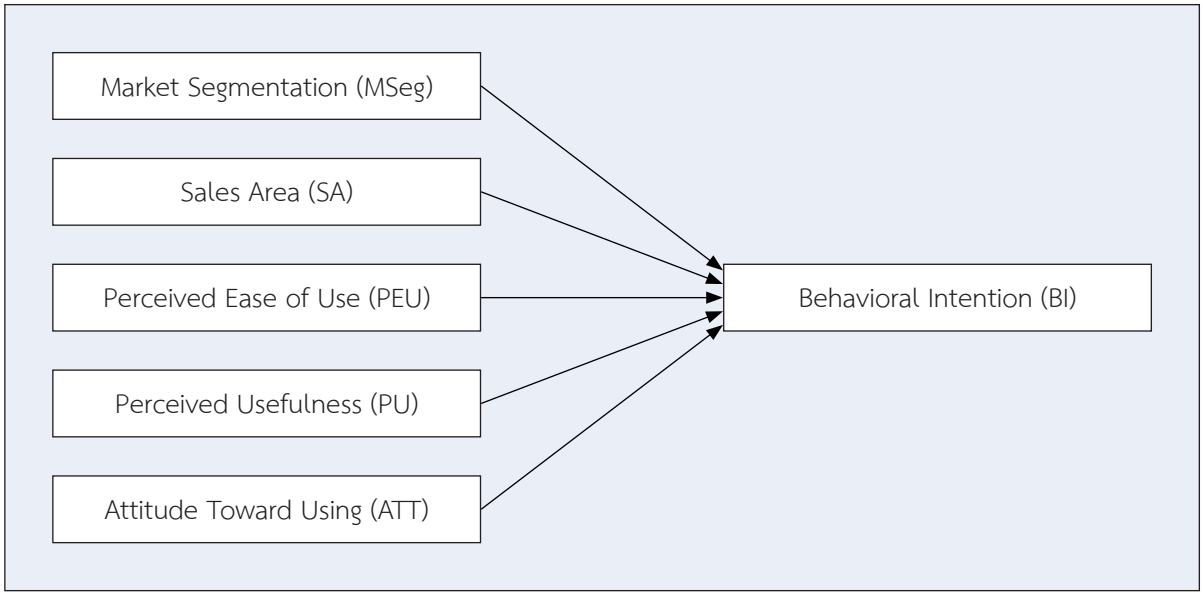
Type 2: e-Tax Invoice by E-mail

This method applied for entrepreneurs who have incomes not more than 30 million baht per year. The file must be attached and send e-mail to suppliers or customers. Moreover, the entrepreneurs need to CC mail to e-Tax Invoice by E-mail system for time stamp and they will receive an invoice with time stamp by the system.

e-Filing is electronic submission of tax documents. This system serves services on website. The processing time is real time and can be freely accessed and used anywhere via Internet. Instead of submitting the tax documents at the Revenue Department, the revenue department only require one electronic sign in (Jantavongso et al., 2016).

Technology Acceptance Model (TAM)

According to Chuttur (2009), the Technology Acceptance Model (TAM) is a theoretical framework designed to explain and predict user motivation in adopting new technologies. This motivation is influenced by external stimuli, which are reflected in the actual features and capabilities of the system in question (Chuttur, 2009). Originally developed by Davis (1989), TAM has become one of the most widely used models in research for understanding user acceptance and utilization of information systems and technological innovations (Davis, 1989). The core components of the TAM framework are Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), both of which are essential in determining technology adoption behavior. In the context of this study, a modified version of the TAM is applied to investigate user acceptance, as illustrated in Figure. 1. In congruence with TAM2 (Venkatesh & Davis, 2000) and TAM3 (Venkatesh & Bala, 2008), and consistent with extendedTAM logic, two contextual variables, Market Segmentation (MSeg) and Sales Area (SA) are theorized as direct predictors of Behavior Intention (BI) alongside the core TAM beliefs.



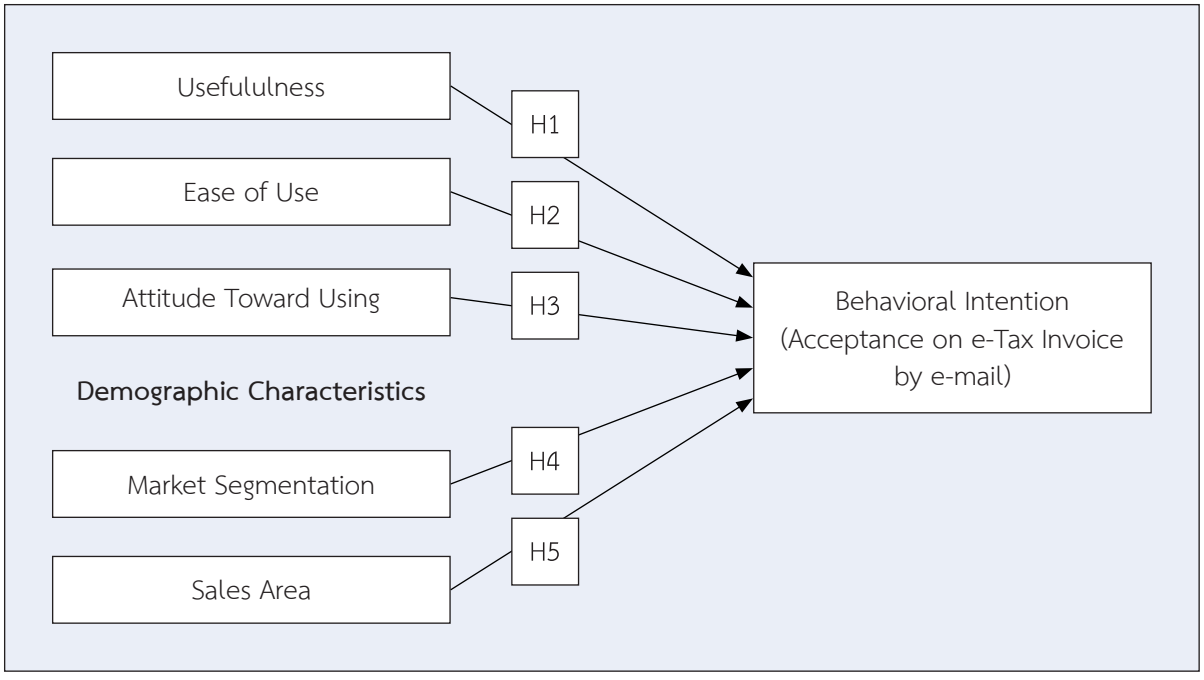
Source: Own Creation

Figure 1 Extended Technology Acceptance Model (ETAM)

Figure 1. Extended Technology Acceptance Model (ETAM) for e-Tax Invoice adoption. All domainspecific and belief variables are modelled as direct antecedents of Behavioral Intention (BI).

Conceptual Framework

The conceptual framework of this study consists of four core elements: PU, PEOU, ATT, and customer characteristics, including external variables MSeg and SA. These factors are treated as independent variables that may influence the BI of customers to accept e-Tax invoices via e-mail, which serves as the dependent variable. In this study 'customer acceptance' is operationalized solely as BI; actual usage data were not available in cross-section, so BI serves as the accepted proxy for acceptance, consistent with TAM literature (Venkatesh & Davis, 2000). The relationship among these variables is illustrated in Figure 2.



Source: Author (2025)

Figure 2 Conceptual Framework

Research Hypotheses

H1 - PU has a significant positive relationship with the BI to accept e-Tax invoices by e-mail.

H2 - PEOU has a significant positive relationship with the BI to accept e-Tax invoices by e-mail.

H3 - ATT has a significant positive relationship with the BI to accept e-Tax invoices by e-mail.

H4 (External Variable) - BI differs across MSeg to accept e-Tax invoices by e-mail.

H5 (External Variable) - BI differs across SA to accept e-Tax invoices by e-mail.

Perceived Usefulness (PU)

PU refers to the extent to which users believe that utilizing an e-invoicing system will enhance their performance and provide measurable benefits at the organizational level. The appeal of e-invoicing systems lies in the advantages they offer, which influence users' perceptions of their PU. This PU plays a critical role in shaping user behavior and can serve as a predictor of continued system usage. As Gunaratne and Pappel (2020) note, users and firms assess the practical value of the system based on the efficiency and improvements it brings to business operations. Given these documented benefits, we expect that higher PU will motivate Thai firms to adopt the e-Tax-invoice-by-email channel. Accordingly, PU is hypothesized to exert a positive effect on BI (H1).

Perceived Ease of Use (PEOU)

PEOU is the degree of ease of use with the use of e-invoice. Even it can be defined as the degree which the user can effortlessly use an e-invoicing system where it has an inverse relation with the notion of complexity (Gunaratne & Pappel, 2020). Because e-Tax systems can differ in interface complexity, ease of use remains pivotal. Extending the above findings to the XYZ roll-out, we posit a positive PEOU, BI link (H2).

Attitude Toward Using (ATT)

Attitude is defined as an individual's overall evaluation, either positive or negative, toward performing a specific behavior. It reflects how a person feels about engaging in a particular action. According to Tan and Teo (2000), attitude is closely linked to BI, as individuals tend to form intentions aligned with behaviors they perceive to produce positive outcomes (Tan & Teo, 2000). More recently, Ajzen and Fishbein (2000) have defined attitude as the degree of favorableness or un-favorableness of a person's feelings toward a psychological object. In the context of this study, a more favorable attitude toward the e-Tax invoice system is expected to increase the likelihood of customer intention to adopt and use e-Tax invoices via e-mail (Ajzen & Fishbein, 2000). Positive attitudes have consistently translated into adoption across digital-tax contexts. The present study therefore predicts that a more favorable ATT will positively influence BI (H3).

External Variables-Demographic Characteristics

The term demographics refers to characteristics of a population. The word is derived from the Greek words for people (demos) and picture (graph), (Lee & Schuele, 2010). Examples of demographic characteristics include age, race, gender, ethnicity, religion, income, education, home ownership, sexual orientation, marital status, family size, health and disability status, and psychiatric diagnosis. Demographic information provides data regarding research participants and is necessary for the determination of whether the individual in a particular study is representative sample of the target population for generalization purposes. Usually, demographics or research participant characteristics are described in the methods section of the research article and serve as independent variables in the research design.

Demographic variables are independent variables, because they cannot be manipulated. In research, demographic variables may be either categorical (e.g., gender, race, marital status, psychiatric diagnosis) or continuous (e.g., age, years of education, income, family size), (Salkind & Frey, 2021). This study adopts two customer demographic characteristics, (1) MSeg and (2) SA that may be important for identifying relations between these variables and the BI to acceptance on using e-Tax invoice by e-mail. Segment effects, especially digital readiness, shape how firms evaluate new channels. We thus test whether BI differs across XYZ's four market segments (H4). Regional infrastructure and business culture can affect e-service uptake. Building on Thai e-Government studies, we expect BI to vary by SA (H5).

Behavioral Intention (BI) to Use

According to Mamman et. al (2016), intention is simply defined as how hard persons are willing to try and how much determinations they are planning to use e-Tax invoice by e-mail towards performing a behavior (Mamman et al., 2016). BI refers to a person subjective probability that he will perform some behavior (Ajzen & Fishbein, 2000). The behavior was extensively overstated by individual intention and helping conditions. Nevertheless, Customer's intention stays unique as a factor that performance an additional significant role in consumer behavior. A study into customer's intention yields a vital foundation for forecasting customer's actual behavior on the manner to a particular action (Gaur & Tiwari, 2006).

Acceptance on Using e-Tax Invoice

The acceptance and the use of information technologies can bring immediate and long-term benefits at organizational and individual levels, such as improved performance, financial and time efficiency and convenience (Mamman et al., 2016). The potential of technology to deliver benefits has long motivated information system management research to examine the willingness of individuals to accept innovative technology (Davis, 1989). In the research on customer acceptance using e-Tax invoice by e-mail is conducted to identify and define variables and validate measures that would highly correlate with system use according to TAM which is one of the most popular theories that is used widely to explain Information System usage. Prior TAM studies and recent demographic extensions motivate the five hypotheses (H1-H5) outlined above. The next section describes how these hypotheses were operationalized in the survey.

Research Methodology

This study employed a case study approach, focusing on a single organization, XYZ Company, to explore customer acceptance of the e-Tax invoice system via e-mail. The sampling technique used was stratified random sampling, a probability-based method, to ensure adequate representation across subgroups within the target population.

Population and Sample

The study covered all 700 corporate customers of XYZ Company in Thailand, grouped by the firm's market segment and SA. Using the Krejcie and Morgan (1970) sample-size table for a 95% confidence level and 5% margin of error, the minimum required sample was 248 cases (Krejcie & Morgan, 1970). To offset non-response, 265 questionnaires were mailed in April 2022; 251 usable surveys were returned, a 94.7% response rate. The realized sample exceeds the Krejcie-Morgan minimum and meets Hair et al.'s (2019) "10-times" guideline for multivariate analysis (Hair et al., 2019). The stratified sampling ratio applied

in this study was 1:2.70, which enhances the accuracy of the findings by ensuring each subgroup is proportionally represented (McCombes, 2019; Sharma, 2023). While stratified sampling provides precision, it may pose challenges in identifying appropriate strata and requires more complex organization and analysis than simple random sampling (Singh & Masuku, 2014).

Measurement Instrument

The questionnaire contained twelve 5-point Likert items (1 = Strongly Disagree, 5 = Strongly Agree) adapted from Davis (1989) and later TAM replications, plus two single-item demographic factors. Item wording and scale sources are shown Table 1.

Table 1 Questionnaire Construct

Construct	Item Code & Wording	Source	α (Pilot, n = 30)
PU	PU1 "Using e-Tax invoices via e-mail improves my work performance." PU2 "e-Tax invoices make my job faster." PU3 "e-Tax invoices enhance my effectiveness."	Davis (1989)	.89
PEOU	PEOU1 "Learning to use the e-Tax system was easy for me." PEOU2 "Interacting with the system is clear and understandable." PEOU3 "I find the system easy to use."	Davis (1989)	.87
ATT	ATT1 "Using e-Tax invoices via e-mail is a good idea." ATT2 "I like the idea of using e-Tax invoices via e-mail." ATT3 "Using e-Tax invoices via e-mail is pleasant."	Tan & Teo (2000)	.88
BI	BI1 "I intend to use e-Tax invoices via e-mail in the future." BI2 "I will recommend the e-Tax invoice system to others." BI3 "Given the chance, I prefer e-Tax invoices to paper invoices."	Sondakh (2017)	.91
MSeg	Categorical (Industrial, Commercial, Government, Service) Checklist	Company CRM Taxonomy	n.a.
SA	Categorical (Central, Bangkok & Vicinity, Eastern, West/South, North/Northeast) Checklist	XYZ Sales Codebook	n.a.

Source: Own Creation

Questionnaire Development

The initial item pool was taken from established TAM scales (Davis, 1989; Tan & Teo, 2000) and recent e-Tax studies. All wording was forward-translated into Thai and back-translated by two bilingual academics to ensure semantic equivalence (Brislin, 1986). An expert panel of two scholars and one senior Revenue Department officer then reviewed each item for clarity, relevance, and cultural appropriateness, yielding a scale-level Content Validity Index (S-CVI) of .92. Minor wording tweaks were made where I-CVI < .80.

Pilot Reliability and Validity Testing

A pilot survey (n = 30) from the target population assessed psychometric properties.

1) Internal consistency. Cronbach's α ranged from .87 (PEOU) to .91 (BI), exceeding the .70 threshold (Nunnally, 1978).

2) Construct validity. Exploratory factor analysis (principal-axis, varimax) produced four factors with eigenvalues > 1, mirroring the theorized PU, PEOU, ATT, and BI dimensions. KMO = .81 and Bartlett's test $p < .001$ indicated sampling adequacy (Sharma, 2023; Singh & Masuku, 2014). All items loaded on their intended factor (> .63) with cross-loadings < .30.

3) Demographic checks. MSeg and SA were measured with categorical check-boxes sourced from the company's CRM taxonomy; no reliability estimate is required for single-item categorical variables.

The final 12-item instrument (plus the two categorical demographics) was then fielded to the full sample articulated in Section 3. Cronbach's α values for the study sample are reproduced in Table 2 and remained above .85 for every construct.

Table 2 Pilot Reliability and Validity Testing (n = 30)

Factor	Items	Loading Range	AVE	Cronbach's α
PU	PU1 - PU3	.71 - .84	.63	.89
PEOU	PEOU1 - PEOU3	.68 - .82	.59	.87
ATT	ATT1 - ATT3	.66 - .85	.61	.88
BI	BI1 - BI3	.75 - .86	.65	.91

Source: Own Creation

Data Collection

Data collection was conducted using a structured questionnaire, distributed electronically via Google Forms, and shared with participants through e-mail and Line Application. Respondents were given clear instructions, and confidentiality of their responses was assured via informed consent form.

The survey instrument consisted of four main sections:

Personal Information–Collected in checklist format, including age, gender, education level, and job function.

Company Information–Including business type, year of establishment, registered capital, SA, and MSeg.

Customer Acceptance and Influencing Factors–This section utilized a 5-point Likert scale to assess respondents' levels of agreement. It included 12 structured statements, divided into four dimensions:

PU (3 items)

PEOU (3 items)

ATT (3 items)

BI to Use (3 items)

Additional Questions–Comprised of four open-ended questions, allowing participants to express their views in their own words. Detailed item wording, pilot reliability, and validity statistics appear in Table 2.

Data Analysis

Data was analyzed using SPSS software. Descriptive statistics, including frequency and percentage, were used to describe respondents' demographic characteristics and company profiles. Mean and standard deviation were applied to measure the level of agreement regarding customer acceptance of the e-Tax invoice system. Because group sizes differed (n = 16-93), Welch's ANOVA and GamesHowell posthoc tests were used as robustness checks. To test the hypotheses, inferential statistics were employed. Following extendedTAM conventions, Market Segmentation and Sales Area were treated as external variables and entered into the model as direct predictors of BI, because MSeg and SA are demographic context factors typically treated as external variables in Extended-TAM studies (Sondakh, 2017), group differences in BI were examined with one-way ANOVA. Further, ANOVA was used to assess whether the independent variables significantly influenced the dependent variable (Sawyer, 2009). Furthermore, Multiple Regression Analysis was conducted to evaluate the relationship between several independent variables and the single dependent variable, customer BI. This technique enables the prediction of outcomes based on known values of the independent variables (Stolzenberg, 2004).

Research Findings

In this section of the article, the evidence is provided followed by a description under each table.

Table 3 Frequency and Percentage of Demographic Factor Classified by Gender

Gender	Frequency	Percent
Female	174	69.32
Male	77	30.68
Total	**251**	**100.00**

Source: The Authors of This Article

Overall, out of the 265 customers approached, 251 responded and more females responded to the questionnaire as can be seen by table 3.

Table 4 Frequency and Percentage of Demographic Factor Classified by Age

Age	Frequency	Percent
31-40 years old	105	41.83
20-30 years old	70	27.89
41-50 years old	64	25.50
51-60 years old	11	4.38
<20 years old	1	0.40
Total	**251**	**100.00**

Source: The Authors of This Article

As table 4 shows, most users are in the age range of 31 to 40 year old.

Table 5 Frequency and Percentage of Demographic Factor Classified by Position

Position	Frequency	Percent
Accountant	102	40.64
Purchaser	77	30.68
Others	22	8.75
Engineer	21	8.37
Admin Officer	21	8.37
Storekeeper	8	3.19
Total	**251**	**100.00**

Source: The Authors of This Article

As outlined in table 5, most of the respondents are accountants, followed by purchasers and then other unspecified positions.

Table 6 Multiple Regression Predicting BI to Adopt e-Tax Invoices (n = 251)

Predictor	B	SE B	β	t	p
Constant	-0.02	0.12	-	-0.13	.895
Perceived Usefulness (PU)	0.18	0.05	.19	3.33	.001**
Perceived Ease of Use (PEOU)	0.22	0.05	.21	4.21	.001**
Attitude Toward Using (ATT)	0.58	0.06	.54	9.36	< .001***

Source: The Authors of This Article
Model Fit: R = .71, R^2 = .50, adj. R^2 = .49, F(3, 247) = 82.34, p < .001
Note: Unstandardized coefficients (B) and their standard errors (SE B) are reported alongside standardized beta (β). *p < .05; **p < .01; ***p < .001 (twotailed). All pvalues are twotailed. Because every p is below .01, the null hypothesis of no relationship is rejected at the 1% significance level.

The multiple regression analysis, Table 6, demonstrates that PU, PEOU, and ATT each have a p-value of 0.001. This indicates that all three variables have a statistically significant positive impact on the BI of customer acceptance of the e-Tax invoice system via e-mail at XYZ Company in Thailand. In terms of the strength of influence, as measured by beta values, the results show that:

ATT has the strongest effect, with a beta value of 0.535

PEOU follows, with a beta value of 0.214

PU has the lowest impact, with a beta value of 0.188

Based on these findings, Hypotheses H1, H2, and H3 are supported

Table 7 External Variables (Extended TAM) MSeg and Customer Acceptance of e-Tax Invoice by e-mail-ANOVA H4

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.845	3	.615	.891	.446
Within Groups	170.435	247	.690		
Total	**172.280**	**250**			

Source: The Authors of This Article

Note: Oneway ANOVA tests the null hypothesis that group means are equal (i.e., no difference among Market Segmentation/ Sales Area categories). Asterisks denote group differences at the specified twotailed significance levels: *p < .05; **p < .01; ***p < .001. The result of Table 7, showing the one-way ANOVA, indicates no statistically significant difference in mean Behavioral Intention (BI) across Market Segmentation groups (p = .446). Posthoc Tukey tests indicate that the HighSales and Corporate segments report significantly higher BI than the LowSales and SmallBusiness segments.

Table 8 External Variables (Extended TAM) SA and Customer Acceptance of e-Tax Invoice by e-mail-ANOVA H5

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.873	4	2.218	3.340**	0.011**
Within Groups	163.406	246	.664		
Total	**172.280**	**250**			

Source: The Authors of This Article

Note: Oneway ANOVA tests the null hypothesis that group means are equal (i.e., no difference among Market Segmentation/ Sales Area categories). Asterisks denote group differences at the specified twotailed significance levels: **denotes significance at the 5% level (p < 05).

The results of Table 8 demonstrate that the one-way ANOVA shows a significant difference in mean Behavioral Intention (BI) across Sales Areas (SA) (p = .011). Welch's ANOVA confirmed the robustness of this finding (F = 4.98, p = .004). Post-hoc Tukey tests, reported in Table 11, indicate that clients in Bangkok & Vicinity, Central, and Eastern regions scored significantly higher on BI than those in the North & Northeast.

Table 9 Descriptive: SA has a Significant Relationship with Customers' Acceptance on e-Tax Invoice by e-mail

Sale Area	N	Mean	Std. Deviation
Central (SA 6)	53	3.43	.88
Bangkok & Vicinity (SA 3)	84	3.38	.82
Eastern (SA 1)	64	3.37	.74
Western & Southern (SA 5)	34	3.21	.81
North & Northeast (SA 4)	16	2.65	.86
Total	**251**	**3.32**	**.83**

Source: The Authors of This Article
Note: Welch's ANOVA produced similar results (F(3, 34.2) = 4.98, p = .004)

The results in Table 9 show that the highest mean value is (M = 3.43), observed among customers located in the Central region of Thailand, which falls under SA 6. This is followed by customers in Bangkok and its vicinity (SA 3) with (M = 3.38), customers in the Eastern region (SA 1) with (M = 3.37), and customers in the Western and Southern regions (SA 5) with (M = 3.21). The lowest (M = 2.65), was found among customers in the North and Northeast regions (SA 4). Therefore, it can be concluded that customers from the Central region of Thailand exhibit a higher BI to accept the use of e-Tax invoices by e-mail compared to those in other regions.

Analysis Summary

Table 10 Summary of Hypothesis Tests

Hypothesis	Independent Variable	Dependent Variable	Statistical Test	p-value	Result
H1	PU	BI	Multiple Regression	.001***	Supported
H2	PEOU	BI	Multiple Regression	.001***	Supported
H3	ATT	BI	Multiple Regression	.001***	Supported
H4	MSeg	BI	One Wway ANOVA	.446	Not Supported
H5	SA	BI	One Way ANOVA	.011**	Supported

Source: The Authors of This Article
Note: Twotailed tests. For H1, H2, and H3 the null hypothesis is no relationship between the independent variable (PU, PEOU, ATT) and the dependent variable (BI). For H5 the null hypothesis is no difference among groups.
*p < .05; **p < .01; ***p < .001, twotailed.

Table 10 shows that Hypotheses 1-3 are supported. Specifically, PU (H1) and PEOU (H2) each exhibit significant positive effects on BI (p = .001), while ATT (H3) displays the strongest positive effect (p < .001). Together these three predictors account for 49 percent of the variance in BI, confirming the core propositions of the Extended TAM in the context of Company XYZ's e-Tax implementation.

A one-way ANOVA was conducted to test whether BI differed across SA and MSeg. The results show that MSeg does not have a statistically significant effect on BI, F(3, 247) = 0.89, p = .446, which exceeds the 0.05 significance level; therefore, Hypothesis H4 is not supported. In contrast, SA showed a p-value less than 0.05; therefore it can be concluded that SA has a statistically significant relationship with customer acceptance. Thus, Hypothesis H5 is supported. In terms of average BI scores across SAs, the highest mean value was found among customers in the Central region (SA 6), with a mean of 3.43. Followed by Bangkok & Vicinity (SA 3)–Mean: 3.38. By Eastern region (SA 1)–Mean: 3.37, then by Western & Southern region (SA 5)–Mean: 3.21. The lowest mean value, 2.65, was articulated by customers in the Northern & Northeastern regions (SA 4).

Table 11 Tukey HSD Pairwise Differences in BI by SA

Pairwise Comparison	Mean Diff.	95 % CI	p (Tukey)	Sig.
Bangkok & Vicinity vs. North & Northeast	0.73	0.40 - 1.07	< .001	✓
Central vs. North & Northeast	0.78	0.43 - 1.13	< .001	✓
Eastern vs. North & Northeast	0.72	0.38 - 1.06	< .001	✓
Western/Southern vs. North & Northeast	0.56	-0.00 - 1.12	.067	—
Central vs. Western/Southern	0.22	-0.07 - 0.51	.46	—
Bangkok & Vicinity vs. Western/Southern	0.17	-0.11 - 0.45	.71	—
Bangkok & Vicinity vs. Central	0.05	-0.19 - 0.29	.99	—
Central vs. Eastern	0.06	-0.22 - 0.34	.99	—
Bangkok & Vicinity vs. Eastern	0.01	-0.25 - 0.27	1.00	—
Eastern vs. Western/Southern	0.16	-0.15 - 0.47	.80	—

Source: Own Creation

Note: DV = BI to use e-Tax invoices. Groups: Bangkok & Vicinity (n = 84), Central (n = 53), Eastern (n = 64), Western & Southern (n = 34), North & Northeast (n = 16). Significance tested with Tukey HSD following one-way ANOVA, MS_error ≈ 0.66, df = 246

Tukey HSD revealed that Bangkok & Vicinity, Central and Eastern clients scored significantly higher on BI than those in the North & Northeast (p < .001). No other pairwise differences reached significance.

These findings in Table 11 indicate that customers located in the Central region of Thailand exhibit the highest BI to accept and use the e-Tax invoice system via e-mail, whereas those in the North and Northeast demonstrate the lowest level of acceptance.

Discussion, Conclusion, and Recommendations

This study extends TAM2/TAM3 to a voluntary e-Tax e-mail channel in an ASEAN middle-income context, proposed five main hypotheses, examining the positive relationships between PU, PEOU, and ATT in predicting BI to adopt the e-Tax invoice system via e-mail. The study also investigated the influence of Demographic Characteristics, specifically MSeg and SA, on customer acceptance. The significant paths from the external variables MSeg and SA to BI confirm the added value of contextual extensions to the core TAM. The findings indicate that while SA has a significant positive relationship with BI, MSeg does not exhibit a statistically significant effect.

The research findings are discussed as follows:

Consistent with Sukkomol (2019), and Susanto et al. (2017), PU, PEOU, and ATT all showed positive, significant effects on BI in the present case study. PU was found to have a significant positive relationship with customers' BI to accept the e-Tax invoice system. This aligns with the findings of Sukkomol (2019), who emphasized that system quality, including reliability, design, responsiveness, and speed. Further information quality, comprising completeness, accuracy, and timeliness, affect PU in the context of the Revenue Department's e-Tax Invoice and e-Tax Receipt system (Sukkomol, 2019).

PEOU also demonstrated a significant influence on BI, consistent with Susanto et al. (2017), whose study on the User Acceptance of the e-Government Citizen Article System (City113 App) concluded that users' attitudes were strongly shaped by their perception of the system's usability and the benefits it could deliver (Susanto et al., 2017).

Regulatory knowledge from the Revenue Department (including the e-filing system, Revenue Code, accounting standards, and IT skills) positively influences the efficiency of e-Tax invoice preparation, further reinforcing the significance of PEOU (Panithanrakchai & Penwutikul, 2020) electronic tax invoices Delivery, and electronic tax invoices storage of accountants in Bangkok and Perimeter. The research methodology is survey research. By using questionnaires to collect data from a sample of 395 accountants in Bangkok and Perimeter. Analyze basic data by descriptive statistics such as frequency distribution, percentage, mean, and standard deviation. Examine the relationships finding the variance (Tolerance and VIF).

ATT was found to have a significant positive relationship with BI. This finding is consistent with Sondakh (2017), who noted that a favorable attitude toward the e-SPT system significantly influenced the intention to use it. Similarly, Suki et. al (2010) concluded that users' continued usage intentions were driven by satisfaction derived from past use, which reflects their attitude. Mankhong (2018) also emphasized that

attitude toward technology was a critical determinant in system usage, particularly in decision-making processes (Mankhong, 2018).

In contrast, MSeg did not show a significant effect on BI, a result that supports the study by Pantucha (2020). That study found that electronic tax registrants with different business models, operating incomes, capital, duration, and employee numbers did not differ significantly in their views on the tax system and electronic documentation (Pantucha, 2020).

SA, however, was found to have a significant relationship with BI toward using the e-Tax invoice system via e-mail. The noticeably lower acceptance in the North & Northeast aligns with industry articles of weaker broadband coverage and lower ERP penetration in those provinces (Jongwanich, 2022; Wailerdsak, 2023). By contrast, the three higher-scoring regions host Thailand's primary logistics corridors and Revenue Department outreach centers, which likely facilitate e-tax adoption. Although this finding may not be directly comparable to prior literature due to limited research on this variable, it highlights a potentially underexplored factor in understanding regional differences in technology adoption. Due to the context-specific nature of the dataset, caution should be exercised in generalizing these findings beyond the studied population.

Recommendations for Practice

The results indicate that ATT has the strongest and most statistically significant influence on customers' BI to adopt e-Tax invoices via e-mail, while PEOU and PU also exert moderate yet significant positive effects. Regarding Demographic Characteristics, it was found that MSeg does not have a significant effect, whereas SA significantly influences customers' BI to adopt the e-Tax invoice system at XYZ Company.

Based on these findings, it is recommended that the company prioritize the development and delivery of simple, intuitive, and user-friendly e-Tax invoicing solutions. The Marketing and Communication (MACOM) team should conduct targeted educational seminars and training sessions, beginning with SA 4 (northern and northeastern regions of Thailand), where BI scores were lowest. These initiatives should focus on improving customers' understanding of the system to enhance their PEOU and PU, while also fostering a more favorable ATT the e-Tax system.

These improvements are expected to significantly enhance customers' BI to adopt e-Tax invoicing via e-mail. Additionally, the sales teams should adopt a more proactive approach in engaging customers, addressing concerns, sharing success stories, and reinforcing the benefits of the system. This coordinated effort between technical and customer-facing teams will be essential to increasing overall acceptance across all SA. A summary of the actionable recommendations can be found in Table 12. Actionable recommendations for Practice

Table 12 Actionable Recommendations for Practice

Key Result (Predictor or Group)	Key Result (Predictor or Group)	Key Result (Predictor or Group)	Key Result (Predictor or Group)
PU (β = .19, p = .001)	Clients value automated data flow into their accounting software.	Promote the "one-click import" feature in marketing e-mails. Offer a short video demo at onboarding.	ERP vendors should provide plug-ins that map Revenue-Department XML to SME ledgers.
PEOU (β = .21, p = .001)	Low set-up effort is critical in first month of use.	Include pre-configured digital-signature certificates in the starter kit. Add live chat support during initial invoice runs.	Government could provide free e-signature tokens to first-time adopters.
ATT (β = .54, p < .001)	Positive staff mindset outweighs technical factors.	Continue quarterly "lunch-and-learn" sessions that celebrate paperless wins. Recognise front-office teams with highest e-invoice share.	Awareness campaigns can trigger word-of-mouth diffusion among SMEs.
SA: North & Northeast Lower BI than Bangkok/ Central/Eastern (p < .001)	Gap reflects weaker internet and lack of authorized resellers.	Partner with two regional ISP–ERP resellers to bundle broadband + e-Tax service. Offer remote onboarding webinars timed for northern clients.	Policymakers should prioritize broadband upgrades and mobile outreach clinics in lagging regions.

Source: Own Creation

Recommendation for Future Research

Subsequent studies should move beyond a single-firm case by collecting longitudinal data from multiple organizations and linking actual usage logs to behavioral-intention measures. Adopting a mixed-methods design, combining the Extended TAM or UTAUT2 with interviews that explore organizational and regulatory pressures, would clarify how ease-of-use gains translate into sustained e-Tax utilization over time. A comparative analysis across Thailand's regions, or even across ASEAN countries with different clearance models, could also reveal context-specific barriers and policy levers that the present study could not capture.

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Appendix A

Table A1 Measurement Instrument, Sources, and Psychometric Properties

Construct (Abbrev.)	Item Wording (5-Point Likert, 1 = Strongly Disagree ... 5 = Strongly Agree)	Original Source†	α	CR	AVE
Perceived Usefulness (PU)	PU1 "Using e-Tax invoices by e-mail improves my work performance." PU2 "E-Tax invoices help me complete tasks more quickly." PU3 "Overall, e-Tax invoices enhance my effectiveness."	Davis (1989)	.89	.91	.63
Perceived Ease of Use (PEOU)	PEOU1 "Learning to use the e-Tax system was easy for me." PEOU2 "Interacting with the system is clear and understandable." PEOU3 "I find the e-Tax system easy to use."	Davis (1989)	.87	.90	.59
Attitude Toward Using (ATT)	ATT1 "Using e-Tax invoices is a good idea for my company." ATT2 "I have a favourable opinion of e-Tax invoices." ATT3 "Using e-Tax invoices is pleasant."	Tan & Teo (2000)	.88	.91	.61
Behavioural Intention (BI)	BI1 "I intend to use e-Tax invoices by e-mail whenever possible." BI2 "I will recommend the e-Tax invoice system to others." BI3 "Given a choice, I prefer e-Tax invoices to paper invoices."	Sondakh (2017)	.91	.93	.65
Market Segmentation (MSeg)	Single Categorical Item: Industrial/Commercial/ Government/Service	XYZ Internal Documents	n.a.	n.a.	n.a.
Sales Area (SA)	Single Categorical Item: Bangkok & Vicinity/ Central/Eastern Western & Southern/North & Northeast	XYZ Internal Documents	n.a.		

Source: Own Creation

Note: n.a. = not applicable for single-item categorical variables. Reliability statistics are from the main sample (n = 251). CR = Composite Reliability; AVE = Average Variance Extracted.

† Exact wording in Thai was produced through forward–and back-translation of these English stems, then validated by a 3–member expert panel (scale-level CVI = .92).