Effect of E-Filing, Tax Understanding, and Tax Awareness on Taxpayer Compliance Moderated By Internet Understanding

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Abstract

This study examines the effects of E-Filing implementation, tax understanding, and tax awareness on individual taxpayer compliance and investigates whether internet understanding strengthens the relationship between E-Filing and compliance. A quantitative cross-sectional survey was conducted among 119 individual taxpayers registered at Kantor Pelayanan Pajak/KPP Pratama Kupang who had used E-Filing. Respondents were selected through purposive sampling. Data were analyzed using PLS-SEM in SmartPLS 4, with moderation tested through a two-stage approach. E-Filing implementation (β = 0.219), tax understanding (β = 0.393), and tax awareness (β = 0.176) positively influenced taxpayer compliance, supporting H_1–H_3. Tax understanding was the strongest predictor, and the model explained 67.1% of compliance variance. Internet understanding showed a significant negative moderating effect (β = −0.100, 95% CI −0.196 to −0.016), contrary to the proposed hypothesis, leading to the rejection of H_4. E-Filing, tax understanding, and awareness improve taxpayer compliance. However, internet understanding does not strengthen E-Filing effectiveness, although its direct relationship with compliance remains positive. The study focuses on E-Filing users in one region, relies on self-reported cross-sectional data, and has limited precision in estimating the moderating effect. This study extends digital tax compliance research by applying latent-variable moderation analysis and identifying results that differ from previous regression-based findings. It highlights the distinction between general internet understanding and E-Filing-specific competence, offering practical implications for targeted taxpayer education.

Keywords: *E-Filing, Internet Understanding, PLS-SEM, Taxpayer Compliance, Tax Understanding, Tax Awareness*

1. INTRODUCTION

Tax is a mandatory contribution to the state owed by individuals or entities. It is compulsory under the law, carries no direct reward, and is used for the greatest possible prosperity of the people, as stipulated in Law Number 16 of 2009 on General Provisions and Tax Procedures. Without tax revenue, the government cannot finance public services or development programs and loses one of its main instruments for maintaining economic stability and reducing income inequality through redistribution. Taxpayer compliance is therefore a key measure of the success of a tax system, and the factors that determine compliance among individual taxpayers in Indonesia remain a focus of empirical research (Anggadini, Surtikanti, Bramasto, & Fahrana, 2022; Sunarto, & Liana, 2020).

The public's willingness to pay taxes is still generally low. The Directorate General of Taxes (DGT) set a formal compliance ratio target of 83.22% for 2024, but as of April 30, 2024, 2024, the realization was only 73.58%, with 14,186,630 annual tax returns (SPT) received. To reach the target, the number of returns had to exceed 16,039,302, an increase of more than 1,852,672 returns (9.64%). A tax system can work effectively only if taxpayers have awareness, integrity, self-control, and the will to fulfill their obligations in accordance with the regulations.

As part of its use of information and communication technology, the DGT introduced E-Filing, the online, real-time submission of tax returns that removes the need to print forms and wait for a manual receipt. Most taxpayers, however, have not yet used it. Limited outreach by the DGT and the Tax Service Offices or locally *Kantor Pelayanan Pajak/KPP* leads taxpayers to regard electronic reporting as harder than manual reporting (Nainggolan, Nababan, & Gaol, 2022). This situation is visible in eastern Indonesia. The 2024 survey of the Indonesian internet service providers association put internet penetration in the Bali–Nusa Tenggara region at 71.80%, below both the national figure (79.5%) and Java (83.64%). Regional averages do not describe individual taxpayers, but they indicate

that digital access and habits in Nusa Tenggara are less developed than in Java and Sumatra, where most of the earlier E-Filing studies reviewed below were conducted. KPP Pratama Kupang was therefore chosen as a setting in which the proposed moderator, internet understanding, is expected to matter, and in which the question of whether internet competence conditions the benefit of E-Filing can be asked under less favorable digital conditions. Informal preliminary interviews with ten taxpayers, which are illustrative rather than representative, are consistent with this picture: three had never reported taxes because they had no Taxpayer Identification Number or locally *Nomor Pokok Wajib Pajak/NPWP* and did not understand their obligations, three held an NPWP but could not use E-Filing, three delegated reporting to a tax consultant or third party, and only one could report independently through E-Filing (Valentino & Susilowati, 2026).

Several studies have shown that E-filing implementation contributes to the compliance of individual taxpayers because it simplifies the process of filling out and submitting returns (Nainggolan et al., 2022; Situmorang, & Ginarti, 2022). Better tax knowledge also has a positive effect on compliance Mulyati and Ismanto (2021), and taxpayer awareness has been shown to encourage compliance (Sulistyawati, Lestari, & Sabilla, 2022). However, the findings are not uniform. Anjani (2022) and Mahadianto, Kamilia, Ramadhani, Fuziani, and Siregar (2024) found no effect of E-filing on individual taxpayer compliance, Yoga and Dewi (2022) found a positive but insignificant effect, and Sulistyawati et al. (2022) found no effect of tax understanding. Across the studies summarized in Table 1, positive and null results for the same predictors appear in different offices and respondent groups, which suggests that the effect of E-filing depends on conditions that earlier models did not include, such as taxpayers' ability to use online services.

One such condition is internet understanding. Using E-Filing requires the ability to operate the internet; therefore, taxpayers who understand the internet poorly will not enjoy the comfort and convenience the system promises (Purba, Sarpingah, & Nugroho, 2020). Under the theory of planned behavior, this ability is part of perceived behavioral control, which gives a theoretical reason to expect that the compliance benefit of E-Filing is larger for taxpayers who can operate online services with ease. Internet understanding has already been tested as a moderator, however, the evidence is not unanimous: Purba et al. (2020), Rachmawati, Burhanudin, and Octaviani (2022), and Jatnika (2024) report that it strengthens the effect of E-Filing on compliance, whereas Yanti and Setiawan (2020) found no moderation among taxpayers at KPP Pratama Badung Utara. These studies relied mainly on moderated regression and were conducted in Java, Sumatra, and Bali. Therefore, the unresolved problem is whether general internet understanding actually conditions the benefit of E-Filing and in which direction, when the relationship is modeled with latent variables and tested in a region with lower internet penetration.

This study does not claim that internet understanding is a new moderator. Its novelty lies in three features. First, moderation is tested as a latent-variable interaction in PLS-SEM, in which each construct is measured by several indicators rather than moderated regression, the main approach in earlier studies (Purba et al., 2020; Yanti and Setiawan, 2020). Second, the setting is KPP Pratama Kupang, which none of the moderation studies cited above covered. Third, general internet understanding is distinguished from E-Filing-specific competence, a distinction that the unexpected direction of the moderating effect found here brings to the fore.

Based on this background, the study had two objectives: to test the effects of E-Filing implementation, tax understanding, and tax awareness on the compliance of individual taxpayers at KPP Pratama Kupang, and to test whether internet understanding moderates the relationship between E-Filing implementation and compliance, which is hypothesized to be strengthened. Theoretically, the study contributes by combining the Theory of Planned Behavior and the Slippery Slope Framework in one model of compliance with digital tax services, by testing a hypothesized moderation as a latent-variable interaction in a setting that earlier work did not cover, and by separating general internet understanding from E-Filing-specific competence. Practically, the results show the DGT factors that are associated with compliance and whether promoting E-Filing should be accompanied by system-specific guidance, so that education programs can be better targeted and more efficient.

2. LITERATURE REVIEW

2.1 Theoretical Basis

This study rests on two theories. The first is the Theory of Planned Behavior (TPB) developed by Ajzen (1991) as an extension of the theory of reasoned action. The TPB explains that individual behavior is determined by intention, and that intention is formed by three components, such as attitude toward the behavior, subjective norm, and perceived behavioral control. Attitude reflects an individual's evaluation of a behavior, subjective norm describes the perceived social pressure to perform or not perform the behavior, and perceived behavioral control describes how easy or difficult the behavior is to perform (Ajzen, 1991). In the tax context, taxpayers who believe that paying taxes is beneficial, feel encouraged by their surroundings, and feel capable of meeting their obligations because they understand taxation and its reporting system tend to have stronger intentions to comply. The TPB is used here to explain how E-filing implementation, tax understanding, tax awareness, and internet understanding relate to taxpayer compliance.

The second is the Slippery Slope Framework (SSF) proposed by Kirchler et al. (2008). The framework identifies trust in the tax authority and the power of the tax authority as the two main determinants of compliance. High trust encourages voluntary compliance, whereas the authority's power to detect and punish violations produces enforced compliance. The effect of a change in one dimension depends on the level of the other, and compliance can drop sharply when both trust and power fall below a certain level (Kirchler et al., 2008). The SSF is used mainly to explain how good tax understanding can build trust in the tax authority so that taxpayers report voluntarily.

The two theories play complementary roles in the research model. The TPB explains why taxpayers who hold favorable beliefs about reporting and feel able to carry it out form the intention to comply. E-filing implementation lowers the effort of reporting and supports favorable attitudes and perceived behavioral control, while tax awareness reflects the attitudinal and normative commitment to contribute to the state, and tax understanding supplies the knowledge on which perceived behavioral control rests. However, the TPB says little about why taxpayers are willing to deal with the authority at all (Emilia, Fasa, & Etika, 2026). SSF fills this gap when taxpayers understand how the system works and find the service simple and fair, trust in the authority grows, and compliance becomes voluntary rather than enforced. Tax understanding is therefore linked to compliance through both theories, whereas E-filing implementation and tax awareness are interpreted mainly through the TPB (Mujahidah, Muzalifah, & Mubarok, 2026). Because trust and power are not measured in this study, the SSF arguments are interpretive and are not tested directly, which is acknowledged as a limitation.

Within TPB, internet understanding is expected to moderate the effect of E-Filing through perceived behavioral control, which reflects both a person's confidence in being able to perform a behavior and the resources and obstacles involved (Ajzen, 1991). E-Filing delivers its convenience only to taxpayers who can operate an online system; thus, a taxpayer with higher internet understanding should convert E-Filing implementation into compliance more easily, which implies strengthening. This mechanism rests on an assumption that must be stated explicitly that general internet understanding stands for the specific competence needed to use a digital tax service. The two are not the same. General internet understanding, as measured here, concerns finding information, guidance, and rules online (Oktaviani et al., 2020), whereas E-Filing-specific competence covers obtaining an EFIN, completing the return, and submitting it through the DGT system. General understanding is probably necessary for using E-Filing but need not be sufficient, and among taxpayers who already use E-Filing, its marginal contribution may be small or may substitute for the effect of the system itself. Whether the interaction is positive, null, or negative thus depends on which of the two competences operates in the sample, this is a theoretical inconsistency in the earlier literature rather than a settled expectation.

2.2 Concepts and Research Variables

Taxpayer compliance is the act of fulfilling tax obligations in accordance with the law, covering registration, bookkeeping, withholding or collection, reporting, and payment. In this study,

compliance is measured through voluntary registration for an NPWP, regularity, timeliness, and correctness of return submission, and consistency in paying taxes (Muhammad, & Mildawati, 2020; Wilasandy, Chairunnisa, & Heriyati, 2026).

Under the Director General of Taxes Regulation Number PER-1/PJ/2014, e-filing is a way of submitting an annual tax return or a notification of its extension online and in real time through the DGT website or an authorized application service provider. It is an e-government initiative in tax administration with several advantages: returns can be submitted anytime and anywhere, around the clock, reporting costs are lower, calculations are faster and more accurate because they are computerized, filling in is easier because it follows a step-by-step wizard, data are more complete because of validation, paper use is reduced, and supporting documents need not be sent unless requested by the KPP. To use it, a taxpayer first obtains an Electronic Filing Identification Number (EFIN) from the DGT or the nearest KPP and then registers in the E-Filing system.

Tax understanding indicates how far taxpayers know and comprehend general tax provisions and procedures, their rights and obligations as individual taxpayers, and the tax system in force, including the regulations disseminated by the KPP (Ningsih & Saragih, 2020). Tax awareness is the taxpayer's behavior in fulfilling tax rights and obligations in accordance with the rules without coercion, with full recognition that taxes finance the state (Alfina & Diana, 2021). This is reflected in an understanding of the functions of tax, willingness to calculate, pay, and report taxes voluntarily, and recognition that tax is the largest source of state revenue (Setiawan, 2020).

Internet understanding means understanding the internet and knowing how to use it. The internet supports E-Filing, therefore, a good understanding is required to reach reporting services, procedural guides, and tax rules (Olayinka, Sule, & Kaka, 2025). The better the understanding, the greater the taxpayer's desire to use E-Filing and the higher the compliance in reporting taxes (Gultom, Arief, & Sani, 2022; Rachmawati, Burhanudin, & Octaviani, 2022). In this study, the construct is general internet understanding, that is, the ease of obtaining tax information and E-Filing guidance online, and it is distinguished from E-Filing-specific competence (for example, familiarity with EFIN registration and the submission procedure).

2.3 Previous Research

The determinants of individual taxpayer compliance have been extensively studied by combining E-Filing, tax socialization, sanctions, and awareness as predictors (Aqiila & Furqon, 2021; Benarda & Asyifa, 2023; Dewi et al., 2022; Dwiadityo & Subiyanto, 2024; Hamilah & Aliza, 2021; Indah & Setiawan, 2020; Sunarto & Liana, 2020; Supriatiningsih & Jamil, 2021). Purba (2021) positioned tax awareness as a mediating variable between socialization and tax knowledge on the one hand and compliance on the other. Table 1 summarizes the twelve studies most relevant to this research and their findings.

Table 1. Summary of previous research

No	Author (year)	Location	Main findings
1	Situmorang & Ginarti (2022)	KPP Pratama Medan Petisah	E-Filing, tax understanding, and tax awareness positively affect individual taxpayer compliance
2	Nainggolan et al. (2022)	KPP Pratama Sibolga	E-Filing, tax understanding, and taxpayer awareness affect taxpayer compliance
3	Mulyati & Ismanto (2021)	Ministry of Education and Culture employees	E-Filing, tax knowledge, and tax sanctions positively affect taxpayer compliance
4	Anjani (2022)	KPP Pratama Surabaya Sukomanunggal	E-Filing has no effect, tax understanding and taxpayer awareness have positive effects
5	Sulistyawati et al. (2022)	KPP Pratama Jepara	Taxpayer awareness has an effect, tax understanding, socialization, and fiscus services do not

No	Author (year)	Location	Main findings
6	Yoga & Dewi (2022)	KPP Pratama East Denpasar	E-Filing and socialization positive but insignificant, taxpayer awareness and sanctions positive and significant
7	Ay et al. (2021)	Kabul, Afghanistan	Tax understanding and taxpayer awareness affect compliance
8	Matshona et al. (2024)	South Africa	Tax knowledge affects compliance behavior
9	Mapope et al. (2022)	ZIMRA, Zimbabwe	The E-Filing system positively affects taxpayer compliance
10	Mahadianto et al. (2024)	KPP Pratama Cirebon Dua	E-Filing has no effect, E-Billing and tax sanctions have an effect
11	Purba et al. (2020)	KPP Pratama Jakarta Kramat Jati	E-Filing has a positive effect, internet knowledge moderates the E-Filing–compliance relationship
12	Yanti & Setiawan (2020)	KPP Pratama Badung Utara	E-Filing has a positive effect, internet understanding does not moderate the E-Filing–compliance relationship

Situmorang and Ginarti (2022) studied 100 taxpayers at KPP Pratama Medan Petisah, Nainggolan et al. (2022) studied 69 respondents at KPP Pratama Sibolga, and Mulyati and Ismanto (2021) studied 146 employees of the Ministry of Education and Culture, all found a positive effect of E-Filing on compliance. Similar evidence was reported by Ardianti and Sari (2023) and Fadhilah and Afiqoh (2022), and abroad by Mapope et al. (2022) for the Zimbabwe Revenue Authority (ZIMRA). In contrast, Anjani (2022) at KPP Pratama Surabaya Mahadianto et al. (2024) at KPP Pratama Cirebon Dua found no effect of E-Filing, and Yoga and Dewi (2022) in East Denpasar found only a positive but insignificant effect.

Regarding tax understanding and awareness, Situmorang and Ginarti (2022), Nainggolan et al. (2022), and Anjani (2022) reported positive effects. Ay et al. (2021) in Kabul found an effect of tax understanding and awareness, and Matshona et al. (2024) in a scoping review in South Africa concluded that tax knowledge affects compliance behavior. An effect of taxpayer awareness was also found by Oktaviani and Triyani (2023), Mudamakin and Rupilu (2022), and Yoga and Dewi (2022). Sulistyawati et al. (2022) at KPP Pratama Jepara, however, found no effect of tax understanding on compliance.

On the role of internet understanding, Purba et al. (2020) at KPP Pratama Jakarta Kramat Jati used moderated regression analysis and found that internet knowledge moderates the relationship between E-Filing implementation and compliance, in line with Rachmawati et al. (2022) and Jatnika et al. (2024), who reported that internet understanding strengthens the effect of E-Filing. However, Yanti and Setiawan (2020), who studied 100 taxpayers at KPP Pratama Badung Utara using the same moderated regression approach, found that Internet understanding did not moderate the effect of E-Filing. Most of these studies used multiple regression or path analysis in different regional contexts, whereas this study tests the same model simultaneously using PLS-SEM on taxpayers at KPP Pratama Kupang.

Taken together, the earlier studies leave three inconsistencies unresolved. First, E-Filing implementation is positively related to compliance in most studies but not in all (Anjani, 2022; Mahadianto et al., 2024; Yoga & Dewi, 2022), and the null results come from different offices and respondent groups, which points to a conditional rather than a uniform effect. Second, tax understanding has a positive effect in most studies and no effect in one (Sulistyawati et al., 2022). Third, the moderation studies point toward strengthening in some settings (Purba et al., 2020; Rachmawati et al., 2022; Jatnika et al., 2024) but not in another (Yanti & Setiawan, 2020), and none of them separates general internet understanding from system-specific competence. The evidence therefore supports the expectation underlying H_4, but does not establish it.

2.4 Hypothesis Development

Under the TPB, E-Filing implementation can be seen as a factor that shapes taxpayers' attitudes toward the obligation to report. Obstacles in implementing E-Filing lead many taxpayers to visit the KPP in person to submit returns, which ultimately affects compliance (Fadhilah & Afiqoh, 2022). In contrast, E-Filing allows returns to be submitted from anywhere without leaving home or the workplace, making tax reporting easier, simpler, and less expensive. This is consistent with Ardianti and Sari (2023), Fadhilah and Afiqoh (2022), and Situmorang and Ginarti (2022), who state that e-filing implementation positively affects taxpayer compliance. In terms of SSF, a simple and reliable service can also contribute to a service-oriented relationship between the authority and taxpayers, which supports trust (Kirchler, Hoelzl, & Wahl, 2008). Studies that found no or insignificant effects, Anjani (2022), Mahadianto, Kamilia, Ramadhani, Fuziani, & Siregar, 2024 and Yoga and Dewi (2022) imply that the effect depends on how well taxpayers can use the system, which H_4 tests. Therefore, the first hypothesis is stated as follows:

H_1: E-filing implementation has a positive effect on taxpayer compliance

In the SSF framework, taxpayers who understand tax law, regulations, and procedures tend to trust the tax authority more and are willing to report voluntarily, which increases compliance. A high understanding of tax provisions and procedures, as well as taxpayers' rights and obligations, makes it easier to apply them in practice. This positive effect was reported by Situmorang and Ginarti (2022), Nainggolan, Nababan, and Gaol (2022), and Anjani (2022). Under TPB, understanding strengthens perceived behavioral control because taxpayers who know what is required can complete a return with confidence. Sulistyawati, Lestari, and Sabilla (2022) is the exception among the studies in Table 1, the hypothesis follows the weight of the evidence. The second hypothesis is as follows.

H_2: Tax understanding positively affects taxpayer compliance

TPB holds that intention precedes behavior. Taxpayers who are aware of the importance of tax for state revenue and public welfare will intend to fulfill their obligations, thus, the higher the awareness, the higher the compliance. This view is consistent with the findings of Oktaviani and Triyani (2023), Mudamakin and Rupilu (2022), and Sulistyawati et al. (2022). Awareness also reflects an internalized commitment to contribute to the state, which TPB captures through attitudes and subjective norms rather than through enforcement. The third hypothesis is as follows:

H_3: Tax awareness positively affects taxpayer compliance

E-Filing is designed to give taxpayers comfort and convenience, but only taxpayers who can use the internet can benefit from it. According to TPB, ease of use, as part of perceived behavioral control, affects the intention to comply and compliant behavior. Taxpayers with good internet understanding tend to use E-Filing effectively, so their compliance rises. H_4 rests on two assumptions: that the convenience of E-Filing is realized only through the use of an online system, so that the effect of E-Filing on compliance depends on the user's ability to operate online services, and that general internet understanding is a reasonable indicator of that ability. Given these assumptions and the evidence of Purba, Sarpingah, and Nugroho (2020), Rachmawati, Burhanudin, and Octaviani (2022), and Jatnika (2024), who found that internet understanding strengthens the effect of E-Filing on compliance, a strengthening effect is the reasonable expectation. The evidence is not unanimous (Yanti & Setiawan, 2020), therefore, the hypothesis is stated in the direction implied by theory and prior evidence and is tested as such; a significant interaction in the opposite direction would not support it. The fourth hypothesis is as follows:

H_4: Internet understanding moderates (strengthens) the effect of E-filing implementation on taxpayer compliance

2.5 Research Framework

Figure 1 presents the research framework. E-Filing implementation, tax understanding, and tax awareness were positioned as independent variables that influence taxpayer compliance, while internet understanding was positioned as a moderating variable on the relationship between E-Filing implementation and compliance. Adding a moderating variable distinguishes this study from earlier studies that tested only direct effects. The hypothesized directions, including the strengthening interaction in H_4, were fixed before estimation and were not revised to fit the results.

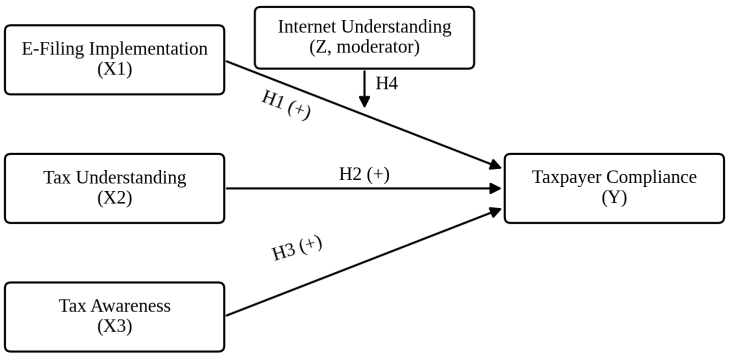


Figure 1. Research framework

3. RESEARCH METHODOLOGY

3.1 Design, Population, and Sample

This study used a quantitative approach with primary data. The subjects were individual taxpayers registered at KPP Pratama Kupang, and the objects were E-Filing implementation, tax understanding, tax awareness, internet understanding, and taxpayer compliance. The sample was selected using purposive sampling, a non-probability sampling technique, using three criteria, such as the respondent held an NPWP, the respondent had used E-Filing, and the respondent was registered at KPP Pratama Kupang. The minimum sample size followed the rule of five times the number of indicators; with 23 indicators, at least 115 respondents were required (23 × 5 respondents). A total of 119 questionnaires were collected, all complete, so all were analyzed.

Purposive sampling was chosen because the model can be evaluated only by respondents who hold an NPWP and have used E-Filing, and this technique selects the respondents best able to provide informative data on the phenomenon studied (Saunders, Lewis, & Thornhill, 2023). As a non-probability technique, it does not give every registered taxpayer a known chance of selection, therefore, the sample is not statistically representative of all individual taxpayers at KPP Pratama Kupang, and the results are read as evidence on the relationships in the model rather than as population estimates. The criteria also shape what the results can say. Because all 119 respondents had used E-Filing, taxpayers who do not use it, who rely on consultants or third parties for reporting, or who cannot use the internet are excluded, and these are groups likely to have lower internet understanding. The range of E-Filing implementation and internet understanding is therefore restricted (see Table 3), the interaction is estimated mainly among taxpayers with moderate to high internet understanding, and the findings do not extend to taxpayers with low internet literacy. Range restriction of this kind can bias an estimated interaction; therefore, the sign and size of the moderating effect should be read as applying to existing E-Filing users.

The minimum sample of 115 follows the rule of five times the number of indicators. Because this rule ignores effect size and the interaction term, a sensitivity analysis was also run with the noncentral F distribution used in G*Power for the compliance equation with five predictors (E-Filing implementation, tax understanding, tax awareness, internet understanding, and the interaction), N = 119, and $\alpha = 0.05$. The sample gives 80% power to detect a single predictor with an effect size of $f^2 \geq 0.067$ (between Cohen (1988) small and medium benchmarks of 0.02 and 0.15) and to detect the overall model at $f^2 \geq 0.113$. By the inverse square root method Kock and Hadaya (2018), a sample of

this size is adequate for 80% power only for path coefficients of about 0.23 or larger. Power is therefore adequate for medium effects but limited for small ones, including interaction effects, which are typically small; for a single-predictor effect of $f^2 = 0.049$, the size later observed for the interaction, power is about 0.67. Nonsignificant results for small effects would not be conclusive, and significant small effects should be read as imprecise estimates.

3.2 Data Collection and Variable Measurement

Data were collected through an online questionnaire (Google Form) with two parts: statements measuring the research variables and respondent identity. The identity section included screening items on NPWP ownership and prior E-Filing use, which were used to confirm eligibility. All statements were measured on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Before distribution, the statements were pilot-tested to ensure that respondents understood the wording and to obtain suggestions for improvement. All items were adapted from published instruments (cited below) and administered in Indonesian, the language of the instruments.

Taxpayer compliance was measured with four statements covering voluntary registration for an NPWP, routine annual return reporting, correct and timely submission of returns, and the habit of paying taxes. E-Filing implementation was measured with six statements on the speed and security of reporting, calculation accuracy, ease of filling in, data completeness, environmental concern, and the absence of supporting documents (both adapted from Muhammad and Mildawati (2020). Tax understanding was measured with four statements on general tax provisions and procedures, taxpayers' rights and obligations, the tax system, and KPP socialization (Ningsih & Saragih, 2020). Tax awareness was measured with four statements on the function of tax, compliance with regulations, voluntary calculation, payment, and reporting, and tax as the largest source of revenue (Setiawan, 2020). Internet understanding was measured with five statements on how easily the internet provides information and E-Filing guidance, knowledge of tax rules and calculation procedures, and the speed of access for return submission (Oktaviani, Della, Sunarto, & Wulandari, 2020). To limit common method bias, the cover letter assured respondents that their answers would be kept confidential, the compliance items were presented before the predictor items, and each statement required a single answer on the same five-point scale. Because the data are self-reported and collected at one point in time, bias was also checked statistically: Harman's single-factor test showed that the first unrotated factor accounts for 42.0% of the variance of the 23 indicators (below the 50% criterion), and the full collinearity Variance Inflation Factor (VIF) of every construct was at most 2.90 (below the 3.3 threshold). These checks reduced but did not eliminate the concern.

3.3 Data Analysis Technique

Descriptive statistics were computed in SPSS 27 using the minimum, maximum, mean, and standard deviation. The category interval was set at $(5-1)/5 = 0.8$, therefore, mean scores of 1.0–1.8 were very low, 1.9–2.6 rather low, 2.7–3.4 neutral, 3.5–4.2 rather high, and 4.3–5.0 very high. Hypotheses were tested with PLS-SEM in SmartPLS 4 in two stages. In the measurement (outer) model, convergent validity was assessed with outer loadings above 0.70 and Average Variance Extracted (AVE) above 0.50, discriminant validity with cross loadings and the Heterotrait–Monotrait Ratio (HTMT, point estimates below 0.85 and 95% confidence intervals excluding 1, Henseler, Ringle, and Sarstedt (2015), and reliability with Cronbach's alpha and composite reliability, each above 0.70. In the structural (inner) model, collinearity was assessed with the variance inflation factor (VIF, values below 3), explanatory power with R^2, effect size with f^2 (0.02, 0.15, and 0.35 for small, medium, and large effects, Cohen (1988), and each path with its coefficient, confidence interval, and significance (Hair, Risher, Sarstedt, & Ringle, 2019). Significance was assessed by bootstrapping with 5,000 resamples, using two-tailed tests at the 5% level (critical $t = 1.96$) and 95% percentile confidence intervals.

All five constructs were modeled reflectively, as each was measured by several indicators expected to covary (Figure 2). The moderating effect was estimated using the two-stage approach Henseler and Chin (2010), the latent variable scores of E-Filing implementation and internet understanding were first estimated in a model with the direct effects, and the interaction term was then

built as the product of these two standardized scores and entered in the structural model together with the direct effects of E-Filing implementation, tax understanding, tax awareness, and internet understanding. The interaction coefficient is therefore expressed per unit of that product and can be read as the change in the effect of E-Filing implementation on compliance for a one-standard-deviation increase in internet understanding. R^2 is interpreted as in-sample explanatory power, an out-of-sample predictive assessment (PLSpredict) was not performed, so no claim of predictive accuracy is made. The interaction is illustrated with simple slopes at ±1 SD of internet understanding.

4. RESULTS AND DISCUSSION

4.1 Respondent Characteristics

The online questionnaire yielded 119 respondents, all complete. Table 2 shows that female respondents (55%) slightly outnumber male respondents (45%). The largest age group was 25–35 years (49%), followed by 36–45 years (40%) and 46–55 years (11%), no respondent was older than 56. Most respondents held a bachelor's, master's, or doctoral degree (62%), and the rest held a diploma (D-I to D-IV, 38%). All respondents held an NPWP and used E-filing, in line with the sampling criteria.

Table 2. Respondent characteristics (n=19)

Characteristic	Frequency	Percentage (%)
Gender		
Male	54	45
Female	65	55
Age	Age	Age
25–35 years	58	49
36–45 years	48	40
46–55 years	13	11
> 56 years	0	0
Education level		
Diploma (D-I/D-II/D-III/D-IV)	45	38
Bachelor/Master/Doctoral	74	62
NPWP ownership		
Holds an NPWP	119	100
E-Filing experience		
Has used E-Filing	119	100

4.2 Descriptive Statistics

Table 3 presents the descriptive statistics of the five variables. The mean answers range from 3.99 to 4.22, all in the rather high category, which means that respondents generally agree with the statements. E-Filing implementation has the highest mean (4.22), followed by taxpayer compliance (4.16), tax understanding (4.07), internet understanding (4.01), and tax awareness (3.99). Tax awareness also has the largest standard deviation (1.23), indicating that answers on this variable vary the most. Scores are concentrated at the upper end of the scale: 63.9% of respondents have a mean internet understanding score of at least 4.0, and only 8 respondents (6.7%) score below 3.0, so taxpayers with low internet understanding are few in this sample.

Table 3. Descriptive statistics

Variables	Min	Max	Mean	Std. deviation
Taxpayer Compliance	1	5	4.16	1.01
E-Filing Implementation	1	5	4.22	0.97
Tax Understanding	1	5	4.07	0.92
Tax Awareness	1	5	3.99	1.23

Variables	Min	Max	Mean	Std. deviation
Internet Understanding	1	5	4.01	0.86

4.3 Measurement Model Evaluation

Table 4 summarizes the evaluation of the measurement model. All indicators had outer loadings between 0.74 and 0.94, above the 0.70 threshold, and the AVE of every construct ranged from 0.60 to 0.84, above the 0.50 threshold, so convergent validity was satisfied. Discriminant validity was also satisfied because each indicator's cross loading on its own construct was larger than on the other constructs, for example, indicator KWP1 loads 0.86 on taxpayer compliance compared with 0.60 on E-Filing implementation, 0.63 on tax understanding, 0.46 on tax awareness, and 0.40 on internet understanding. Cronbach's alpha (0.84–0.94) and composite reliability (0.88–0.96) exceeded 0.70, so all constructs were reliable. The composite reliability of tax understanding (0.96) is slightly above 0.95, which can signal some redundancy among its items, but no discriminant validity problem appears. Table 5 reports the HTMT: all point estimates are below 0.85 (the largest is 0.81, between E-Filing implementation and compliance), and the upper limits of the 95% confidence intervals (the largest is 0.93) are below 1, so discriminant validity was established.

Table 4. Validity and reliability test results

Variables	Number of indicators	Outer loading range	AVE	Cronbach alpha	Composite reliability
Taxpayer Compliance	4	0.80–0.86	0.67	0.84	0.89
E-Filing Implementation	6	0.74–0.81	0.62	0.88	0.91
Tax Understanding	4	0.88–0.94	0.84	0.94	0.96
Tax Awareness	4	0.74–0.91	0.69	0.85	0.90
Internet Understanding	5	0.77–0.79	0.60	0.84	0.88

Table 5. Discriminant validity: HTMT with 95% bootstrap confidence intervals

	Taxpayer Compliance	E-Filing Implementation	Tax Understanding	Tax Awareness
E-Filing Implementation	0.814 (0.660–0.930)			
Tax Understanding	0.805 (0.668–0.916)	0.691 (0.533–0.816)		
Tax Awareness	0.652 (0.449–0.848)	0.688 (0.508–0.839)	0.457 (0.255–0.639)	
Internet Understanding	0.534 (0.250–0.818)	0.503 (0.274–0.743)	0.378 (0.136–0.661)	0.316 (0.137–0.580)

The cells show the HTMT with the 95% percentile bootstrap interval in parentheses (5,000 resamples)

4.4 Structural Model Evaluation and Hypothesis Testing

Before the structural paths were interpreted, collinearity was checked. All inner VIF values were below 3 (E-Filing implementation 2.45, tax understanding 1.75, tax awareness 1.54, internet understanding 1.25, and the interaction term 1.41), therefore, collinearity was not a concern (Table 7). The estimated model includes the direct path from internet understanding to compliance, in addition to the interaction term (β = 0.131, 95% CI 0.033–0.277), Figure 2 shows only the moderating arrow. The R^2 of taxpayer compliance is 0.671 (adjusted R^2 = 0.657), meaning that, in this sample, the predictors account for approximately two-thirds of the variance in compliance, and the remaining 32.9% is explained by factors outside the model. R^2 describes in-sample explanatory power for cross-sectional, self-reported data; it does not show out-of-sample predictive accuracy or establish causal effects. Figure 2 presents the estimated model, Table 6 summarizes the hypothesis tests

Table 6. Hypothesis test results

	Relationship	Coefficient	*t*-statistic	*p*-value	Conclusion
H_1	E-Filing Implementation → Taxpayer Compliance	0.219	2.02	0.043	Supported
H_2	Tax Understanding → Taxpayer Compliance	0.393	4.64	<0.001	Supported
H_3	Tax Awareness → Taxpayer Compliance	0.176	2.25	0.024	Supported
H_4	Internet Understanding × E-Filing Implementation → Taxpayer Compliance	−0.100	2.14	0.032	Not supported (significant, opposite direction)

Two-tailed tests at the 5% level (critical t = 1.96), p-values are two-tailed. The coefficient for H_4 is the interaction effect, expressed per unit of the product of the standardized scores of E-Filing implementation and internet understanding. H_1–H_3 predict positive effects, and H_4 predicts a positive (strengthening) interaction.

Table 7. Confidence intervals, effect sizes, and collinearity

Path	*β*	95% CI	f^2	VIF
E-Filing Implementation → Taxpayer Compliance	0.219	0.021 to 0.446	0.059 (small)	2.45
Tax Understanding → Taxpayer Compliance	0.393	0.223 to 0.547	0.268 (medium)	1.75
Tax Awareness → Taxpayer Compliance	0.176	0.033 to 0.341	0.061 (small)	1.54
Internet Understanding → Taxpayer Compliance (direct)	0.131	0.033 to 0.277	0.042 (small)	1.25
Internet Understanding × E-Filing Implementation → Taxpayer Compliance	−0.100	−0.196 to −0.016	0.049 (small)	1.41

95% percentile intervals from 5,000 bootstrap resamples. f^2: 0.02 small, 0.15 medium, and 0.35 large (Cohen, 1988). VIF: inner variance inflation factor.

Table 7 reports the confidence intervals, effect sizes, and collinearity statistics. E-Filing implementation has a positive effect on taxpayer compliance ($\beta = 0.219$, $t = 2.02$, $p = 0.043$, 95% CI 0.021–0.446); therefore, H_1 is supported. Tax understanding has a positive effect, with the largest coefficient ($\beta = 0.393$, $t = 4.64$, $p < 0.001$, 95% CI 0.223–0.547), therefore, H_2 is supported, and tax awareness has a positive effect ($\beta = 0.176$, $t = 2.25$, $p = 0.024$, 95% CI 0.033–0.341), therefore, H_3 is supported. All three effects are significant in the two-tailed test ($t > 1.96$) and therefore also in the one-tailed test (1.65). The effects of E-Filing implementation and tax awareness were small ($f^2 = 0.059$ and 0.061), and that of tax understanding was medium ($f^2 = 0.268$). H_4 predicts that internet understanding strengthens the effect of E-Filing implementation, that is, a positive interaction. The estimated interaction is statistically significant but negative ($\beta = -0.100$, $t = 2.14$, $p = 0.032$, 95% CI −0.196 to −0.016, $f^2 = 0.049$). Statistical significance and hypothesis support are not the same here: the effect is significant but in the direction opposite to the one predicted, therefore, H_4 is not supported. The hypothesis was not reformulated after estimation; the result is reported as a significant moderating relationship that runs against the hypothesized direction.

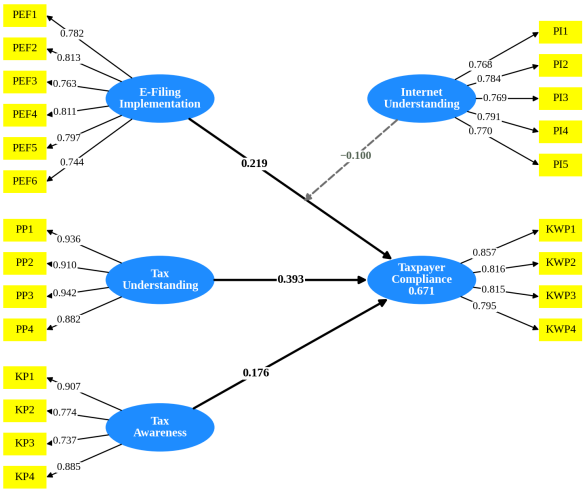


Figure 2. Research result model (the direct path from internet understanding to compliance, β = 0.131, is estimated but not drawn)

Figure 2 shows that E-Filing implementation ($\beta = 0.219$), tax understanding ($\beta = 0.393$), and tax awareness ($\beta = 0.176$) positively influence taxpayer compliance, explaining 67.1% of its variance ($R^2 = 0.671$). Internet understanding negatively moderates the relationship between E-Filing Implementation and taxpayer compliance ($\beta = -0.100$), indicating that it does not strengthen the effect of E-Filing on compliance. The interaction coefficient indicates that a one-standard-deviation increase in internet understanding reduces the path from E-Filing implementation to compliance by 0.100, from 0.219 at the mean to 0.118 (Figure 3). The simple slope is 0.319 (95% CI 0.129 to 0.522) at one standard deviation below the mean of internet understanding, 0.219 (0.021 to 0.446) at the mean, and 0.118 (−0.135 to 0.401) at one standard deviation above it, where it can no longer be distinguished from zero. The conditional effect of internet understanding on compliance is 0.131 − 0.100 × (E-Filing implementation score in standard-deviation units), which stays positive for E-Filing scores below about +1.3 SD, so internet understanding is not negatively related to compliance as such. The interaction is small ($f^2 = 0.049$), its confidence interval is wide, and its upper limit is close to zero, and the test has limited power for effects of this size (see Research Method), so its magnitude should be read as imprecise.

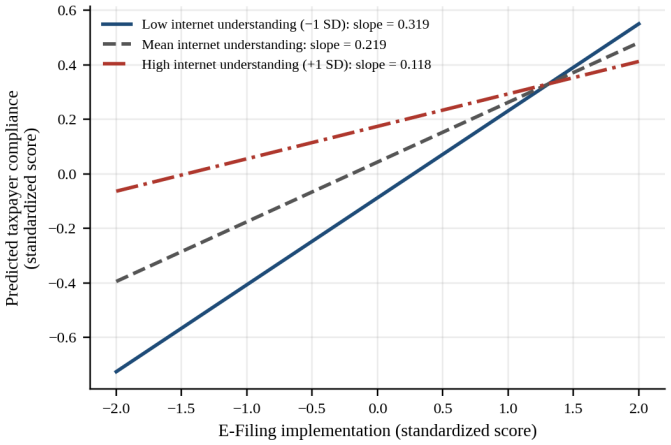


Figure 3. Interaction of E-Filing implementation and internet understanding (simple slopes)

4.5 Discussion

The result for H_1 is consistent with TPB: taxpayers who believe that E-Filing is convenient, faster, and less error-prone tend to have a strong intention to use it, which ultimately affects compliance. This finding supports Situmorang and Ginarti (2022), Nainggolan et al. (2022), and Mapope et al. (2022). With E-Filing, individual taxpayers at KPP Pratama Kupang can submit their

tax obligations more easily and quickly, with complete data, without going to the tax office, while also reducing paper use. The result differs from Anjani (2022) and Mahadianto et al. (2024), who found no effect of E-Filing. One possible reason is that the sample criteria in this study include only taxpayers who have used E-Filing, so respondents have directly experienced the benefits of the system. This is a plausible explanation rather than a tested one, and it also means that the effect applies to taxpayers who already use E-Filing. The effect is small (f^2 = 0.059), which agrees with the view that E-Filing alone does not secure compliance.

Tax understanding is the strongest direct predictor and the only one with a medium effect size (f^2 = 0.268). Its position at the intersection of the two theories helps explain why it matters most. In the TPB, knowing the provisions, rights, and procedures is the basis of perceived behavioral control: taxpayers who know what is required can fulfill it with confidence, whereas those who lack this knowledge may not form an intention to comply even when their attitudes are favorable. In SSF, understanding the rules and how the system operates supports the perception that obligations are clear, fair, and manageable, which is the basis of trust and voluntary compliance. Because trust was not measured, the SSF interpretation is plausible but not directly tested, and because one tax understanding item concerns KPP socialization, the construct also partly reflects contact with the authority. Taxpayers at KPP Pratama Kupang generally understand general tax provisions and procedures, the tax system and its implementation in Indonesia, and the function of tax, the mean tax understanding score of 4.07 is in the rather high category. The result reinforces Situmorang and Ginarti (2022), Nainggolan et al. (2022), Anjani (2022), Ay et al. (2021), and Matshona et al. (2024), but differs from Sulistyawati et al. (2022), who found no effect of tax understanding at KPP Pratama Jepara.

The result for H_3 agrees with the TPB in that behavior is preceded by an intention that grows from within. Taxpayers who recognize the importance of taxes for national development are driven to fulfill their obligations. This finding supports the findings of Oktaviani and Triyani (2023), Mudamakin and Rupilu (2022), Sulistyawati et al. (2022), and Yoga and Dewi (2022). The coefficient for tax awareness (0.18) is the smallest of the three predictors, and this variable also has the widest spread of answers (standard deviation = 1.23), indicating that awareness varies considerably among respondents. The smaller effect (f^2 = 0.061) and wide spread of answers suggest that awareness alone is a weaker driver of compliance than understanding in this setting, which is consistent with the TPB view that attitudes and norms translate into behavior only when a person also feels able to act on them.

Internet understanding moderates the effect of E-Filing implementation on compliance, but in the direction opposite to H_4: the interaction is significant and negative; therefore, the predicted strengthening is not supported. This contrasts with the findings of Purba et al. (2020), Rachmawati et al. (2022), and Jatnika et al. (2024), who reported a strengthening effect, and differs from the findings of Yanti and Setiawan (2020), who found no moderation. Three findings in the data bound this interpretation. First, the direct effect of internet understanding on compliance was positive (β = 0.131), therefore, general internet understanding was not detrimental. Second, the benefit of E-Filing is smaller when internet understanding is higher: the E-Filing path is 0.319, one standard deviation below the mean of internet understanding, and 0.118, not distinguishable from zero, one standard deviation above it. Third, the interaction was small and imprecisely estimated (f^2 = 0.049, 95% CI −0.196 to −0.016).

The data do not show why the interaction is negative, therefore, the explanations below are plausible accounts that require further investigation, not findings of this study. Substitution: Taxpayers with high general Internet understanding can obtain guidance and use other digital channels without relying on e-filing, therefore, the additional contribution of e-filing implementation to their compliance is smaller. In this reading, Internet understanding and e-filing partly substitute for each other in lowering the cost of reporting. Competence mismatch: The internet understanding items measure how easily taxpayers obtain information and E-Filing guidance online, which is not the same as the ability to complete and submit a return in the DGT system. Limited DGT outreach (Nainggolan

et al., 2022) and limited guidance material on the DGT website could widen this gap, but no variable here measures the quality of guidance or socialization, therefore, these remain untested. Range restriction and sample composition: All respondents are e-filing users, scores on both variables are concentrated at the upper end (means of 4.22 and 4.01), every respondent has at least a diploma, and 89% are aged 25–45, therefore, the interaction reflects relatively educated, digitally active users. Differences in digital competence or taxpayer characteristics could produce different patterns in a broader population. Measurement: The five internet understanding items refer to the perceived ease of obtaining tax information online and may capture perceived access more than skill, which weakens the link between the construct and e-filing use. Chance: with limited power for small interactions and a confidence interval whose upper limit is close to zero, a sample-specific result cannot be excluded.

Theoretically, the results suggest that perceived behavioral control in digital tax settings is better represented by system-specific competence than by general Internet understanding. Earlier studies have reported that general Internet understanding is a proxy for the ability to use E-Filing, however, the present result, obtained among existing E-Filing users in a region with lower Internet penetration, indicates that this proxy cannot be assumed to hold. Differences between studies may therefore come from who is sampled (users or non-users), the competence measured (general or system-specific), and the method (moderated regression or latent-variable interaction), which the present design cannot separate. Testing these possibilities requires samples that include non-users, direct measures of E-Filing self-efficacy, and replication in other regions.

5. CONCLUSIONS

5.1 Conclusion

This study examined the effects of E-Filing implementation, tax understanding, and tax awareness on the compliance of individual taxpayers at KPP Pratama Kupang and tested whether internet understanding moderates the effect of E-Filing. First, the three factors each have a significant positive effect on compliance (H_1–H_3 supported), with tax understanding the strongest (β = 0.393). Second, H_4, which predicted that internet understanding strengthens the effect of E-Filing, is not supported: the interaction is statistically significant but negative (β = −0.100), the opposite of the predicted direction. This contradicts the predicted strengthening, it does not show that internet understanding is harmful to compliance because its direct effect is positive (β = 0.131). It indicates that, among taxpayers who already use E-Filing, general internet understanding did not amplify the benefit of E-Filing. The main empirical contribution is evidence on digital tax compliance from a region with lower internet penetration, with a moderating result that differs from earlier regression-based findings. For digital tax administration, the findings suggest that digital competence specific to tax services, such as obtaining an EFIN and completing and submitting a return, deserves attention alongside general internet access. These conclusions apply to E-Filing users in the study area and are bounded by the limitations below. For the DGT, the results show that raising compliance cannot be achieved by providing E-Filing alone but also requires tax education and E-Filing guidance that are easier to access. Theoretically, the study enriches research on tax compliance behavior in the context of digital tax services.

5.2 Research Limitations

This study has several limitations. First, the object of research is limited to individual taxpayers registered in the Kupang City area, while geographic conditions, digital literacy, and tax compliance in other regions may differ; thus, the results may not represent other regions. Second, data were collected through Google Form, so respondents may have completed the questionnaire without full seriousness, and participation is limited to taxpayers with internet access and adequate digital literacy, which may create respondent bias against taxpayers less familiar with technology. Third, all respondents had used E-Filing and only 6.7% had a mean internet understanding score below 3.0, thus, the sample contains few taxpayers with low internet literacy, and the results, and the moderating effect in particular, cannot be generalized to non-users or taxpayers with low digital competence. Fourth, the sample was selected purposively, and its size gives limited power for small effects, thus, the interaction is imprecisely estimated. Fifth, the data are cross-sectional and self-reported, common method bias was checked statistically but cannot be excluded, and causal claims are not warranted.

Sixth, trust and power in SSF and system-specific E-Filing competence were not measured, and no out-of-sample predictive assessment was conducted.

5.3 Suggestions and Directions for Future Research

Future research should cover wider regions with different economic, social, and cultural characteristics so that the effect of E-Filing implementation, tax understanding, and tax awareness on compliance can be more comprehensively understood. Samples should also include taxpayers who do not use E-Filing and taxpayers with low internet literacy so that the moderating role of internet understanding can be tested over its full range. Future models can measure E-Filing-specific self-efficacy alongside general internet understanding, include trust in and perceived power of the authority to test SSF directly, and assess out-of-sample prediction. Data collection could also use mixed methods, combining surveys and interviews, to obtain deeper data, including on the reasons behind the negative moderating effect of internet understanding. Because 33% of the variance in compliance is not explained by the model, future studies can add other relevant factors. For the DGT and KPP, the results imply the need to strengthen socialization and add E-Filing guidance material on the DGT website.

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AUTHOR CONTRIBUTIONS

ALF contributed to research conceptualization, methodology development, questionnaire design, data collection, statistical analysis using SmartPLS 4, interpretation of findings, and preparation of the original manuscript. ACL contributed to research supervision, theoretical framework development, methodological validation, interpretation of results, and critical review and editing of the manuscript. Both authors reviewed and approved the final version of the manuscript for publication.

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